

Aug. 18, 1942.

F. J. REILLY ET AL

2,293,360

AIR CONDITIONING METHOD AND APPARATUS

Filed Sept. 3, 1935

6 Sheets-Sheet 1

FIG. 1.

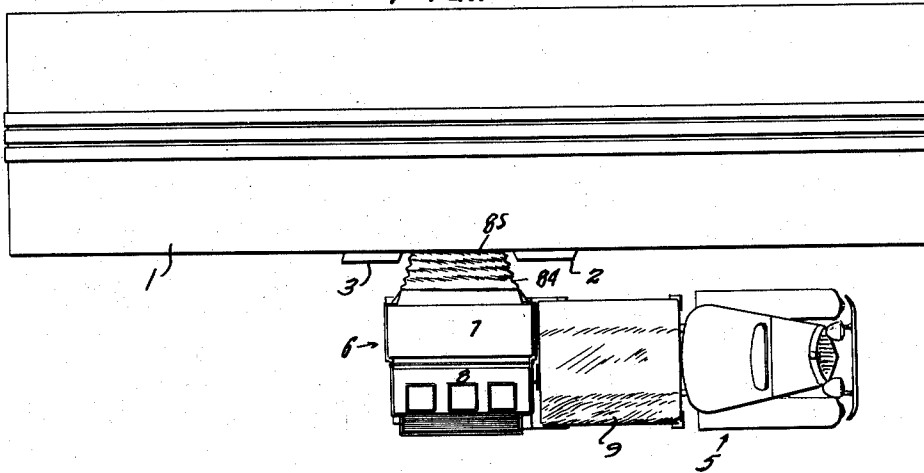


FIG. 2.

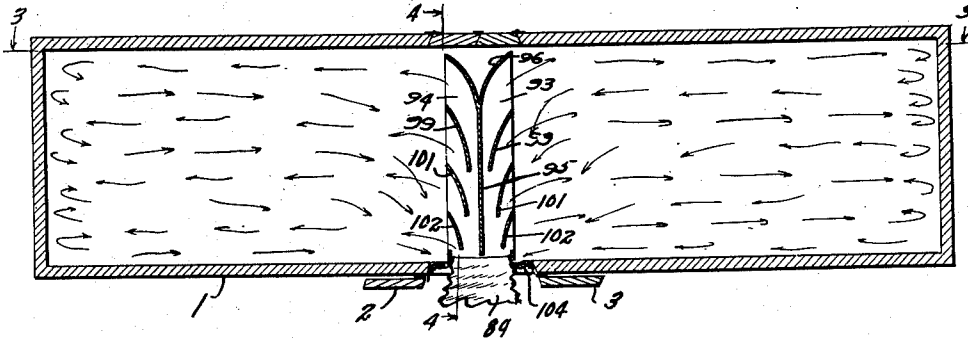
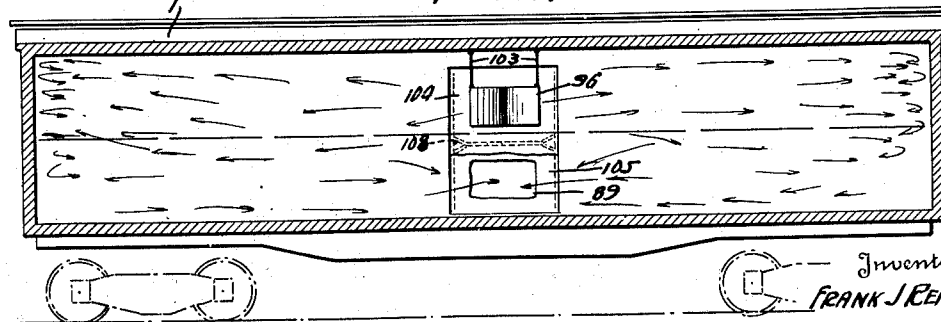


FIG. 3.



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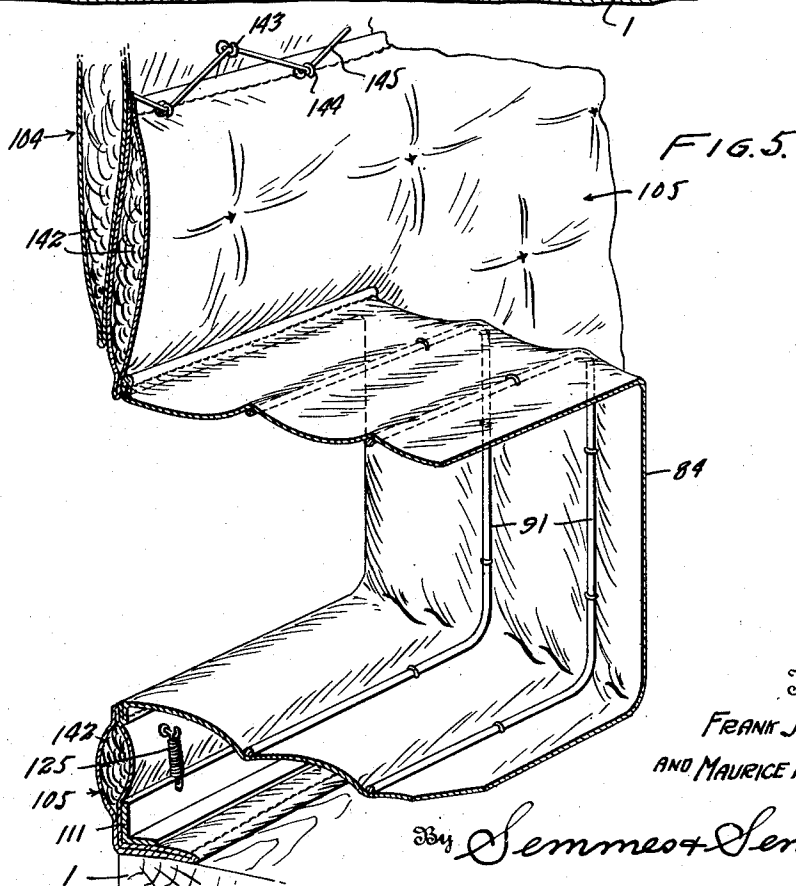
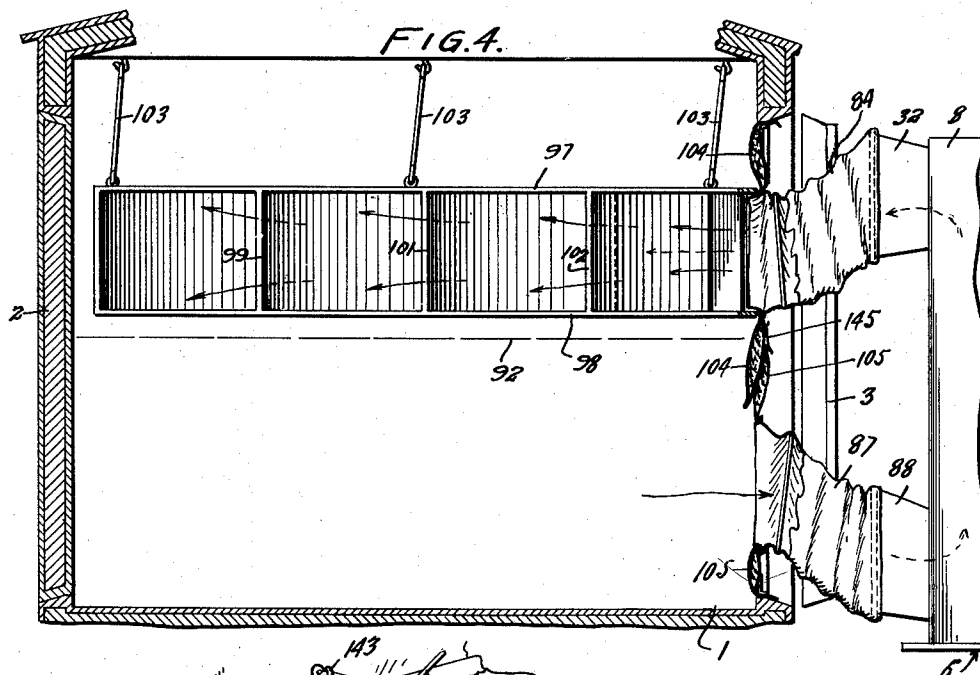
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6 Sheets-Sheet 2



