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O. P. OSTERGREN.

REFRIGERATING AND VENTILATING APPARATUS.

(Application filed June 11, 1900. Renewed Apr. 17, 1901.)

(No Model.)

Fig. 1.

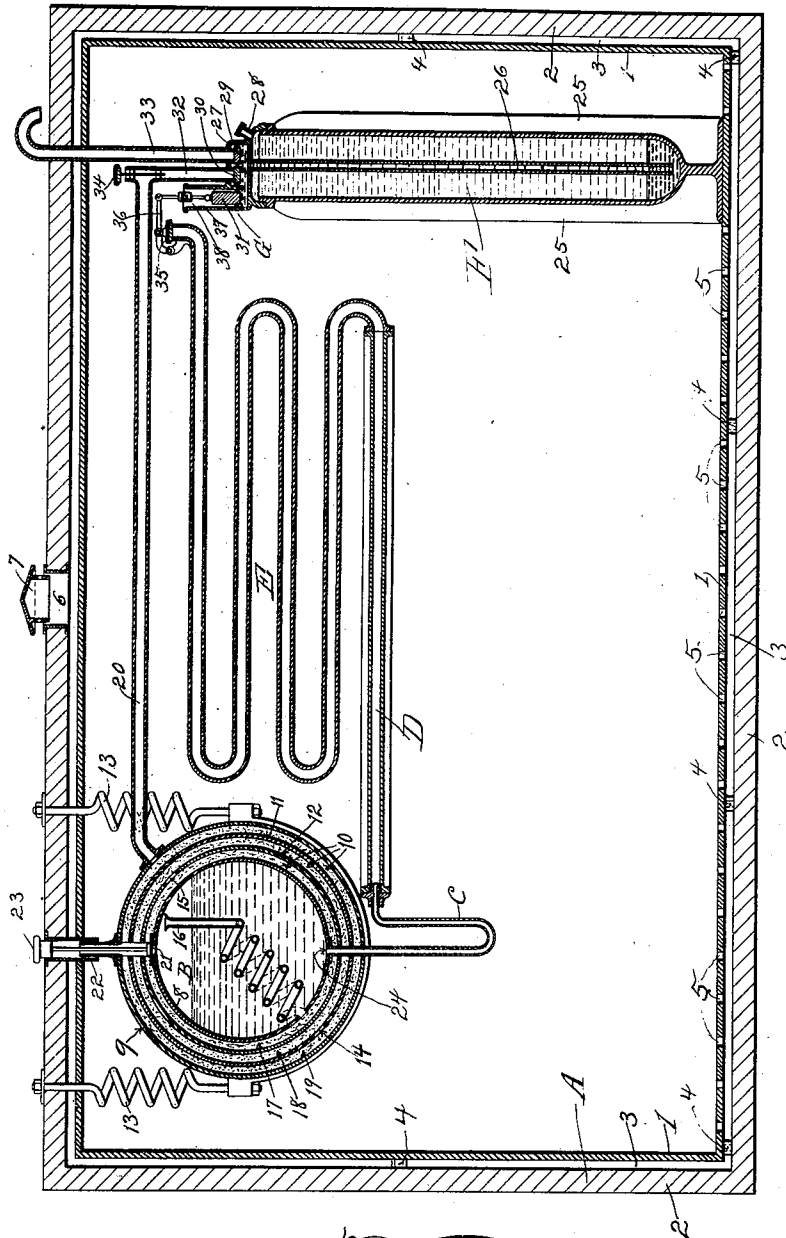


Fig. 2.

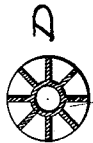
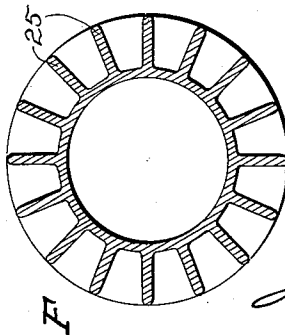


Fig. 3.



