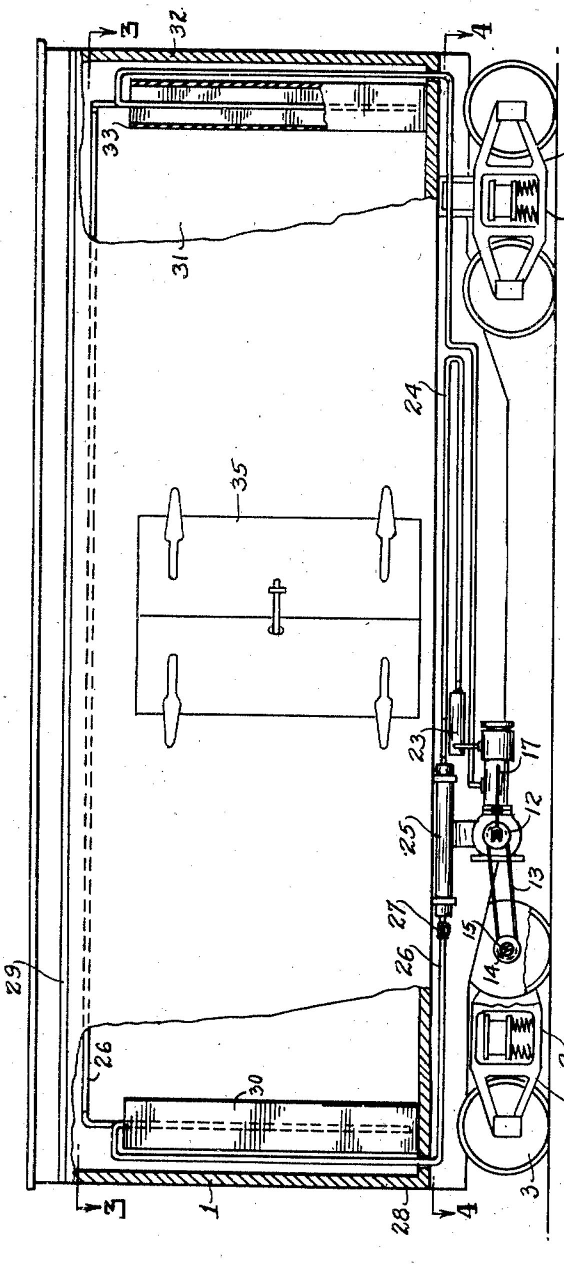
April 26, 1932. J. M. LE MIEUX 1,856,041

REFRIGERATOR UNIT FOR RAILROAD CARS

Filed Aug. 28, 1929 2 Sheets-Sheet 1

Fig. 1.



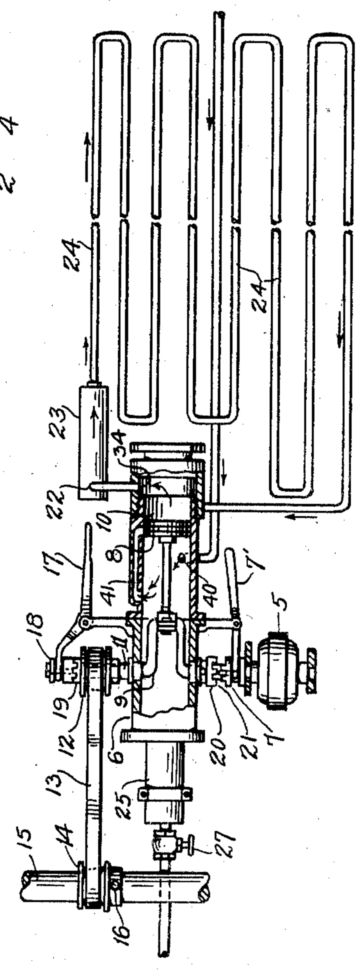


Fig. 2.