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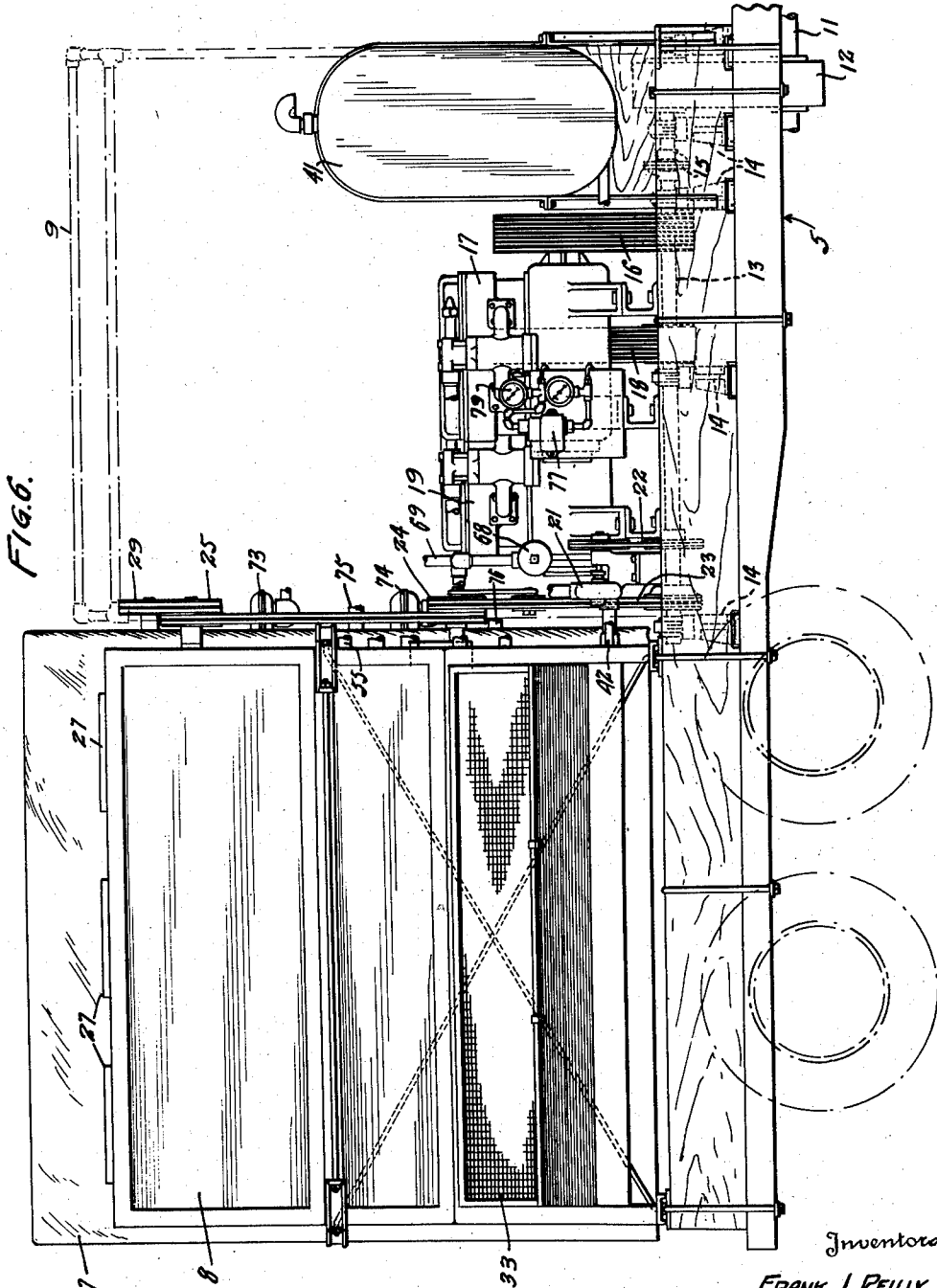
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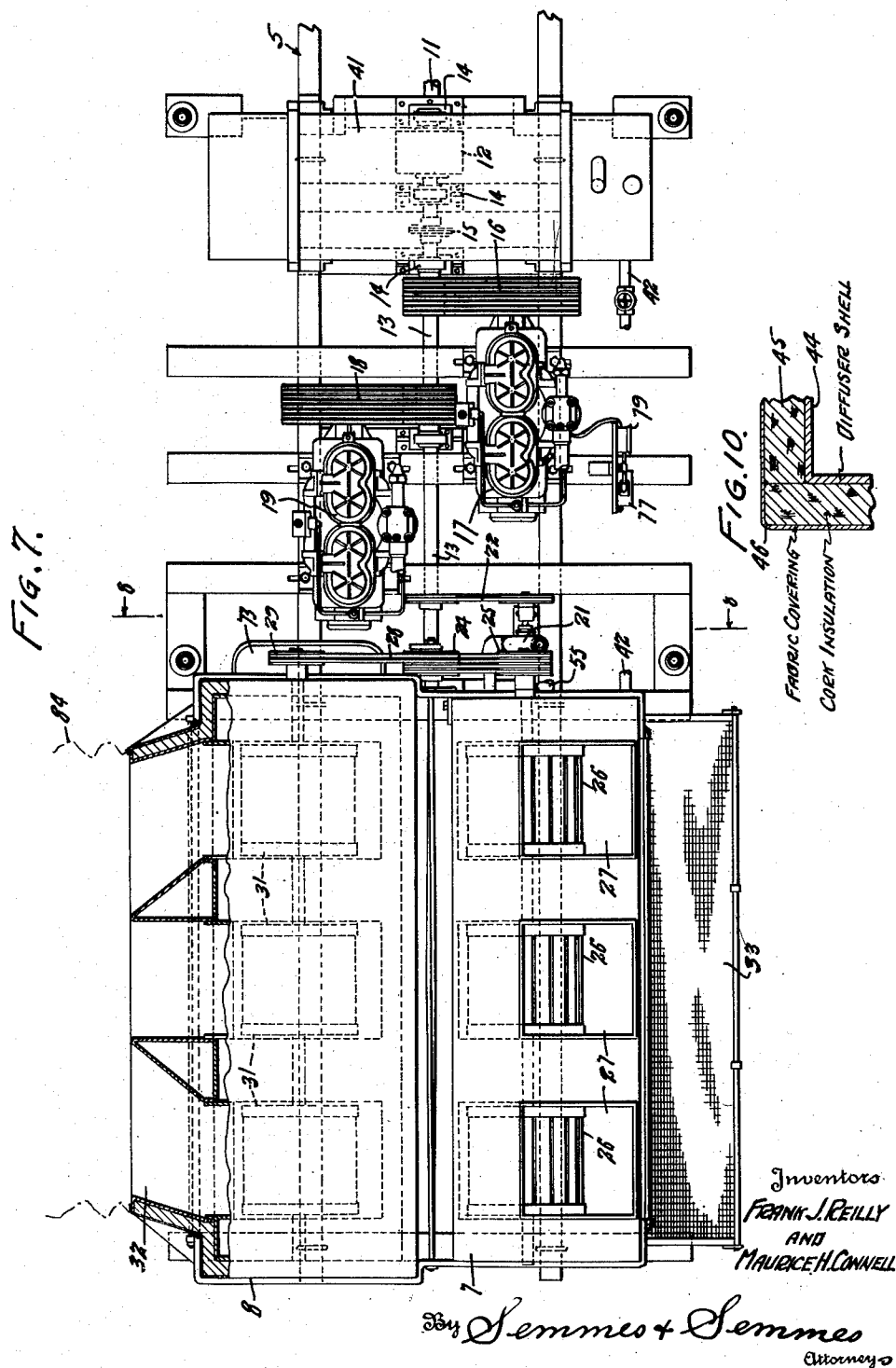
