May 22, 1934. O. LUHR 1,959,681

REFRIGERATOR CAR

Filed April 30, 1931 5 Sheets-Sheet 1

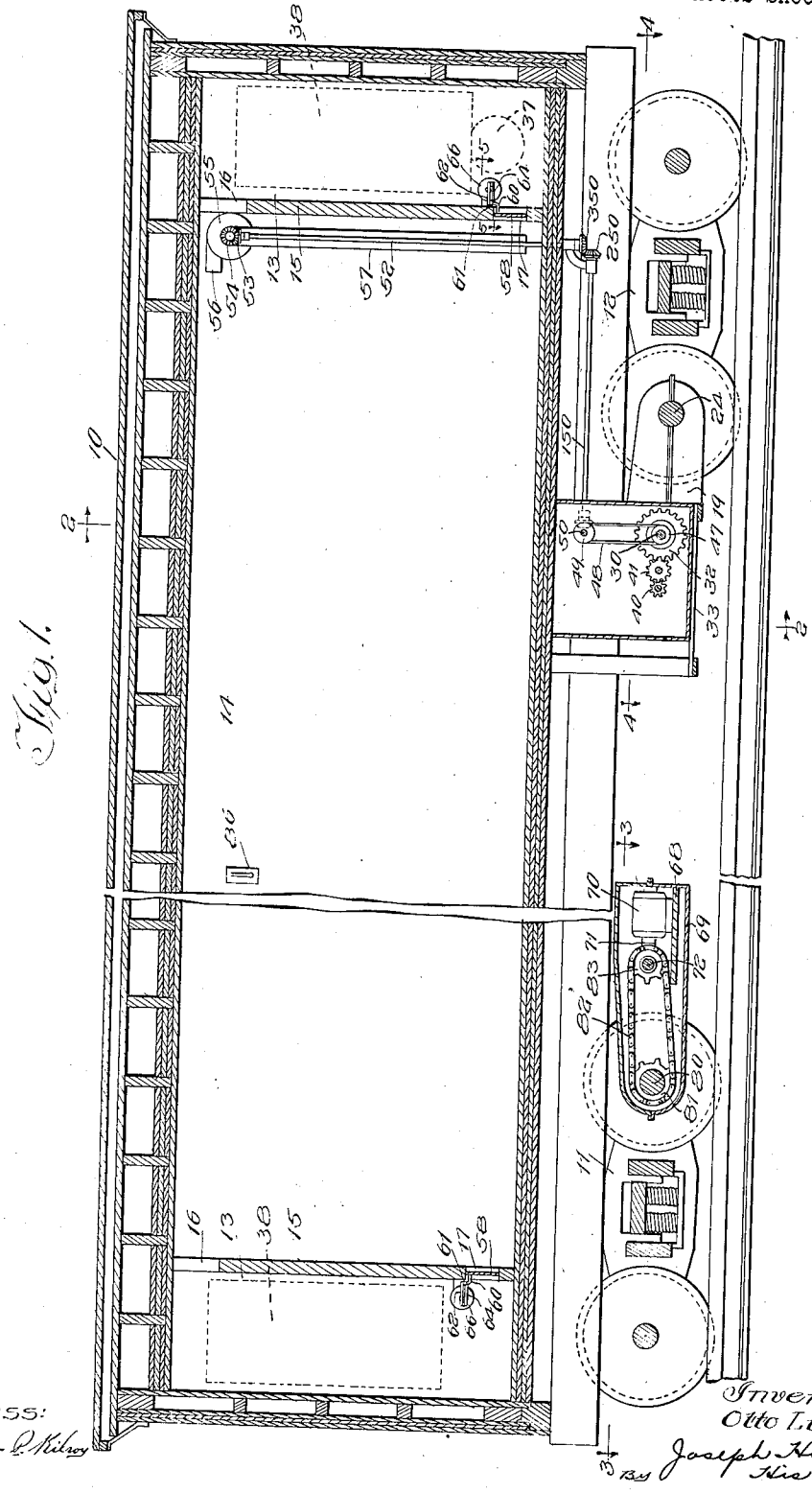


Fig. 1.