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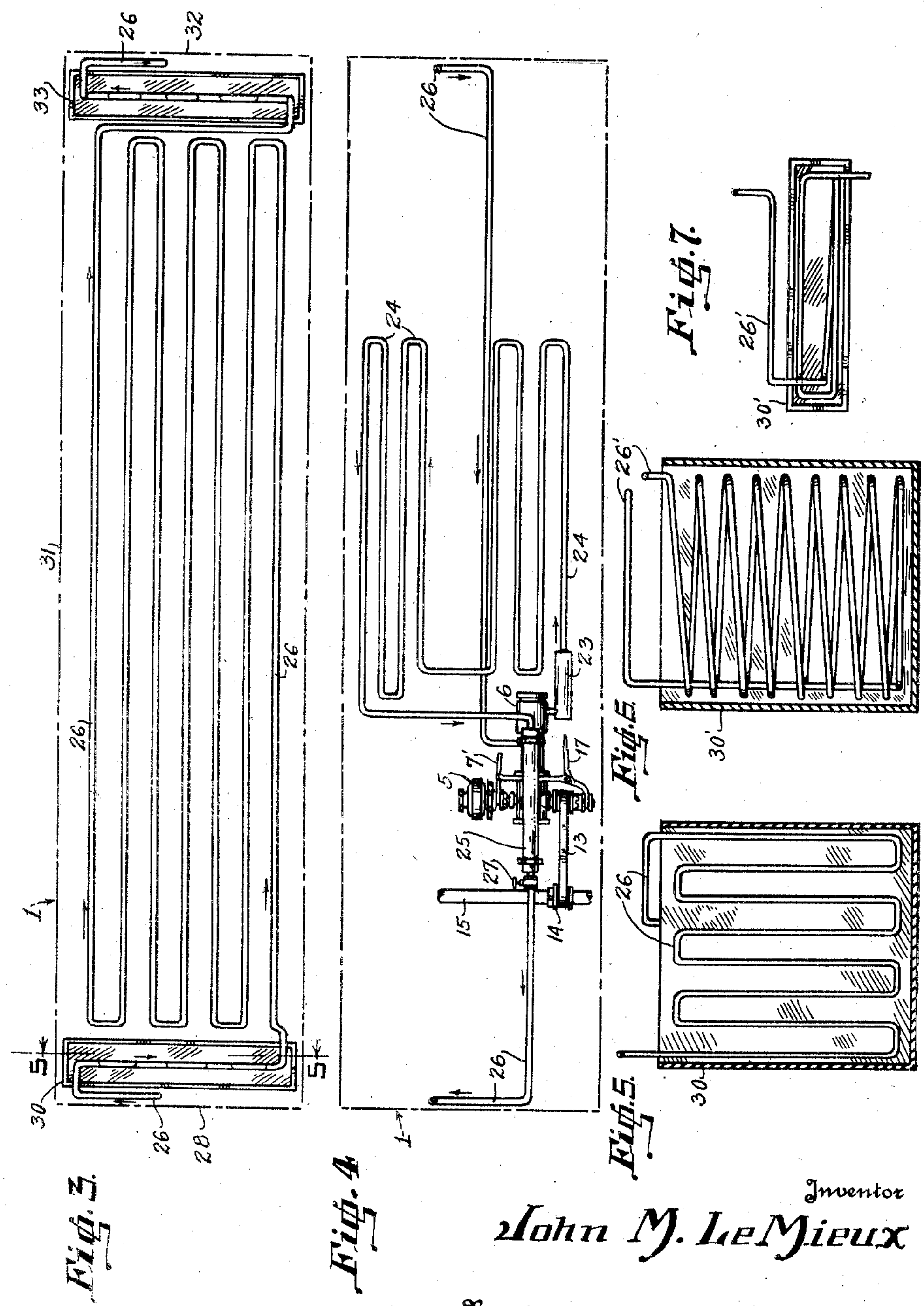

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Patented Apr. 26, 1932

1,856,041

UNITED STATES PATENT OFFICE

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REFRIGERATOR UNIT FOR RAILROAD CARS

Application filed August 28, 1929. Serial No. 389,013.

This invention relates to improvements in a system for controlling the temperature in railroad cars.

The prime object of my invention is to provide a cooling apparatus that will occupy a minimum amount of space within the usual railroad car, and at the same time, function more efficiently than the apparatus now in use.

Another object is to provide a structure that will make ice, as well as control the temperatures of the car.

Still another object is to provide an even temperature at all times throughout the car. It is well known that the usual refrigerator car travels long distances, and passes through varying temperatures and climates.

It is my object to provide means for controlling the refrigerating apparatus so that the flow of the refrigerant material will be in accordance with the temperature in the interior of the car and surrounding atmosphere. This would result in a great saving of material and wear and tear on the apparatus and, at the same time, ensure the preservation of the foodstuffs or other commodities shipped in the car.

Another object is to utilize the power from the moving car when the same is in motion, and to provide means for operating the refrigerating apparatus when the car is at a standstill.

Other objects will be disclosed in the specification and drawings made a part of this application.

In the drawings:

Figure 1 is a side elevation of a railroad car with parts broken away showing the refrigerating apparatus;

Figure 2 is a bottom plan in detail of the refrigerating apparatus removed from the car;

Figure 3 is a plan view of the expansion coils taken on the line 3—3 of Figure 1;

Figure 4 is a plan view looking downward on the line 4—4 of Figure 1;

Figure 5 is a vertical section on 5—5 of Figure 3, showing the coils;

Figure 6 is a section showing a modification of Figure 5; and

Figure 7 is a top plan of the modification shown in Figure 6.

