C. W. MILES.

REFRIGERATING APPARATUS.

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1,318,221. Patented Oct. 7, 1919.

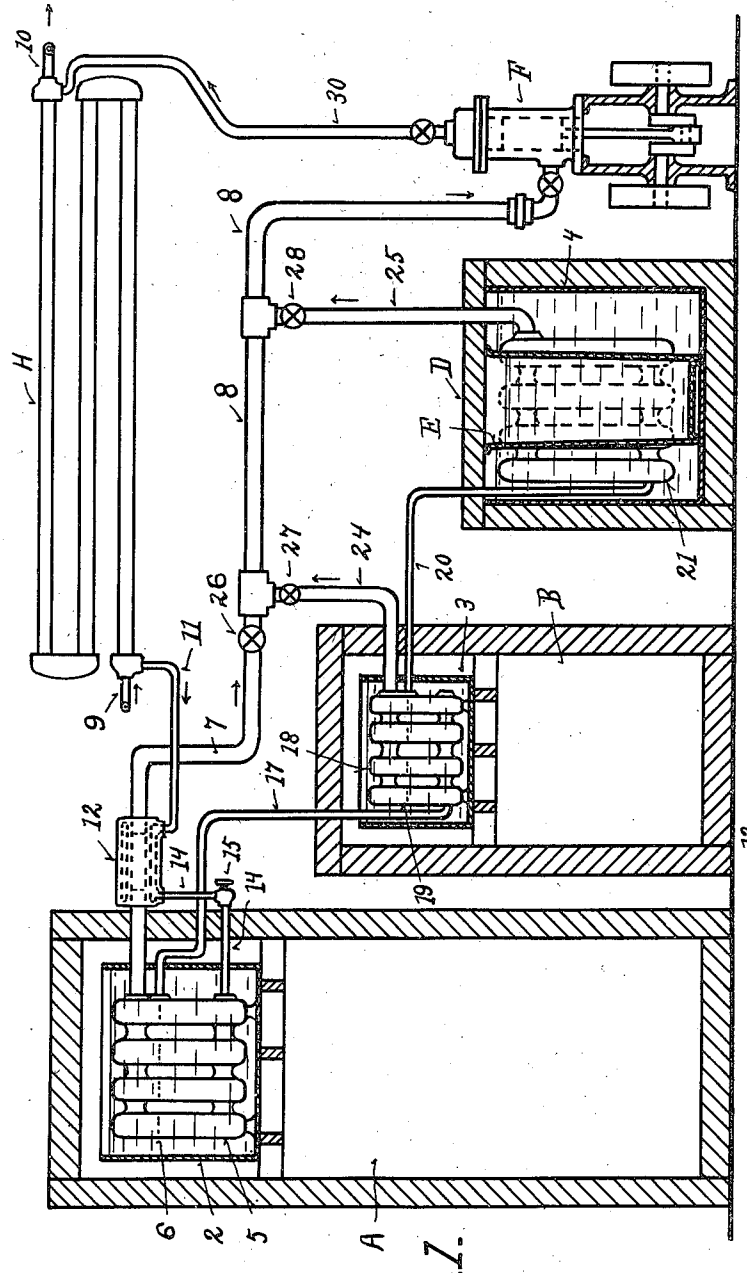


Fig. 1.

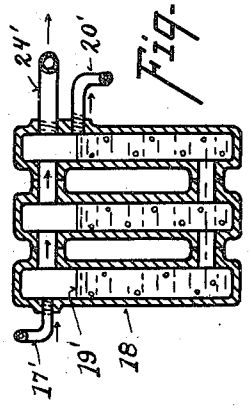


Fig. 3.

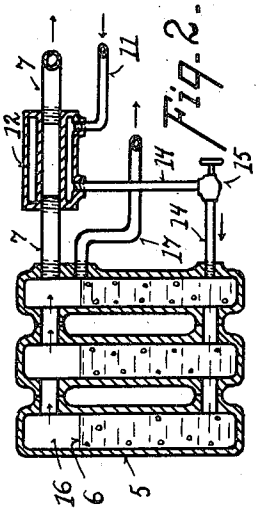


Fig. 2.

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REFRIGERATING APPARATUS.

1,318,221. Specification of Letters Patent. Patented Oct. 7, 1919.

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To all whom it may concern:

Be it known that I, CASPER W. MILES, a citizen of the United States, residing at Anderson township, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

My invention relates to improvements in refrigerating apparatus and method of distribution. One of its objects is to connect a plurality of refrigerating members to be operated together in one system. Another object is to provide for holding the temperature over in two or more refrigerator members where the apparatus is not in operation continuously. Another object is to provide for connecting two or more refrigerating members together in a refrigerating system with provision for regulating the temperature of or work done by the respective members, and also for cutting one or more of said refrigerating members out or partially out of circuit with the balance of the system. My invention also comprises certain details of form combination and procedure all of which will be fully set forth in the description of the accompanying drawings in which:

Figure 1 is a diagram of an artificial refrigerating system, embodying my invention.