Witness:
William P. Kilroy

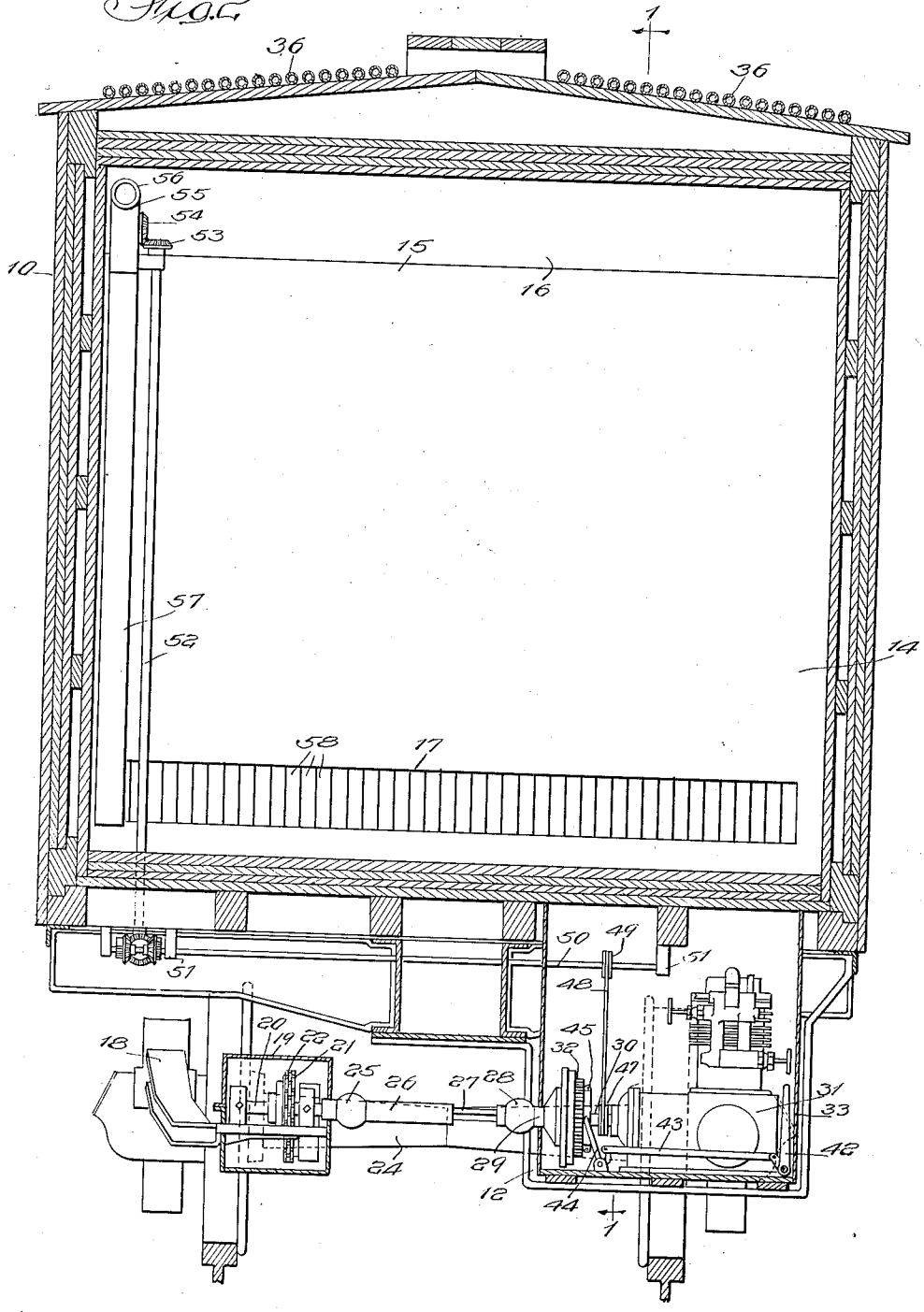
Inventor:
Otto Luhr
By Joseph Harris
His Atty.

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REFRIGERATOR CAR

Filed April 30, 1931 5 Sheets-Sheet 2

Fig. 2.



Witness:
William P. Kilroy

Inventor:
Otto Luhr
By Joseph Harris
His Attys.