Referring to the drawings in detail, in which similar reference characters designate corresponding parts throughout the several views; numeral 1 designates a railroad car of the usual construction having trucks 2 with wheels 3 and axles 15 connecting the wheels 3. Suspended between the trucks 2 is a frame on which is supported a motor 5 and a compressor 6 with a clutch member 7 between the compressor 6 and motor 5. A piston 8 connected to a crank arm 9, slides in a cylinder 10. The crank arm 9 extends beyond the wall of the cylinder 10 to form a shaft 11 on which is freely mounted a belt pulley 12, which is connected by a belt 13 to a second belt pulley 14 secured to the axle 15 by a screw or bolt 16.

A clutch lever 17 controls a clutch 18, which is slidably mounted in a key-way on the shaft 11, the belt pulley 12 having a ratchet face 19 to engage with said clutch 18. The same structure is present in the clutch 7, controlling the motor 5. A lever 7′ is provided for throwing the clutch 7 into and out of engagement with a collar 20 mounted on the end of the crank arm 9, which extends from the cylinder wall 10 adjacent the motor 5; the collar 20 having a ratchet face 21 to engage the clutch 7.

At the end of the cylinder 10 is a by-passage 22 leading into an oil separator 23. Extending from the oil separator 23 is a pipe formed into a series of cooling coils 24, which, in turn, lead to a chemical retainer 25, in this particular case ammonia. Just beyond the chemical retainer 25, in a pipe 26 leading from said retainer, is an expansion valve 27. The pipe 26 extends beneath the car 1 to the extreme end where it enters the car 1 closely adjacent the end wall 28 thereof, and extends to a point closely adjacent the roof or top wall 29 where it enters a tank 30, being formed in said tank into a series of coils, as shown in Figure 5 the coils extending in a vertical direction, or as in Figure 6 in the form of a helix.

From the last turn of the coils, the pipe 26 extends the length of the car 1, adjacent the roof 29 thereof and is returned to form a network of coils, covering the entire area beneath the roof 29.

It is to be noted that these convolutions of the coils are in a common horizontal plane. The last convolution of the coil will be adjacent the side wall 31, which is the side opposite that along which the first length of pipe extends and will be bent parallel with the ends of the convolutions parallel to the end wall 32, entering the top of a tank 33 at end wall 32 of the car 1.

A coil similar to the coil in tank 30 is provided in tank 33. The last convolution of the coil extends to the top of the tank 33, passing over the edge thereof and extending downwardly parallel to the end wall 32 to the floor where it leaves the car and extends beneath the same, to return to the compressor 6 through port 40 and the cycle of operation is repeated.

A door 35 permits ingress and egress to and from the car 1. Positioned in a line of the circulation at ends 28 and 32, respectively, are thermostatic valve controls 36 and 37. The thermostatic valve controls are connected to valves 38 and 39 so that upon the rise or fall of the temperature within the car the respective valves 38 and 39 will be opened or closed accordingly, to control the flow of the refrigerant material.

As actually operated, the clutch lever 17 will be operated to throw the clutch 18 into engagement with the compressor and the clutch lever 7′ will be operated to throw the clutch 7 out of engagement with the motor 5 if the car is in motion or about to start. The belt 13, which connects the axle 15 and the belt 12 will cause the compressor 6 to operate as the axle 15 revolves.

Should the car be at a standstill or shunted to a siding, the clutch lever 17 will throw the clutch 18 out of engagement with the belt 12, and the operation of the clutch lever 7′ will throw the clutch 7 into engagement with the collar 20 and the motor 5, whereupon the motor being turned on, the compressor will operate.

The operation of the compressor 6 will force the refrigerant such as compressed ammonia gas through the oil separator 23 and cooling coils 24 until it reaches the chemical retainer 25, which, in this case, contains ammonia. The ammonia largely liquid, is forced out of the chemical retainer 25 through an expansion valve 27 under pressure, and as it leaves the expansion valve 27 it will expand, absorbing heat and assume its gaseous form.

The semi-liquid ammonia passes into the coils in the tank 30 and absorbs the heat collected from the refrigerator interior. Water may be placed in the tank if it is desired to form ice, or brine may be placed therein and the brine be conducted to other vessels in which water is placed to form ice. The semi-liquid passes from the tank 30 through a series of coils at the top of the car to a second tank 33 located at the opposite end of the car. The coils continue to cool the interior of the car by absorbing heat from the hottest part, namely; the roof, and causing the cooled air to drop, thus cooling the stratas of air below and setting up a uniform circulation.