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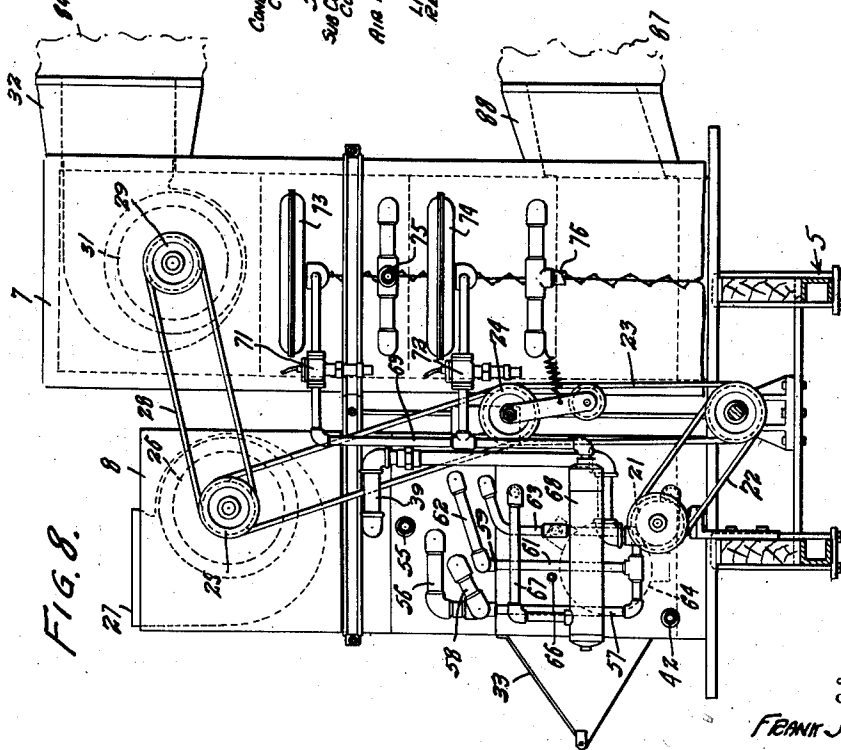
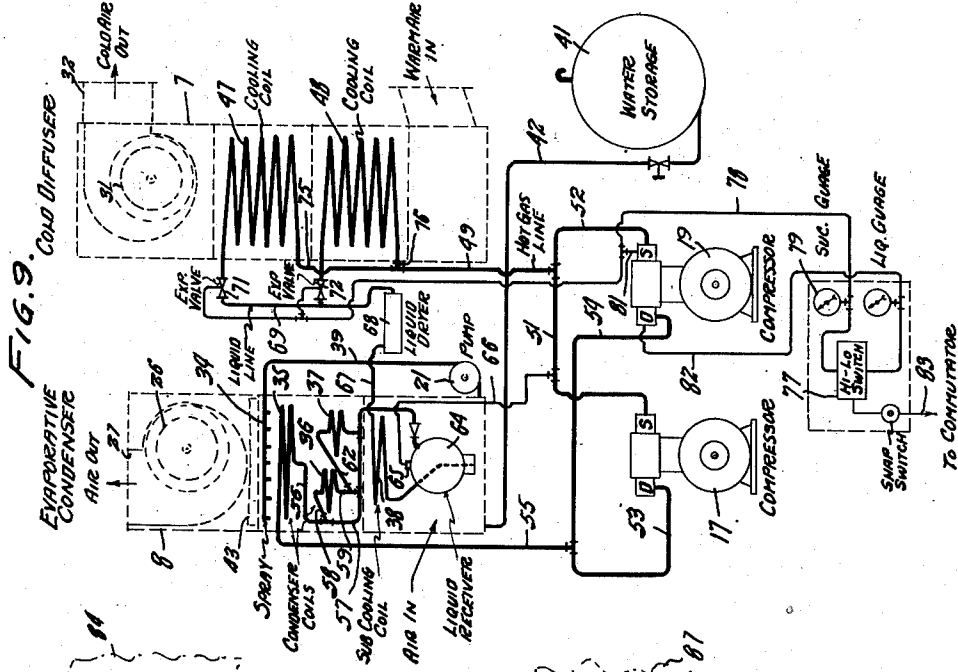
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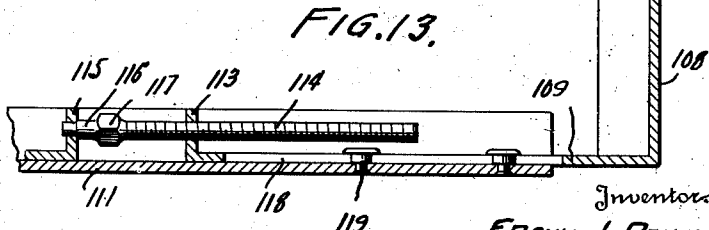