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O. LUHR

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REFRIGERATOR CAR

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5 Sheets-Sheet 3

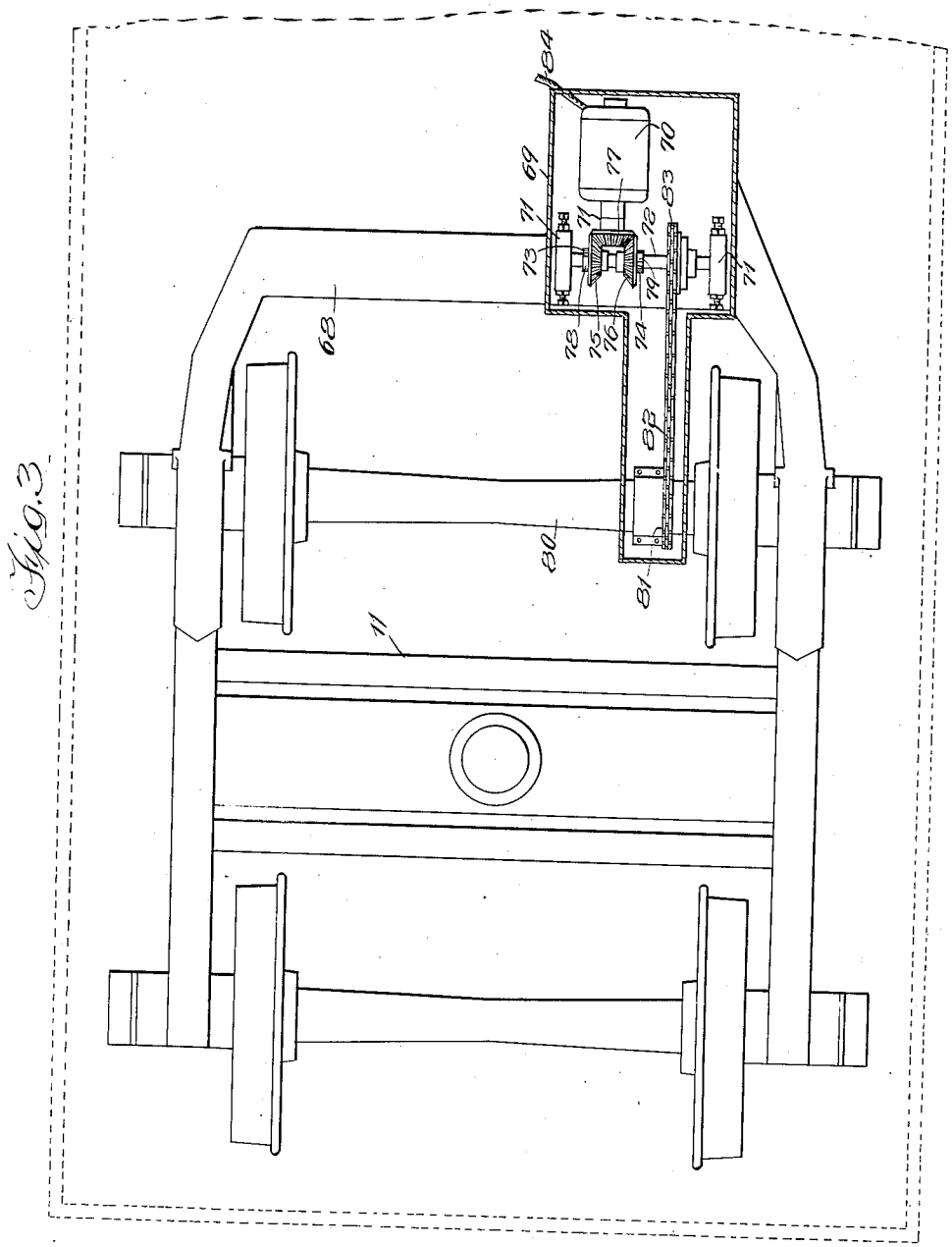


Fig. 3.