WITNESSES
L. Almquist
C. Bedquist

O. P. Ostergren
INVENTOR
J. P. Thayer

ATTY _____

UNITED STATES PATENT OFFICE.

OSCAR P. OSTERGREN, OF BEDFORD PARK, NEW YORK, ASSIGNOR TO THE OSTERGREN MANUFACTURING COMPANY, A CORPORATION OF NEW JERSEY.

REFRIGERATING AND VENTILATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 686,531, dated November 12, 1901.

Application filed June 11, 1900. Renewed April 17, 1901. Serial No. 56,220. (No model.)

To all whom it may concern:

Be it known that I, OSCAR P. OSTERGREN, a resident of Bedford Park, borough of Bronx, city and State of New York, have invented certain new and useful Improvements in Refrigerating and Ventilating Apparatus, of which the following is a specification.

My invention consists of improved means of refrigerating and ventilating railway-cars, dwelling-rooms, warerooms, &c., by evaporation of liquefied air, nitrogen, or other fluids that evaporate by atmospheric temperature.

The present system of car refrigeration in transportation of perishable goods—such as fruits, meats, vegetables, &c.—is one which as yet gives room for radical improvements. Melting ice in boxes exposed to a current of air is the refrigerating medium generally used at the present time on the railroads; but the bulk and weight of the same are very great, and the initial cost for the refrigerant is high, with a correspondingly high freight rate. To this consideration is added the fact that the melting ice always gives off damp water-vapors to the circulating air, which in turn deposits a part thereof on the articles we desire to preserve with damaging effect.

Before proceeding to describe my improved refrigerating and ventilating system I will first point out some desirable features in car refrigeration, the attainment of which I consider as being of greatest importance. First, the refrigerant should be in such a concentrated form that bulk and weight are minimum; second, it should be dry and preservative; third, the consumption of the refrigerant should be regulated so that the temperature is constant; fourth, the isolation from the atmospheric temperature should be as perfect as possible; fifth, sufficient quantity of the refrigerant should be carried to last the entire journey of the car without refilling at intermediate stations, all of which I seek to attain by my improved system, as herein-after described, reference being made to the accompanying drawings, in which—

Figure 1 is a vertical section of a car-body or other room or chamber to be cooled and of the apparatus which I have chosen in this

example by which to illustrate my invention. Figs. 2 and 3 are details of the apparatus, Fig. 2 being a transverse section of the evaporator D; and Fig. 3, a transverse section of the thermostat F.

With reference to the accompanying drawings we note in this system the following main features: first, an insulated chamber (marked A) to be cooled; second, an insulated container for the refrigerant, (marked B;) third, an evaporator, (marked D;) fourth, a heating-coil, (marked E;) fifth, a thermostat, (marked F,) and, sixth, a governing apparatus, (marked G.)

The room A, above referred to, to be refrigerated may be a wareroom or the trunk of a car or other room, as stated. In either case I prefer to make the same of a light inner casing 1, of some air-tight material, and an outer casing 2, of composite material, such as is used in best refrigerating-cars at the present time, yet I do not wish to limit myself to any definite mode of construction or kind of material for said casing. It is important, however, that even this casing should be made air-tight or as nearly so as practicable to prevent atmospheric moisture from penetrating the same. Between casings 1 and 2 I leave a free air-space 3, which extends all around the entire chamber A. Distance-pieces 4 between the casings are provided; but their area of contact should be as small as possible. The lower side of casing 1 is perforated with small holes 5 for communication between space 3 and the interior of chamber A. Outer casing 2 has at the top an opening 6. A slight air-pressure from the inside is capable of lifting said valve, and thus opening communication of space 3 with the atmosphere.