Fig. 2 is a sectional detail through one of the refrigerator members.

Fig. 3 is a sectional detail illustrating a modification.

The accompanying drawings illustrate one of the preferred embodiments of my invention in which A represents one cold storage room or box to be refrigerated; B represents another cold storage box to be refrigerated and D represents an insulated brine tank in which ice molds E are to be placed to make artificial ice. F represents the ice machine compressor and H the condenser.

Service such as illustrated comprising one or more cold storage compartments and a compartment in which to manufacture ice are frequently required in hotels, hospitals and similar institutions, and it is often desirable to operate the compressor for only a period of ten or twelve hours per day and to maintain substantially uniform temperatures in the storage and ice making compartment. It is also often desirable to maintain low temperatures in one storage compartment and a relatively higher temperature in another. Heretofore a cold brine circulation system has been employed and circulation of brine maintained continuously day and night.

In my improved apparatus I preferably employ a brine tank 2 in the compartment A, a brine tank 3 in the compartment B, and a brine tank 4 in the compartment D. In the tank 2 is placed a cooler member 5 of the flooded type, that is the liquefied refrigerant is contained therein in considerable quantity up to the liquid level line 6, and the refrigerating effect is due to the conversion of the liquid refrigerant to a gas or vapor therein, accompanied by the absorption of heat. The heat so absorbed is carried away by the gas or vapor which is conducted by a branch pipe 7 and trunk pipe 8 to a gas compressor F and compressed and then conducted by pipe 30 to a condenser H, preferably of the concentric pipe variety where the heat is extracted by condensing or cooling water supplied by pipe 9 and carried away through pipe 10. The gas supplied hot to the condenser when cooled returns to the liquid state and then flows from the condenser through pipe 11 to a jacket 12 surrounding a section of the pipe 7 in which the cool gas is flowing to the compressor. In this jacket 12 the liquid refrigerant enters at substantially the temperature of the condensing water, say eighty degrees F and leaves the jacket 12 at the temperature of the gas flowing to the compressor, say fifteen degrees above zero F. The liquid refrigerant from jacket 12 flows through a pipe 14, which should be insulated and through a regulating valve 15 therein and enters the chamber 16, of the cooler 5.

By opening the regulating valve 15 to a sufficient extent more liquid refrigerant will be supplied to the cooler 5 than will be vaporized therein, and as soon as the liquid level rises sufficiently in cooler 5 the excess of liquid refrigerant will flow by a pipe 17 to the chamber of a similar cooler 18 located in the brine tank 3, until a liquid level 19 therein is exceeded when the excess of liquid refrigerant will overflow from the cooler 18 through pipe 20 and enter the chamber of a similar cooler 21 located in the brine tank 4. The liquid level of refrigerant in cooler 21 is maintained at a substantially uniform point by regulation of the valve 15 so as to

supply a quantity of liquid refrigerant to correspond to the rate of vaporization and the capacity of the compressor to take away the vapor formed. The pipes 17 and 20 should be covered with heat insulating material. It will be noted that the liquid refrigerant flowing through the regulating valve 15 is of substantially the same temperature as that contained in the cooler 5, and hence there is practically no tendency for the liquid to flash into a vapor, or to leave a deposit of solidified refrigerant at or near the valve 15, to obstruct and render variable the flow of refrigerant through the regulating valve, and hence very accurate results in regulation over long periods of time are obtainable.

As illustrated in Fig. 1 the pipes 17 and 20 lead the overflow of liquid refrigerant to the lower portion of the next cooler in series, and any vapor generated in the pipes 17 and 20 rises to the cooler above and is thence conducted to the compressor. Branch pipes 24 and 25 conduct the vapor from the coolers 18 and 21 respectively to the trunk pipe 8. Valves 26, 27 and 28 in the branch pipes 7, 24 and 25 enable the amount of vapor drawn from the respective coolers 5, 18 and 21 to be regulated, and thereby the temperature maintained in said respective coolers can be varied within considerable limits. The bodies of brine in the tanks 2, 3 and 4 serve as reservoirs to store up negative heat during the periods that the compressor is being operated and to thus maintain cool temperatures in the boxes A, B and D during periods when the compressor is not operating, and hence the compressor is the only mechanism to be operated, and a separate brine circulating circuit and pump are dispensed with and not required.

In the modification Fig. 3 which represents the cooler of the second or third box the overflow pipe 17′ is led into the upper portion of the cooler 18′ above the liquid level 19′ and hence any vapor formed in tube 17′ is free to escape either to the cooler above or to the cooler below, and no trap or pocket of liquid or vapor can be formed in the overflow pipe. I consider this modification preferable where no considerable difference in temperature is to be maintained in the respective boxes, and to connect the pipes 17 and 20 near the bottom of the coolers as illustrated in Fig. 1 where considerable differences in temperature are required in the respective boxes. It is also an important advantage to be able to regulate the liquid refrigerant for the entire system at one regulating valve instead of at a plurality of regulating valves.