Witness:
William P. Kilroy

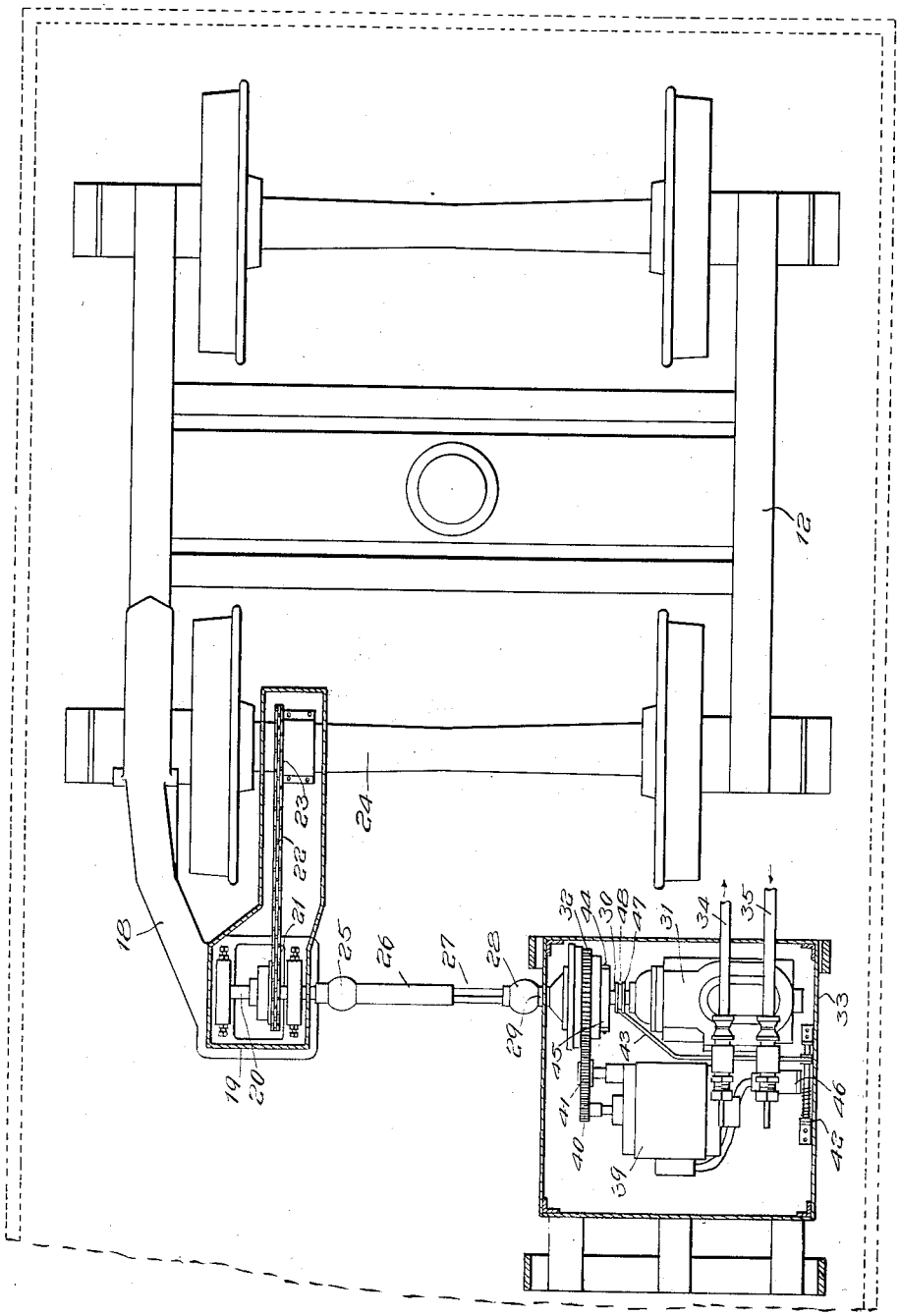
Inventor:
Otto Luhr
By Joseph Harris
His Attorney

May 22, 1934. O. LUHR 1,959,681

REFRIGERATOR CAR

Filed April 30, 1931 5 Sheets-Sheet 4

Fig. 4.



Witness:
William P. Kilroy

Inventor:
Otto Luhr
By Joseph Harris
His Atty.

May 22, 1934.

O. LUHR

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REFRIGERATOR CAR

Filed April 30, 1931

5 Sheets-Sheet 5

Fig. 5.