Container B, which may for convenience be made spherical, is composed of an inner vessel 8, an outer shell 9, porous packing 10—such as hair, felt, or sawdust—and intermediate dividing-sheets 11 and 12. If the vessel is exposed to shocks, jars, and vibrations, such as it will be subject to in cars, it should be suspended on elastic springs, such as 13. The dividing-sheets 11 and 12, which may be

made of light material—such as rubberoid, oil-cloth, or rubber—have each an opening, respectively, 14 and 15, placed diametrically opposite one another. A coiled pipe 16 in the interior of vessel 8 extends between the upper and the lower parts of said vessel, being open at its upper end to the interior space. Its lower end is connected to vessel 8 and opens into space 17. Now if vessel 8 is partially filled with a liquid the air-space above said liquid will be in communication with space 17 through coil 16. Space 17 communicates with space 18 by means of opening 15 and with space 19 by means of opening 15, space 18, and opening 14. Space 19 finally communicates with a pipe 20, through which the vapor is either discharged into the room or into the atmosphere, according as the temperature is to be raised or lowered in the room. An opening 21 is provided at the top of the vessel for filling same from outside the chamber. Shell 9 has a telescopic connection 22 with an opening through the upper wall of chamber A. A heavy removable plug 23 is provided for closing up opening 21 after filling. By a hole 24 vessel 8 is made to communicate with evaporator D by a discharge-pipe *c*. Said pipe *c* is preferably of small diameter, and the end which enters into evaporator D is besides preferably contracted. It is formed as a trap to form a liquid seal to exclude vapor from the container.

Evaporator D is a long cylindrical vessel or pipe supported on the wall of the chamber, or it may be suspended from the roof. It has several radial and longitudinal ribs, as shown in its transverse section, Fig. 3, presenting a large heat-absorbing area to the outside air.

Heater E is a continuation of evaporator D, although made of a plain pipe-coil, as shown. Its function is to vaporize the cooling liquid from the container and discharge the cool vapor into the room when the temperature of the room is high and valve 35 is opened by the thermostat.

Thermostat F is preferably a cylindrical vessel placed in a vertical position, as shown. It may be provided with ribs 25, as shown in its transverse section, Fig. 3, for the purpose of increasing the heat-conducting area. There is a small pipe 26 inside this vessel, which connects at the top with an overflow-cup 27 and extends to the lower end of said vessel. Vessel F is filled with liquid of a higher expansive coefficient than that of the material of the vessel. I prefer to make the vessel of cast-iron or bronze and to nearly fill the same with alcohol, which can be done through nozzle 28. After a suitable amount of alcohol has been introduced nozzle 28 must be tightly capped. I then introduce mercury through cup 27 and pipe 26 until vessel F is entirely filled. Some of the mercury will of course aggregate in the bottom of vessel F and then fill pipe 26 and partially cup 27. Any change of volume in the liquid due to change of temperature will immediately result in a change

of the mercury-level in cup 27. Two valves 29 and 30 float in the mercury in cup 27. Said valves when up against their seats will cut off communication between pipes 32 and 33, connected into the cover of cup 27, and stop the mercury from entering them.

34 is a lift-valve which closes the outlet of air into chamber A when valves 30 and 29 are down and pipes 32 and 33 are open.

35 is a valve hinged on a lever 36 for opening or closing heater E.

31 is a weight suspended on lever 36. Weight 31 is surrounded by cylinder 37, which is an extension of cup 27. After the mercury is high enough in cup 27 to close float-valves 29 and 30 it will rapidly ascend in cylinder 37 and lift weight 31, relieve valve 35 of said weight 31, allowing valve 35 to open.