The apparatus herein illustrated and described is capable of considerable modification without departing from the principle of my invention.

Having described my invention what I claim is:

1. A refrigerating system comprising a plurality of cooling members each adapted to contain a body of liquid refrigerant and having a vapor offtake conduit leading therefrom, a liquid refrigerant supply conduit to one of said coolers and a liquid refrigerant conduit leading from said first cooler to one or more remaining coolers to supply liquid refrigerant thereto.

2. A refrigerating system comprising a plurality of cooling members each adapted to contain a body of liquid refrigerant and having a vapor offtake conduit leading therefrom, a liquid refrigerant supply conduit to one of said coolers, a regulating valve in said supply conduit and a liquid refrigerant conduit leading from said first cooler to one of the remaining coolers to supply liquid refrigerant thereto.

3. A refrigerating system comprising a plurality of cooling members each adapted to contain a body of liquid refrigerant and having a vapor offtake conduit leading therefrom, a liquid refrigerant supply conduit to one of said coolers, and liquid refrigerant overflow conduits leading respectively from one of said cooler members to another of said cooler members to supply liquid refrigerant from one cooler member to another.

4. A refrigerating system comprising a plurality of cooling members each adapted to contain a body of liquid refrigerant and having a vapor offtake conduit leading therefrom, a liquid refrigerant supply conduit to one of said coolers, a regulating valve in said supply conduit, and a plurality of liquid refrigerant overflow conduits leading from one of said cooler members to another of said cooler members respectively to supply liquid refrigerant to the respective cooler members.

5. A refrigerating system comprising a plurality of cooler members each adapted to contain a body of liquid refrigerant and having a vapor off-take conduit leading therefrom, regulating valves in said respective vapor off-take conduits to regulate the relative flow of vapor therein, a liquid refrigerant supply conduit leading to the first of said coolers, a regulating valve in said supply conduit, and a plurality of liquid refrigerant overflow conduits respectively leading from one of said cooler members to another of said cooler members to supply liquid refrigerant to the respective cooler members.

6. A refrigerating system comprising a plurality of cooler members each to contain a body of liquid refrigerant and having a vapor off-take conduit leading therefrom, regulating valves in said respective vapor off-take conduits to regulate the relative flow of vapor therein, a liquid refrigerant supply

conduit leading to the first of said cooling members, a regulating valve in said supply conduit, and a liquid refrigerant supply conduit leading from one of said cooler members to another of said cooler members to supply liquid refrigerant by overflow from one to the other of said cooler members.

7. A refrigerating system comprising a plurality of cooler members each to contain a quantity of liquid refrigerant, and a liquid refrigerant supply conduit leading to the first cooler member, and thence successively by overflow of the liquid refrigerant from one to another of the remaining cooler members.

8. In a refrigerating system a cooler member to contain a quantity of liquid refrigerant, a vapor off-take conduit leading therefrom, a liquid refrigerant supply conduit leading to said cooler member, and means to maintain a uniform quantity of liquid refrigerant in said cooler member, by removing the excess liquid refrigerant therefrom.

9. In a refrigerating system a cooler member to contain a quantity of liquid refrigerant, a vapor off-take conduit leading therefrom, a liquid refrigerant supply conduit leading thereto, and an exit conduit to maintain by overflow a uniform quantity of liquid refrigerant in said cooler member and to conduct the excess of liquid refrigerant from said cooler member.

10. In a refrigerating system a cooler member to contain a quantity of liquid refrigerant, a vapor off-take conduit leading therefrom, a liquid refrigerant supply conduit leading to said cooler member, means to conduct heat from the liquid refrigerant in said supply conduit into the cool vapor escaping through said vapor off-take conduit, a regulating valve in said supply conduit between said conducting means and said cooler member, and means to maintain a substantially uniform liquid level of refrigerant in said cooler member, said liquid refrigerant supply conduit being connected to said cooler member to supply precooled liquid refrigerant thereto below the normal liquid level in said cooler member.

11. In a refrigerating system a cooler member to contain a quantity of liquid refrigerant, a vapor off-take conduit leading therefrom, a liquid refrigerant supply conduit leading thereto, means in said supply conduit to precool the liquid refrigerant by conducting heat therefrom into the cool vapor of said off-take conduit, and a regulating valve in said supply conduit located below the level of the liquid refrigerant in said cooler, and between said cooler and said precooling means, said liquid refrigerant supply conduit being connected to said cooler member to supply precooled liquid refrigerant thereto below the normal liquid level in said cooler member.

12. A refrigerating system comprising a plurality of cooler members each to contain a quantity of liquid refrigerant, and having an off-take conduit, a compressor common to all of said cooler members independent regulating valves in the respective off-take conduits, and means to supply liquid refrigerant to said respective cooler members.

In testimony whereof I have affixed my signature.

CASPER W. MILES.