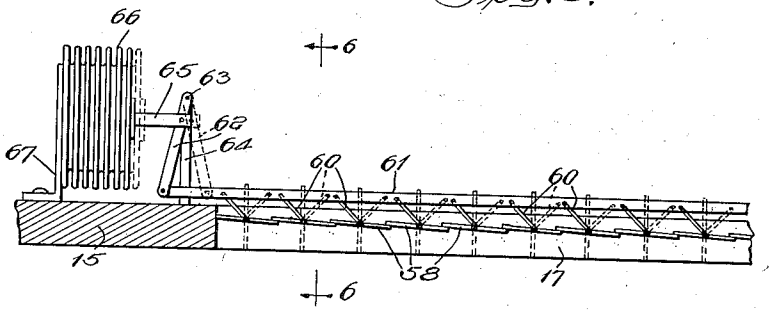


Fig. 6.

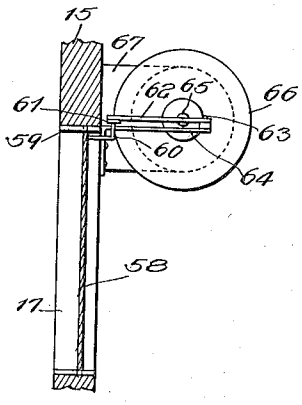


Fig. 7.

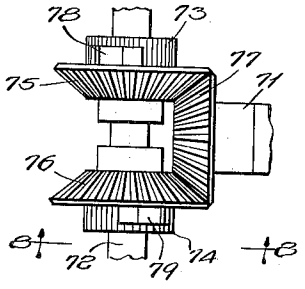


Fig. 8.

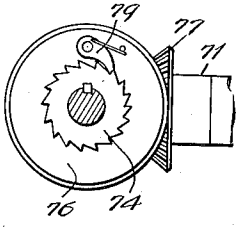
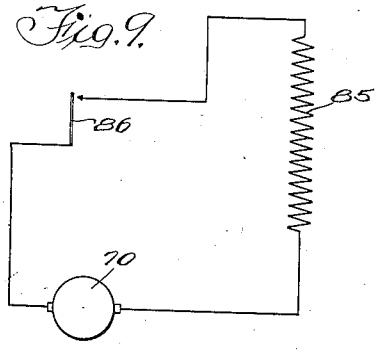


Fig. 9.



Witness:
William P. Kilroy

Inventor:
Otto Luhr

By Joseph Harris
His Atty.

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UNITED STATES PATENT OFFICE

1,959,681

REFRIGERATOR CAR

Otto Luhr, Chicago, Ill., assignor to Anna Eisemann, Chicago, Ill.

Application April 30, 1931, Serial No. 534,010

2 Claims. (Cl. 257—7)

This invention relates to improvements in refrigerator cars, and more particularly to improvements on that type of refrigerator car shown in my co-pending application, Serial No. 413,713, for Refrigerator cars filed December 13, 1929, and to which reference should be had in connection with the following description.

In my said co-pending application, the type of refrigerator car there disclosed embodies a refrigerating system of the compression, condenser, expander type, wherein the compressor is adapted to be operated from one of the car axles when the car is in motion, the refrigerating or expander coils being located in refrigerating compartments at the opposite ends of the car defined by bulkheads or partitions separating said refrigerating compartments from the main or pay load carrying compartment.

As is well known to those familiar with refrigerator car operation, refrigerator cars, while transporting loads of perishable freight, may pass from a warm zone to a cold zone and vice versa during a single trip or may operate during a trip entirely in a cold zone with the result that, when traversing a cold zone of extreme severity, there is danger of the car contents becoming too cold and freezing even though the refrigerator system be automatically rendered inactive for the time being. Stated otherwise, the service of refrigerator cars is such that there are frequent times when, instead of a supply of cold being required for the perishable freight, heat may be desirable to prevent spoilage from freezing. At other times, the outside temperature conditions may be such that neither a supply of heat nor cold is required. A greater part of the time a supply of cold is necessary in order to maintain the freight at a proper temperature within predetermined minimum and maximum limits.