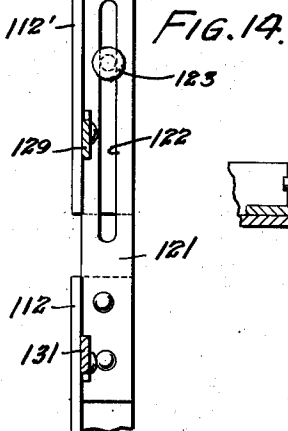
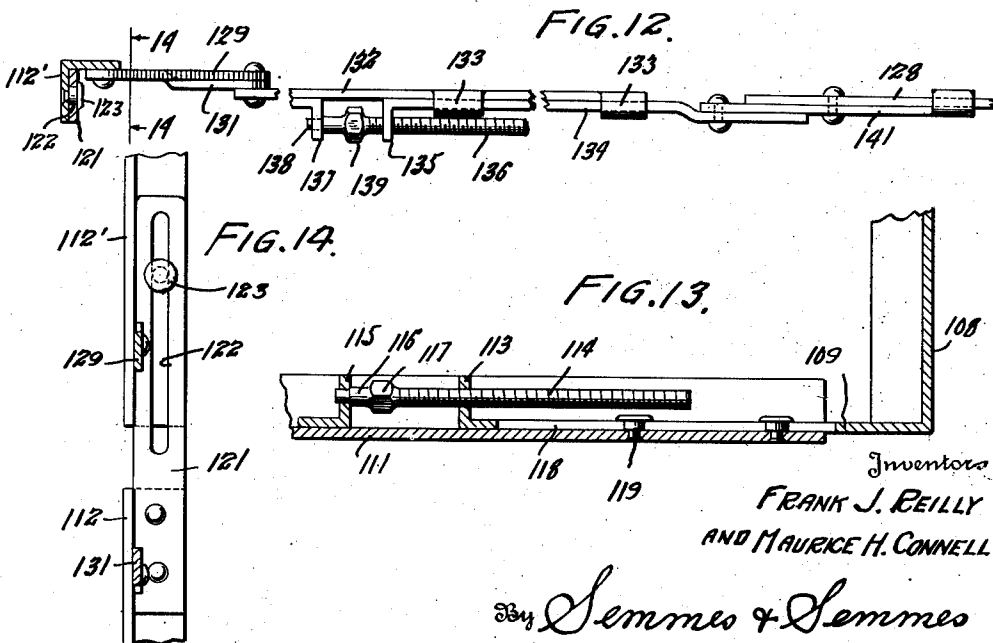
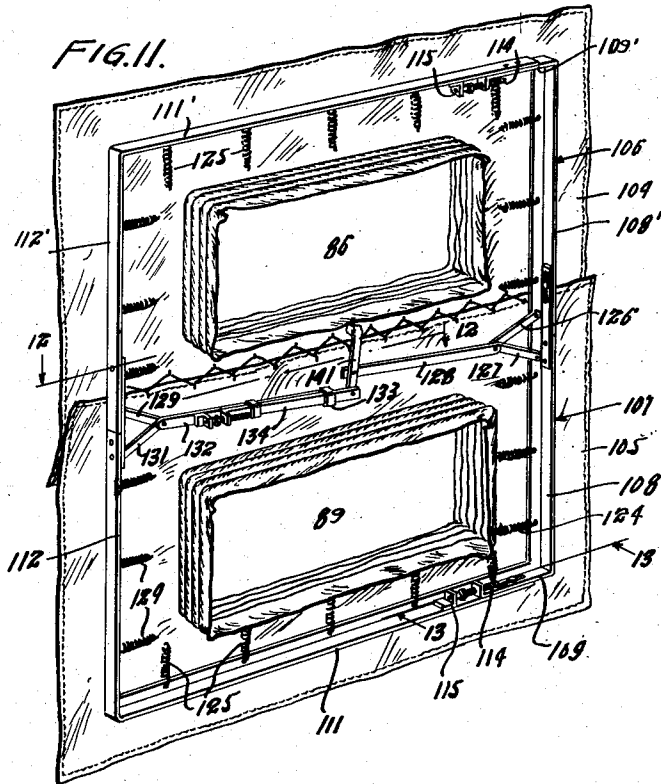
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AIR CONDITIONING METHOD AND APPARATUS