The water or brine may be placed in the tank 33 as described in connection with the tank 30, and from the tank 33 the semi-liquid, which, by this time, is practically gas again due to the absorption of heat, passes out of the car at the farthest end wall 32, so that the floor space will not be occupied with the pipe, and the temperature within the car will not be further reduced due to the passage of ammonia gas which has practically lost all of its heat absorbing qualities. The passage of the pipe beneath the car exposes the same to the air, and upon its reaching the compressor it is in a gaseous form once more. The gas enters the compressor through an opening 40 at the rear of the outlet port 34.

Upon the piston 8 operating on the down-stroke, the gas will fill the cylinder 10 at the rear of said piston 8, and upon the up-stroke the gas will be forced through a by-passage 41 to collect below the piston 8 in the lower portion of the cylinder 10. Upon the down-stroke of the piston, the gas will be compressed and forced out through the outlet port 34, and through the system as described.

The modification, as shown in Figures 6 and 7, may be utilized where it is desired to place receptacles within the coils for forming ice. It is to be noted that all structure that is not needed for actually cooling the interior of the car, is placed without the same, and that the placing of the coils within the car along with the tanks is so arranged as to occupy a minimum of space and yet provide the greatest efficiency from the cooling system.

By having tanks placed in both ends, a circulation may be established from both ends extending toward the middle, and the great objection of having the source of refrigeration only at one end, thus depending upon radiation or circulation to properly refrigerate the car, is overcome.

Further, by connecting the two tanks with over-head flat coils, a uniform temperature is created between the two tanks, and, in addition to the two circulations set up at both ends, a circulation extending from the top between the two sides of the car is set up, thus thoroughly refrigerating all parts of the car.

Another advantage of having the over-head coils, is that upon the door 35 being opened, the car may be re-refrigerated in much less time than formerly, in that it is not necessary to depend upon the cooled air circulating from one end or both ends alone, but circulation and cooling will be set up immediately opposite the door 35, which, after having been opened, will normally be the warmest portion of the car.

While I have described my invention in a specific form, it is to be understood that various changes may be made in the construction and arrangement of the parts as well as in the proportion thereof without departing from the spirit and scope of the invention to be defined in the claims appended to and forming a part of this specification.

What I claim is:

1. In a refrigerating system for railroad cars, a refrigerating compartment, pipes leading into and out of said compartment, a series of coils at each end of said compartment, the pipes leading into and out of said compartment connected to said coils, a coil adjacent the top of the compartment and connected to the two end coils, and condensing and compressing means beneath said compartment and connected to the said pipes leading into and out of said compartment.

2. In a refrigerator car, an expansion coil at each end of the car, an expansion coil adjacent the ceiling of said car, said ceiling coil receiving the discharge refrigerant from one end coil and discharging into the other end coil, and compressor and condensing means located beneath the car connected with the discharge of one end coil and the intake of the other end coil whereby a continuous circuit of refrigerant is forced through one end coil, the ceiling coil and the other end coil, successively, as specified.

3. In a refrigerator car, an expansion coil at each end of the car, an expansion coil adjacent the ceiling of said car, said ceiling coil receiving the discharge refrigerant from one end coil and including convolutions extending between the end coils and discharging into the other end coil, and compressor and condenser means located beneath the car connected with the discharge of one end coil and the intake of the other end coil whereby a continuous circuit of refrigerant is forced through one end coil, the ceiling coil and the other end coil, successively, as specified.

4. In a refrigerator car, an expansion coil at each end of the car, an expansion coil adjacent the ceiling of said car, said ceiling coil receiving the discharge refrigerant from one end coil and discharging into the other end coil, and compressor and condenser means connected with the discharge of one end coil and the intake of the other end coil whereby a continuous circuit of refrigerant is forced through one end coil, the ceiling coil and the other end coil, successively, as specified, and means for throwing said compressor into and out of operative engagement with the propelling means of said car.

5. In a refrigerator car, an expansion coil adjacent and substantially co-extensive with the ceiling of the car, a gas container connected with the coil, and compressor and condenser means carried outside of and beneath the car connected with the coil whereby a continuous circuit of refrigerant is forced through the ceiling coil as specified.

6. In a refrigerator car, a compressor located outside and beneath the car, means for driving the compressor, means for selectively connecting the compressor with the driving means and the traction means of the car, a condensor coil located outside and beneath the car exposed to air passing thereunder, an expansion coil in the car, positioned in a plane parallel with and closely adjacent to the ceiling of the car the convolutions of said expansion coil extending lengthwise of the car and being substantially coextensive therewith, and means connecting the condensor coil, compressor and expansion coil in series including an expansion valve.

In testimony whereof I affix my signature.

JOHN M. LE MIEUX.