One object of my present invention, therefore, is to provide in a refrigerator car, a combination of independent both cold and heat producing means automatically and individually operable as required by varying temperature conditions to maintain the interior temperature of the car within predetermined minimum and maximum limits.

Another object of my invention is to provide in a refrigerator car, an available source of electric heat, the current for which is generated by the moving car itself.

A still further object of my invention is to provide, in a refrigerator car, improved means for maintaining and controlling the circulation of air within the car, both with respect to the main pay load compartment and the bulkhead or refrigerating chambers.

A specific object of my invention is to provide an arrangement in refrigerator cars such that, when a supply of heat is required, the heat is applied directly to the current of air which is utilized in maintaining the circulation of air within the pay load compartment.

Another object of my invention is to provide an air circulating system for refrigerator cars having bulkhead refrigerating chambers such that the passage of air through said refrigerating chambers is individually and selectively controlled at each chamber to thereby obtain a more balanced and uniform temperature control throughout the entire pay load compartment.

Other objects of the invention will more clearly appear from the description and claims hereinafter appearing, considered in connection with the drawings forming a part hereof.

In the drawings forming a part of this specification, Figure 1 is a vertical, longitudinal, sectional view of a refrigerator car showing my improvements incorporated therein, the section corresponding approximately to the line 1—1 of Figure 2. Figure 2 is a vertical, transverse, sectional view corresponding approximately to the line 2—2 of Figure 1. Figure 3 is a part top plan view of one truck and part horizontal, sectional view, corresponding to the line 3—3 of Figure 1. Figure 4 is a view similar to Figure 3 of the truck at the opposite end of the car, the sectional portions thereof corresponding to the section line 4—4 of Figure 1. Figures 2, 3 and 4 are upon enlarged scales as compared with Figure 1. Figure 5 is a horizontal, enlarged, sectional view corresponding to the section line 5—5 of Figure 1 and illustrating more particularly certain louvers for controlling the air circulation. Figure 6 is a vertical, sectional view, corresponding to the line 6—6 of Figure 5. Figure 7 is an enlarged, top plan view of the generator drive shown in Figure 3. Figure 8 is a vertical, sectional view corresponding to the line 8—8 of Figure 7. And Figure 9 is a diagrammatic view illustrating the circuit for the heating arrangement of the car.

In said drawings, I have shown a refrigerator car, the body and truck arrangement of which is similar to that of most refrigerator cars now in service, the body of said car being indicated generally by the reference character 10, one of the trucks by 11 and the other truck by 12. The body of the car, as shown, is divided into two end refrigerating chambers 13—13 and a main pay load carrying compartment 14, this division into the

three compartments being obtained by means of two bulkheads or partitions 15—15 near the ends of the car, which bulkheads extend entirely across the car but of such height as to leave an upper opening 16 and a bottom opening 17 in each instance.

Preferably, my improvements are employed with a refrigerating system such as shown in my said application, Serial No. 413,713, to which reference may be had for a full disclosure thereof, the present application illustrating only such features thereof as are deemed necessary to indicate the relation of my present improvements in connection therewith. As hereinbefore indicated, the refrigerating system is of the compressor, condenser, expander type, the compressor being operated from the truck 12. To accomplish this, the truck 12 carries a bracket 18, secured to one of the side frames, which bracket has suitably mounted thereon a housing 19 within which is rotatably journaled a shaft 20 carrying a sprocket gear 21, driven by sprocket chain 22, which passes over another sprocket gear 23, secured to the adjacent car axle 24. The shaft 20 has a universal joint connection 25 with one element 26 of a telescopic shaft, the other element of which is indicated at 27. The latter in turn has universal joint connection 28 with a shaft 29 between which and the shaft 30 of the compressor 31 is interposed a clutch gear arrangement 32 so that, when said clutch gear arrangement 32 is in operative condition, rotation of the axle 24 will be transmitted to the shaft 30 and the compressor 31 thereby operated. Said compressor 31 is mounted in a suitable housing and supporting framework 33 fixedly attached to the underframe of the car. The refrigerant, which may be ammonia, is adapted to be delivered to the compressor through the pipe 34, the return pipe being indicated at 35. The compressed refrigerant is delivered to a series of condenser coils 36 located on the roof, as indicated conventionally in Figure 2, and from the latter is delivered into a receiver 37 in one of the end chambers, the condensed refrigerant therein being distributed to the expander or refrigerating coils at both ends of the car, as indicated conventionally at 38—38 in Figure 1. After passing through the expander coils, the refrigerant is then delivered back to the compressor through the pipe 35. For precooling the car or at any time operating the compressor when the car is standing on track, the same may be driven from a motor 39 through suitable gears 40—41, brought into mesh with the gear of the clutch arrangement 32 when the latter is shifted lengthwise of the shaft 30 through a suitable shipper lever arrangement 42—43—44—45, it being understood that the motor 39 is supplied with electric current from an outside source through a suitable plug 46. For a more specific description of the refrigerating system just referred to, reference may be had to my said copending application.