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UNITED STATES PATENT OFFICE

2,293,360

AIR CONDITIONING METHOD AND APPARATUS

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Application September 3, 1935, Serial No. 39,044

6 Claims. (Cl. 98-6)

This invention relates to air conditioning, and more particularly has reference to the precooling and preconditioning of cars transporting perishable food products. While we shall describe our invention with respect to the precooling and preconditioning of cars, it will be appreciated that the inventive concept is of far greater application.

As is well known, it has heretofore been the custom to fill with ice the bunkers of freight cars transporting perishable food products, and to "top ice" the products in certain instances. Such practice presents many disadvantages, including the relatively high cost thereof and the consumption of a large amount of time during the course of transit in view of the necessity of stopping along the route for re-icing.

The principal objection, however, resides in the fact that when fruits and vegetables are so shipped, it is not possible to pick the products in a fully ripened condition, but rather they must be picked when relatively green. This is due to the fact that with the practice above mentioned, there is a considerable period after the products are placed in the car before they are reduced to the proper temperature. This, of course, impairs the quality of the product, and as a result, the shipper does not receive a price equal to that which would be received if the products were picked when fully ripe.

While it has been suggested that loaded freight cars may be precooled, no satisfactory process and apparatus for accomplishing the same has yet been produced. However, adequate precooling has been impossible heretofore. This has been particularly true insofar as concerns the precooling of cars by a portable unit.

An object of this invention is to provide a process and apparatus for the effective cooling and air conditioning of a chamber and its contained products.

Another object of this invention is to provide a process for insuring the uniform distribution and passage of cooled and conditioned air throughout the entire contents of a freight car.

Yet another object of this invention is to provide means for insuring the proper air pressure in various points of a car to obtain the optimum operating conditions.

A further object of this invention is to provide a process and apparatus for the cooling and conditioning of the contents of a car by means of a portable refrigerating device, so that the same may be effectively cooled regardless of the location of the car.

To accomplish the above and other important objects, this invention in general embraces the idea of quickly and thoroughly cooling the contents of a chamber by means of a refrigerating unit. More specifically, we provide a process and apparatus for the precooling of a loaded freight car by means of a portable refrigerating unit that is self-contained and requires little material or attention over a course of operation, and which may be readily moved to any point at which the loaded car may be standing. This refrigerating unit supplies chilled air to the car and withdraws warm air therefrom at such rates, under such pressures, and in such a manner that there is a uniform distribution of the chilled air throughout the lading.

In the accompanying drawings we have depicted one specific embodiment which our invention may assume, but it will of course be appreciated that various modifications may be made therein without exceeding the scope of our inventive concept.

In these drawings, in which corresponding numerals refer to the same parts:

Figure 1 is a top plan view of a freight car and a portable air conditioning apparatus in an operative position with respect thereto.

Figure 2 is a horizontal sectional view of a freight car equipped with a device for insuring an equal distribution of the chilled air.

Figure 3 is a view along the line 3-3 of Figure 2, looking in the direction of the arrows.

Figure 4 is a view partly in section and partly in elevation, taken along line 4-4 of Figure 2, looking in the direction of the arrows.

Figure 5 is a detail view of the false door employed and the return air duct.

Figure 6 is a side elevation of the refrigerating unit.

Figure 7 is a plan view, looking down, of the unit shown in Figure 6.

Figure 8 is a view along the line 8-8 of Figure 7.

Figure 9 is a diagrammatic view of the refrigerating cycle.

Figure 10 is a sectional view in detail of the casing for the diffuser.

Figure 11 is a view of an adjustable false door, which may be used with our invention.

Figure 12 is a detailed view along the line 12-12 of Figure 11.

Figure 13 is a detailed view along the line 13-13 of Figure 11.

Figure 14 is a detailed view of the junction of the door section.

In Figures 1 through 3 there is shown a conventional freight car 1 of the so-called refrigerator type. This car is provided with the usual doors 2 and 3 located on each side and at the center of the car. As best shown in Figure 2, these doors may be swung outwardly to lie flush against the exterior of the sides.

There is disclosed in Figure 1 a truck, designated generally 5, on the rear of which is mounted a refrigerating unit designated by the numeral 6. This refrigerating unit is made up of a diffuser element 7 and a condenser 8, and necessary compressors and pumps mounted on the truck beneath a protective awning 9.

Referring particularly to Figure 6, the refrigerating unit is operated by means of a power shaft 11 driven from the conventional motor of the truck. A suitable power take-off unit 12 is provided to operatively connect the shaft 11 with a drive shaft 13. The drive shaft 13 is mounted on bearings 14 and is provided with a suitable flexible coupling 15. The necessary pulleys, sprockets, or gears, are mounted on the shaft 13 to operate the driven elements of the refrigerating unit.

For instance, a pulley is provided for a belt 16 to drive a compressor 17. Another pulley is provided for a belt 18 which drives a second compressor 19. The compressors 17 and 19 are of a suitable style and capacity to secure the necessary refrigeration, and, as best shown in Figures 7 and 9, these compressors are arranged in parallel for the refrigerating cycle. A water pump 21 is driven by shaft 13 through a suitable pulley arrangement and belt 22.

As best shown in Figure 8, a pulley 24, driven by belt 23, drives a pulley 25 mounted on a common drive shaft for three fans 26. Each of the fans 26 exhausts air from discharge outlets 27 at the top of the condenser unit 8. Obviously, the number of fans and outlets in the condenser may be varied as desired.

The pulley 25 also carries a belt 28 which passes over a pulley 29. The pulley 29 likewise is mounted on a common drive shaft for three pressure fans 31 mounted in the top of the diffuser unit 7. Each of the fans 31 forces air through respective outlets 32 in the diffuser. Here again the number of fans and outlets may of course be varied.