The operation is as follows: Liquid air or liquid nitrogen is first introduced into container B through pipe 22. Plug 23 is placed in position to cover opening 21. Said plug 23 is made heavy, but is free to be lifted should any excessive pressure occur from the interior. It will thus act as a safety-valve. Heat penetrating the insulated container will cause the liquid to boil at a very slow rate. I have in previous experiments found that in a similar vessel of forty gallons capacity so much liquid air is not entirely evaporated in less than seven days. If in the case of a refrigerating-car we should use, say, one hundred and fifty to two hundred gallons, it may be made to last from two to three weeks or more. The vapors thus produced will be employed first in protecting the vessel from heat from the outside as they pass through spaces 17, 18, and 19, and then for cooling the chamber as they are liberated therein. If a certain approximate temperature is required in the chamber, the thermostat will be adjusted accordingly simply by regulating the quantity of mercury in cup 27 to permit valves 29 and 30 to fall and allow a free passage for the cold air from pipes 20 and 32 into 33 when the minimum temperature allowable in the chamber is reached and will lift them up against their seats before the maximum temperature is reached. By means of adjusting-nut 38 weight 31 should be so located that valve 35 will open at or before maximum temperature is obtained. As long as valve 35 is closed no liquid air can enter evaporator D on account of back pressure from the air therein. Such a back pressure will be produced as soon as the valve is shut by the effect of the evaporation of the first few drops of liquid that enters. The entire regulation of temperature within the chamber is thus accomplished automatically in a very short range of variation, and it will be entirely possible to keep a constant temperature even though the bulk of the refrigerant is gradually diminished. The gases liberated within the chamber are allowed to sink downward and through the perforated bottom into space 3, from whence they pass out through opening 6 to the at-

mosphere. The same gases are thus also made to insulate the chamber from external heat, as they will absorb a good deal of such heat from wall 2 and carry it out through said opening 6.

What I claim as my invention is—

1. The combination with a chamber or room to be cooled by an evaporating liquid, of the container for the liquid having a labyrinthal insulating-jacket, an outlet from the upper inner space for the vapors into said jacket, a discharge-passage from the exterior of the jacket for the vapors, valves controlling the escape of the vapors into the chamber, or outward therefrom, according as the temperature of the room varies, and a thermostatic controller for said valves, said controller subject to the varying temperature of the room for controlling it.

2. The combination with a chamber or room to be cooled by an evaporating liquid, of the container for the liquid having a labyrinthal insulating-jacket, an outlet from the upper inner space of said container for the vapors into said jacket, a discharge-passage from the exterior of the jacket for the vapors, valves controlling the escape of the vapors into the chamber, or outward therefrom, according as the temperature of the room changes, an evaporator connected with the liquid-retainer for limited escape of the liquid thereinto, and adapted for discharge of the vapors into the room, a valve controlling the discharge according as the temperature of the room varies, and a thermostat-controller for said valve, and also for the valves controlling the vapors from the jacket, said thermostat subject to the varying temperature of the room.

3. The combination with a chamber or room to be cooled by an evaporating liquid, of the container having a labyrinthal insulating-jacket, an outlet from the upper inner space of said container, for the vapors into said

jacket, a discharge-passage from the exterior of the jacket for the vapors, said passage having an outlet into the room, provided with a gravity-valve for closing it, said passage also having an outlet into the atmosphere provided with float-valves for closing it, and a liquid-thermostat for controlling said float-valves.

4. The combination with a chamber or room to be cooled by an evaporating liquid, of the container for the liquid, the evaporator connected with the liquid-retainer for limited escape of the liquid thereinto and adapted to discharge the vapors into the room, the weighted float-valve and lever controlling the valve, and the liquid-thermostat controlling the weight.

5. The combination with a chamber or room to be cooled by an evaporating liquid, of the container for the liquid, the evaporator connected with the liquid-retainer for limited escape of the liquid thereinto and adapted to discharge the vapor into the room, the weighted valve, floating weight and lever controlling the valve, the labyrinthal insulating-jacket for the container, outlet from the upper inner space of the container for the vapors into said jacket, a discharge-passage from the exterior of the jacket for the vapors, said passage having an outlet into the room provided with a gravitating valve for closing it, said passage also having an outlet into the atmosphere provided with float-valves for closing it, and the liquid-thermostat controlling said float-valves, and also controlling the float of the weighted valve, to open the one and close the other, according as the temperature of the room varies.

Signed at New York city this 3d day of June, 1900.

OSCAR P. OSTERGREN.

Witnesses:

C. SEDGWICK,
J. M. HOWARD.