To maintain circulation of air within the pay load compartment, the following arrangement is preferably employed. Mounted on the compressor shaft 30 is a pulley 47 over which runs a belt 48, the latter in turn running over a second pulley 49 secured to a shaft 50, extended transversely of the car and mounted in suitable bearings 51—51, secured to the longitudinal sills of the underframe, said shaft 50 being passed through the center sills, as indicated in Figure 2. At its lefthand end, as viewed in Figure 2, the shaft 50 drives a horizontal, longitudinally disposed shaft 150 (see Figure 1) through a bevel gear arrangement such as illustrated in Figures 7 and 8, hereinafter described. The shaft 150 has a bevel gear 250 at its righthand end, meshing with a bevel gear 350 at the lower end of a vertical shaft 52. At its upper end, the shaft 52 carries a bevel gear 53, which meshes with another bevel gear 54 connected to the shaft of a fan disposed within the fan housing 55, which is in communication with a delivery duct 56 and an elongated, vertically extending intake duct 57, the lower open end of which is preferably located near the floor, as shown in Figures 1 and 2. With this arrangement, as will be evident, whenever the compressor is being driven either from the car while in motion or from the motor 39, the fan will be operated always in the same direction and a circulation of air produced thereby, which is taken in at the bottom of the tube 57 and delivered at the top of the car through the delivery pipe 56. Said pipe 56 and shaft 52 are located in a corner defined by one of the bulkheads and the side wall of the car and will be suitably housed or protected by a wood or metal partition, as will be understood, in order to protect the parts from injury from any of the load. Illustration of such protecting partition has been omitted in order to better disclose the construction.

To further control the air circulation and particularly to prevent air passing through the refrigerating or bulkhead chambers when the temperature reaches a certain minimum, the following arrangement is employed at each bulkhead, reference being had to Figures 1, 5 and 6. In each of the lower openings 17 at each bulkhead, I provide a plurality of louvers 58—58 pivoted in a suitable framework 59 to swing about vertical axes. Each of said louvers is provided with an arm 60 extended inwardly of the corresponding bulkhead chamber, all of said arms 60 being pivotally connected to an operating link 61, which in turn is pivotally connected at its lefthand end, as viewed in Figure 5, with a lever 62, pivoted at 63 to a bracket 64 secured to the bulkhead or partition. Intermediate its ends, the lever 62 has pivotally connected thereto a rod 65 in turn connected to the adjacent end of a thermostat bellows 66, suitably mounted on a bracket 67, the bellows 66 being preferably of the liquid containing type so that as the liquid is heated, its volume increases and conversely when its temperature is lowered, the volume decreases. By suitably adjusting the lever link arrangement for the louvers 58, it is evident that the louvers may be operated to completely close the opening 17 when a pre-determined minimum temperature is reached and gradually be opened as the temperature rises. When the louvers are closed in either bulkhead, it is evident that circulation of air through the bulkhead or refrigerating chamber is positively shut off and the supply of cold air to the pay load chamber correspondingly shut off. By employing independently controlled sets of louvers at each end of the car, a more balanced regulation of the air currents is thereby obtained since, should one end of the car be somewhat colder than the other, circulation of air at that end will be shut off first, as will be evident.