The condenser element 8 is of the evaporative condenser type. As best shown in Figures 8 and 9, it is provided with an air inlet 33 which passes into the base of the casing. The air is sucked upwardly through the casing by means of the fans 26, and at the same time, water is sprayed downwardly from nozzles 34. The spray falls upon primary condensing coil 35 and a pair of secondary condensing coils 36 and 37. A sub-cooling coil 38 is also subjected to the spray. The air is drawn into the condenser at such a rate as to effect the necessary vaporization of the water that is sprayed onto the condenser coils, and such vaporization extracts sufficient heat from the refrigerant in the condenser coils to result in condensation of the refrigerant. The condensed refrigerant in the sub-cooling coil is likewise further reduced in temperature.

The unvaporized water collects in the base of the condenser casing and is returned to the nozzles 34 by means of pump 21 and line 39. Make-up water is fed to the condenser from a water storage tank 41 through line 42. It will be appreciated that a relatively small amount of liquid is lost through vaporization, 75

and the water storage tank best shown in Figure 6 holds sufficient water for operation of the device over a considerable period of time. Such an arrangement, therefore, makes the refrigerating unit substantially independent of the source of water supply.

An eliminator 43 may be placed in the upper part of the condenser to prevent the escape of water that may be entrained in the air exhausted from the condenser.

The diffuser element 7 is likewise made up of a casing which is preferably insulated as shown in Figure 10. It will be noted that a shell 44, surrounded by cork insulation 45, is provided. A suitable weather-proofing fabric 46, such as, for instance, canvas, may cover the cork.

Arranged one above the other within the diffuser are cooling coils 47 and 48. The relatively warm air is admitted to the base of the diffuser, passes upwardly over the coils 48 and 47, successively, and then is discharged through outlets 32 under pressure, and returned to the car. As the warm air passes upwardly over the coils 48 and 47 its temperature is lowered, and there is a consequent condensing out of the moisture in such air. Ordinarily this moisture will be laden with the dirt and bacteria picked up by the air in the course of its passage through the contents of the car, and this condensation of the moisture consequently effects a cleansing of the air. It will be noted that the condensate drops to and collects in the base of the diffuser member 7, where it is removed from the cycle and where it is out of contact with the air flow.

The refrigerating cycle is best shown in Figure 9. The refrigerant in a hot and gaseous condition, after absorbing the heat of the treated air, is delivered by line 49 and branch lines 51 and 52 to the compressors 17 and 19, respectively. As heretofore pointed out, these compressors are arranged in parallel, and the compressed gas is delivered from the compressors through lines 53 and 54 to a pipe 55.

Pipe 55 is connected to condenser coil 35, from which coil the condensed and gaseous refrigerant is passed through line 56. So much of the refrigerant as has been condensed in condenser coil 35 passes from pipe 56 into line 57. The uncondensed refrigerant, however, passes through line 58 to condenser coil 36. The refrigerant passes from condenser coil 36 into line 59, from which the refrigerant which has been condensed in coil 36 flows into line 61.

The refrigerant that is still in gaseous form after passage through coil 36, is carried by line 62 to final condenser coil 37. From coil 37 the refrigerant, practically all of which is now in liquid form, passes by line 63 into the liquid receiver 64 located in the base of the condenser unit. Pipes 67 and 61 also discharge their liquid refrigerant into receiver 64.

A safety or blow-off plug 65 is provided for the liquid receiver 64 and is connected by a line 66 to the main or branch hot gas lines leading to the compressors. Therefore, if the pressure within liquid receiver 64 becomes excessive, it is relieved by means of the safety plug.

The liquid refrigerant is withdrawn from receiver 64 and is then passed through sub-cooling coil 38. This further reduces the temperature of the refrigerant and thereby increases the efficiency of the device. From the sub-cooling coil the liquid refrigerant passes by way of line 67 to a liquid dryer 68, and thence by way of line 69

to the expansion valves 71 and 72 for the cooling coils 47 and 48, respectively. After passage through the expansion valves, the refrigerant enters the headers 73 and 74.

The hot gases from the coils 47 and 48 pass to hot gas line 49 by way of pipes 75 and 76, respectively.

The diffuser, compressor and condenser elements are maintained in balance by virtue of a blank switch 77. This switch is connected to the expansion valves 71 and 72 by means of a line 78 on which is mounted a suitable suction gauge 79. A line 81 from the suction side of the compressor is teed into the line 78. A line 82, tapped into the pressure side of compressor 19, is likewise connected to switch 77. Switch 77 also receives electric wires 83 leading to a commutator.

A duct 84 is adapted to fit over the discharge outlets 32 of the diffuser element and extends to a false door designated generally 85, which is positioned in the doorway of the freight car. The manner of securing the duct 84 to the diffuser outlets and to the false door 85 may be, of course, varied, but in general we prefer to have the duct 84 permanently sewn to the door.

As best shown in Figure 11, the door is provided with a cut-away section 86, and the duct may be sewn around the edge of such cut-away portion.

As best shown in Figure 8, a return duct 87 extends from the lower portion of the door to the air inlet 88 of the diffuser element, and this duct likewise may be sewn around the edge of a cut-out section 89 in the base of the false door.

It will be noted that both ducts 84 and 87 are of relatively short length, and therefore there is little opportunity for heat exchange between the air within such ducts and the atmospheric air. These ducts may be of bellows-like construction, and may be reinforced by rectangular bands 91, such as shown in Figure 5.

It will therefore be seen that the warm air is exhausted from the car at its base and center, cooled in the diffuser unit, and then returned to the car through the upper duct and under pressure.

The air may be discharged into the car directly from the opening 86 in the door, but in this event it is preferable that there be stretched over the lading in the vicinity of the door a tarpaulin or other suitable means to prevent short-circuiting of the air current to the opening 89. As best shown in Figure 4, the usual height of the lading is indicated by the dotted line 92. However, of course, this height may be varied as occasion demands. The spreading of the tarpaulin, therefore, requires a circulation of the incoming air toward the opposite ends of the car.

We prefer that the air shall be deflected to the ends of the car by means of air ducts which are connected to the inner side of opening 86. It will be observed that one duct 93 deflects the air toward one end of the car and the other duct 94 deflects it toward the opposite end. Preferably these ducts are formed as a single unit with a dividing wall 95 terminating in end portions 96 which diverge. A suitable top 97 and base 98 are provided, and interposed between the top and bottom are deflecting vanes 99, 101 and 102. It will be noted that each of these vanes deflects toward its respective end a portion of the incoming air, and results in a discharge from the duct of a current longitudinally of the car which is substantially uniform throughout the width of the car. Furthermore, it will be noted that the pro-

vision of the ducts 93 and 94 maintains the loss in velocity at a minimum.

The ducts may be formed of any suitable materials, and if desired, may be suspended from the top of the car by means of rods 103. However, canvas ducts may be employed, in which event the velocity of the wind is sufficient to maintain them in extended position during the operation of the device. If made of canvas, the ducts of course may be sewn directly to the door, as in the case of ducts 84 and 87, but if the inner ducts are not formed of fabric, they may be retained in close engagement with the opening 86 in any appropriate manner. It will also be appreciated that while we have shown the two ducts in the form of a single unit, separate ducts may be employed if desired.

The false door 85 may be of any desired construction, but in Figures 11 through 14, there is disclosed a particularly efficient type of door which is adjustable to fit various sized doorways in the refrigerator car.

Referring particularly to Figure 11, it will be seen that we prefer to form the door of two sections in order to facilitate transportation from job to job and easy assembly. Two quilts 104 and 105 of suitable flexible material such as heavy canvas, which is substantially airproof, either naturally or by special treatment, and stuffed with suitable insulating material, form the basis of this door. Associated with the quilts 104 and 105 are frames 106 and 107, respectively, which may be formed of angle irons. The frames 106 and 107 are extensible, both vertically and horizontally, and being identical in construction and operation, only frame 107 will be described.

Frame 107 is made up of angle iron 108 provided at its base with a right angle extension 109. Secured to this extension in a manner to be described is a base member 111. A second side member 112 may be either formed as a continuation of the base member 111 or may be integrally secured thereto by suitable means.

The horizontal extensibility of frames 106 and 107 is secured by the means which join extension 109 to bar 111. As shown in detail in Figure 13, the free end 113 of extension 109 is turned upwardly and is drilled with a threaded aperture adapted to receive a bolt 114. A flange 115 is secured to the bar 111, and is drilled to receive a shouldered extension 116 of the bolt. A suitable head 117 is formed on the bolt and adapted to be engaged by an appropriate instrument.

A slot 118 is cut in extension 109 and headed bolts or lugs 119 extend through the slot and are anchored in bar 111.

It will therefore be observed that the slot 118 and lugs 119 serve to join the extension 109 and bar 111 and to maintain the two members aligned, while at the same time permitting a relative longitudinal movement thereof. Rotation of the bolt 114 of course results in a spreading or contraction of the bars 108 and 112 to accommodate these bars to doors of varying width.

The means of securing together the two sections 106 and 108 and at the same time permitting relative movement thereof to compensate for varying heights, is shown in detail in Figure 14. There is suitably secured to the bars 108 and 112 of section 107 a tongue 121 forming an overlapping connection for the bars 108' and 112' of the upper section. A slot 122 is cut in tongue 121 and a headed bolt 123 extends through the slot and is screwed into the upper

bar 108' or 112', thus serving as a guide between the two sections 106 and 107. Bolt 123 may of course be unscrewed to disassemble sections 106 and 107.

Spaced in the outline of a rectangle, and of a smaller size than the minimum size of the frame formed by 106 and 107, is a series of hooks 124 on the quilts. Substantially opposite each hook 124 is a hole drilled in the frames 106 and 107. A coil spring 125 is connected to each hook 124 and to the corresponding hole, and is of such size and strength as to constantly maintain the quilts 104 and 105 under tension. The means for securing together the two quilts 104 and 105 will be described hereinafter.

A toggle arrangement such as shown in Figures 11 and 12 serves to adjust the door vertically. A toggle arm 126 is pivoted to the upper bar 108' and toggle arm 127 is pivoted to the lower bar 108, the two toggle arms being pivotally connected to a rod 128. Likewise, toggle arm 129 is pivoted to upper bar 112' and toggle arm 131 is pivoted to lower bar 112. These two toggle arms in turn are pivoted to a rod 132.

The rod 132 is provided with a pair of spaced sleeves 133 adapted to receive for longitudinal movement a rod 134. The rod 134 is bent to form a flange 135 which is drilled with a threaded aperture to receive a bolt 136. A flange 137 is secured to rod 132 and is apertured to receive the shouldered extension 138 of bolt 136. A suitable head 139 is formed upon the bolt. By means of the adjustability of the toggle through bolt 136, the frame formed by members 106 and 107 may be lengthened to suit varying door heights.

As shown in Figure 12, the free end of rod 134 may be offset, and there is pivoted to this offset portion an arm 141. At another point along its length, the arm 141 is pivoted to rod 128. It will therefore be observed that movement of rod 141 to the right in Figure 11 results in the spreading of the two toggles, which in turn effects an increase in the height of the door.

In operation, the two sections of the door are assembled with their respective quilts. The edges of the quilts 104 and 105 are tucked between the frames 106 and 107 and the doorway, and the door is roughly adjusted by means of bolts 114 for the proper width. The arm 141 is then manipulated to spread the toggle and increase the frames to tightly fit the doorway.

As best shown in Figure 5, the quilts 104 and 105 are stuffed with suitable insulating material 142, such as seaweed, treated shredded papers, or some other appropriate material. The quilt 104 is provided with a series of spaced hooks 143, and a series of hooks 144 are arranged on quilt 105 in staggered relationship to the hooks 143. A cord 145 is laced over the hooks 143 and 144 to secure the proper joinder of the two quilts, and to maintain this joinder during expansion of the door to fit the doorway.

Of course, the necessary gauges and regulating controls are provided for the operation of the cooling unit, and there is also provided an automatic humidity control so that the moisture content of the air within the car may be maintained for any desired degree. This control (not shown) may be of the conventional wet bulb type operating on the compressor to regulate the speed thereof so that the degree of cooling effected by the coils governs the amount of moisture withdrawn from the air passing thereover.

In operation, the truck 5 is drawn up to the side of the car to be conditioned, the car having

previously been loaded. Our invention may be used on a car which has not been previously bunker-iced, or which has been bunker-iced, or even under certain rare circumstances, it may be desirable to practice our invention on a car that has been both bunker-iced and top-iced.