For obtaining a source of heat for the car, the following arrangement is preferably employed, reference being had to Figures 3, 7, 8 and 9. The truck 11 carries a cross bracket 68, preferably secured at both of its ends to the two side

frames of the truck, said bracket passing around the inner set of wheels, as clearly shown in Figure 3. Carried by said bracket 68 is a suitable, preferably sheet metal, housing 69 within which is carried a small generator 70 having a drive shaft 71. Also supported on the bracket 68 within the housing 69 are adjustable journal bearings 71—71, in which is rotatably mounted a shaft 72 to which are keyed two ratchet wheels 73 and 74, having the teeth thereof faced in opposite directions. Loosely mounted on said shaft 72 between the ratchet wheels 73 and 74 are two bevel gears 75 and 76 both in mesh with a bevel gear 77 on the end of the shaft 71. The bevel gear 75 and 76 carry spring controlled pawls 78 and 79 so that, regardless of the direction of rotation of the shaft 72, rotation will be imparted to the shaft 71 always in the same direction, thus insuring driving of the generator in the proper manner regardless of the direction in which the car may be moving. As hereinbefore indicated, the arrangement shown in Figures 7 and 8 is employed between the shaft 50 and shaft 150 for driving the fan.

On the axle 80 of the truck 11 is secured a sprocket gear 81, which drives a sprocket chain 82, the latter in turn driving a sprocket gear 83 secured to the shaft 72 to thereby obtain the necessary power for operating the generator 70 whenever the car is in motion. From the generator 70 extends a suitably armoured flexible cable 84 for conducting the current to the heating element hereinafter referred to, it being evident that said cable will accommodate itself to the usual movements of the truck in passing over curved and tangent portions of track.

In carrying out my heating arrangement, I employ any suitable electrical heating element, indicated conventionally at 85 in Figure 9, which is placed in circuit with the generator 70, said heating element 85 being preferably of elongated character and disposed within the intake air duct 57. To control the supply of current to the heating element 85, any suitable type of thermostat 86 may be employed, the same being indicated conventionally in Figures 1 and 9 and preferably located near the top of the car approximately at the center thereof. Said thermostat will be so adjusted as to close and open the circuit for the heating element 85 at predetermined minimum and maximum temperatures, respectively. With the arrangement described and by locating the heating element within the air duct 57, it is evident that when heat is being supplied to the pay load chamber, the heat is delivered directly to that current of air which is positively propelled by the fan and delivered to the pay load chamber, thus insuring a uniform distribution of the heated air to the entire pay load chamber and minimization of hot and cold air pockets.

Preferably, when my improvements are used with a refrigerating system of the type herein referred to and as more fully disclosed in my said co-pending application, the louvers 58 will be set to close at approximately 36° F. and to open at approximately 40° F. The electric heating element or elements 85 will preferably be cut in when the temperature at the center of the car drops to about 32° F. and cut out when the temperature at that point rises to about 36° F., although, as will be understood, other temperature limits may be employed, dependent upon the class of freight and judgement of those operating the cars.

Although I have herein shown and described what I now consider the preferred manner of carrying out my invention, the same is merely illustrative and I contemplate all changes and modifications that come within the scope of the claims appended hereto.

I claim:

1. In a refrigerator car having a main payload compartment and a separate refrigerating chamber with ingress and egress openings therebetween for air circulation, the combination with thermostatically governed means for closing one of said openings to thereby restrain circulation of chilled air below a predetermined temperature; of means for positively circulating air within the compartment including a duct having an intake adjacent one of said openings and a fan; means for heating the air positively circulated; and thermostatic means independent of the first named thermostatic means, governing the operation of the heating means, the energy for both actuating said fan and heating said heating means being derived from and by movement of the car and the thermostatic means governing the heating means being set to cut in the heating means at a temperature below that at which the first mentioned thermostatically governed means operates to close one of said openings.

2. In a refrigerator car of the type described having a main payload compartment and a refrigerating chamber separated by a bulkhead formed with ingress and egress openings therebetween for air circulation, the combination with cooling means in said chamber; an air circulating duct in permanent fixed position adjacent to and on the payload compartment side of the bulkhead; a thermostatically controlled electric heating element in said air duct; a fan associated with said duct for effecting positive unidirectional circulation of air therethrough; and means, operable always in the same direction, actuated by power derived from an axle of the car when the latter is propelled in either direction, for rotating the fan.

OTTO LUHR.