The conduits 93 and 94 are placed inside of the car at the time the false door 85 is arranged in the doorway, and the false door is then adjusted as described above. The conduits 84 and 87 are secured to the discharge opening 32 and the inlet opening 88 of the diffuser.

The power shaft for the refrigerating unit is thrown into gear and the unit commences to operate. As above indicated, fan 31 exhausts the air from the car, draws it over the cooling coils in the diffuser, and then discharges it under pressure into conduit 84. This fan operates at such a speed that a sufficient pressure in the top of the car is built up to insure a uniform permeation of the cold throughout the load. A sufficient turbulence is also effected to prevent any hot air pockets within the car. Regardless of whether the inner conduits 93 and 94 are employed, a maximum pressure and turbulence is attained, causing a rapid and uniform cooling of the lading.

It is of course appreciated that various products require varied treatments. For instance, in the case of potatoes, the primary result sought is a drying of the air to prevent sliming of the product. On the other hand, in the case of tomatoes, it is necessary to cool the product appreciably in order to prevent deterioration. In any event, a desideratum is an adequate circulation of air, but here again the extent necessary for the proper end results which are sought varies with the product.

We have found that it is necessary to inject the air at a greater velocity and in greater volume during the initial stages than is necessary toward the end of the operation. For instance, to secure optimum conditions for certain products, the air may be injected at a velocity of four thousand feet per minute initially, and this velocity may be reduced to two thousand feet per minute toward the end. Likewise, the volume of the air may vary from twelve thousand to fourteen thousand cubic feet initially to 8000-8800 cubic feet per minute toward the end.

In any event, the air is injected at such a rate, and in such a manner, that the air at the ends of the car and above the load is under a relatively high static pressure built up in these vicinities. It will be noted that by the use of the ducts 93 and 94 the air is deflected by a gradual curve from a transverse path to a longitudinal path, and at the same time this volume of air is distributed in a relatively uniform stream across the width of the car. Consequently, when the air impacts the ends, it has a very appreciable velocity, and this velocity pressure is transformed into the static pressure above referred to.

Even if the ducts 93 and 94 are not employed, direct short-circuiting of the air is prevented by the tarpaulin, which may be used as above indicated. In this event there is still a sufficient pressure built up throughout the top of the car to insure a thorough permeation of the entire load.

Therefore, while the ducts 93 and 94 are preferable, it will be seen that even when they are not used, the load in the lower ends of the car is subjected to the cold air and thus reduced to

the desired temperature. It is this portion of the load which heretofore has been the most difficult to cool.

It will of course be appreciated that the pressure differential between the top of the car and the bottom of the car is due to the exhaust of air through duct 87. However, and notwithstanding the suction through duct 87, the air, upon entering that duct, may still have a positive pressure, in view of the relatively high pressure built up at the top of the car.

We have referred above to maintaining the car air-tight during the cooling operation. However, under certain conditions, it may be desirable to open some of the hatches in order to permit the escape of stale air, and our invention of course embraces this concept. Likewise, as stated above, automatic humidity controls are provided, so that the moisture content of the air, and also of the products, may at all times be regulated.

It is believed that the advantages of our invention are readily apparent. As mentioned above, an economy in both money and time is effected by our invention. Furthermore, there is a wider range of cooling possible, and the exact degree of cooling desired in any particular situation may be controlled to a nicety. In actual practice, we have found that foods treated in accordance with our invention can secure a higher premium on the market than similar goods which are treated by ice or other prior processes.

The fact that our unit is portable lends particular attraction to it. Especially in the case of fresh and perishable food products, the cars are usually packed on a siding in the country, and in such event our apparatus may be employed immediately after the loading of the car.

Numerous other advantages residing in our invention will be appreciated by those skilled in the art.

While, for purposes of simplification, we have depicted and described a car that is not provided with ice bunkers, it will be appreciated that perishables are usually shipped in cars provided with such bunkers. In such case, the major portion of the stream of incoming air of course strikes the bunker bulkhead rather than the end walls of the car. It will therefore be appreciated that the term "end of the car" appearing in the claims refers to the end wall or, in the case of a bunkered car, the bunker bulkhead.

While we have shown and described the preferred embodiment of our invention, we wish it to be understood that we do not confine ourselves to the precise details of construction herein set forth, by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

We claim:

1. A method of air-conditioning a loaded freight car, comprising withdrawing air from the center and base of the car, conditioning the withdrawn air, returning the conditioned air in two streams to the car at the center and transversely thereof and above the load, deflecting one stream so that its path is longitudinal and toward one end of the car, deflecting the other stream so that its path is longitudinal and toward the other end of the car, each path being substantially the width of the car, and giving the conditioned air such a velocity that upon its impact with the car ends a substantial pressure is built up.

2. In an air-conditioning apparatus for freight cars, a door at the center of the car, an aperture in the upper part of said door to permit the entrance of air to the car interior, a duct within the car communicating with said aperture and adapted to deflect air toward one end of the car, and an aperture in the lower part of said door to permit the discharge of air from the car.

3. In an air-conditioning apparatus for freight cars, a door at the center of the car, an aperture in the door through which conditioned air is admitted to the car, another aperture in the door through which air is withdrawn from the car, a duct extending transversely of the car, means for maintaining one end of the duct against the first mentioned aperture, and means in the duct to deflect the air admitted to the car toward one end thereof.

4. In an air-conditioning apparatus for freight cars, an adjustable door at the center of the car, two apertures in the upper portion of said door through which conditioned air is admitted to the car, a pair of ducts extending transversely of the car and communicating respectively with the two apertures, vanes in one duct adapted to deflect air toward one end of the car, and vanes in the other duct adapted to deflect air toward the other end.

5. In an air-conditioning apparatus for freight cars, a false door comprising an adjustable frame, and a sheet of flexible material mounted upon the frame and adapted to be folded between the frame and the door jamb.

6. A method of conditioning the load of a freight car comprising withdrawing air from the center of the car and below the load level, conditioning the air, introducing the conditioned air transversely to the center of the car above the load level, deflecting the air so that the major portion thereof passes to the ends of the car, introducing such air to the load near the ends of the car, and passing the air through the load to its point of withdrawal from the car.

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