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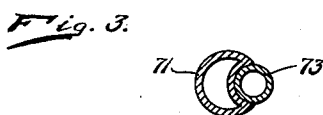
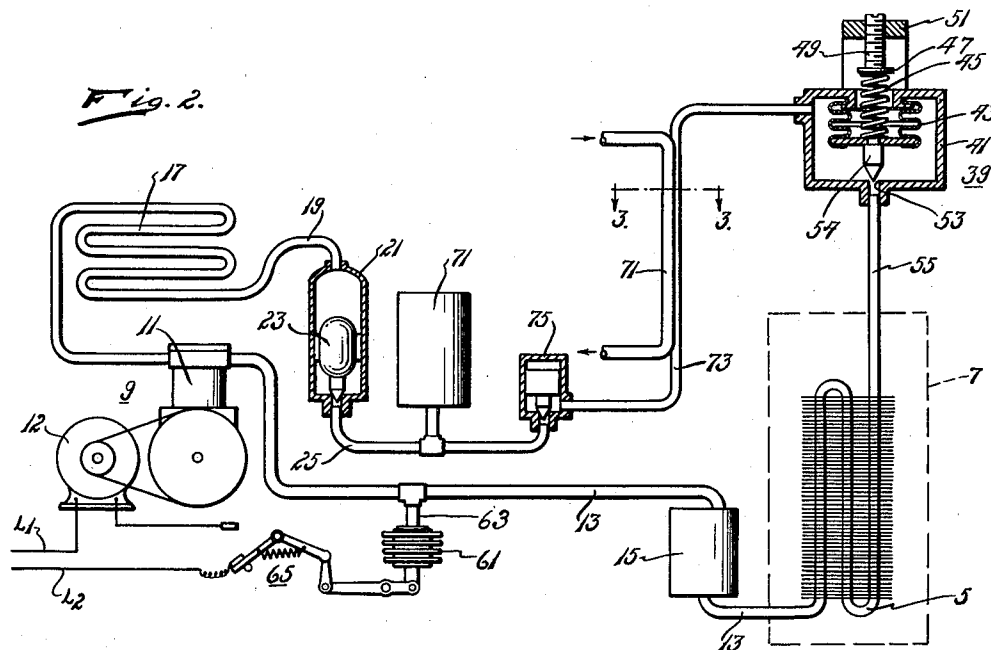
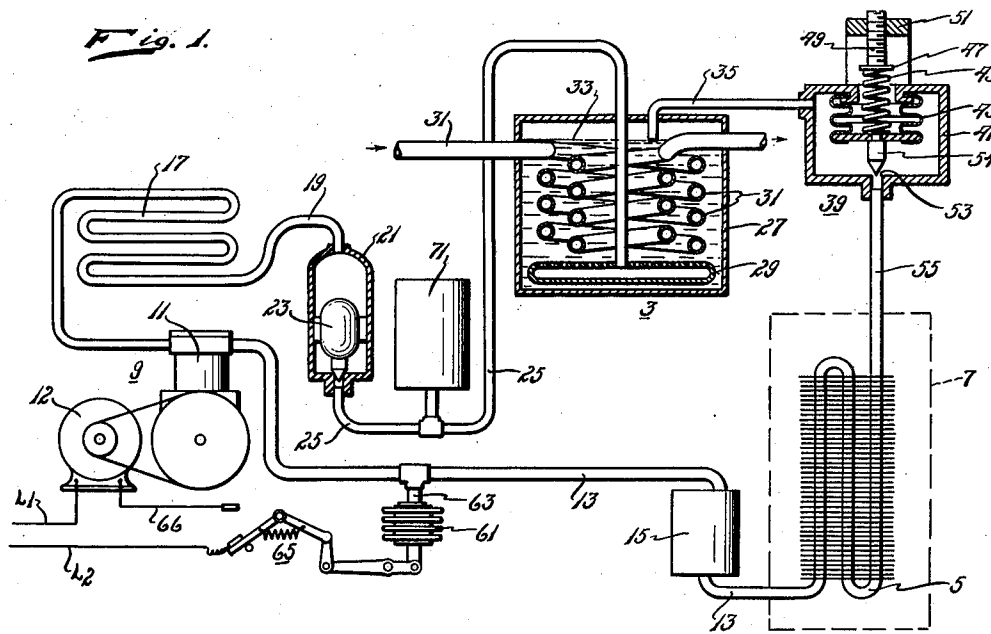
L. A. PHILIPP

2,191,623

REFRIGERATING APPARATUS

Filed June 8, 1937

2 Sheets-Sheet 1



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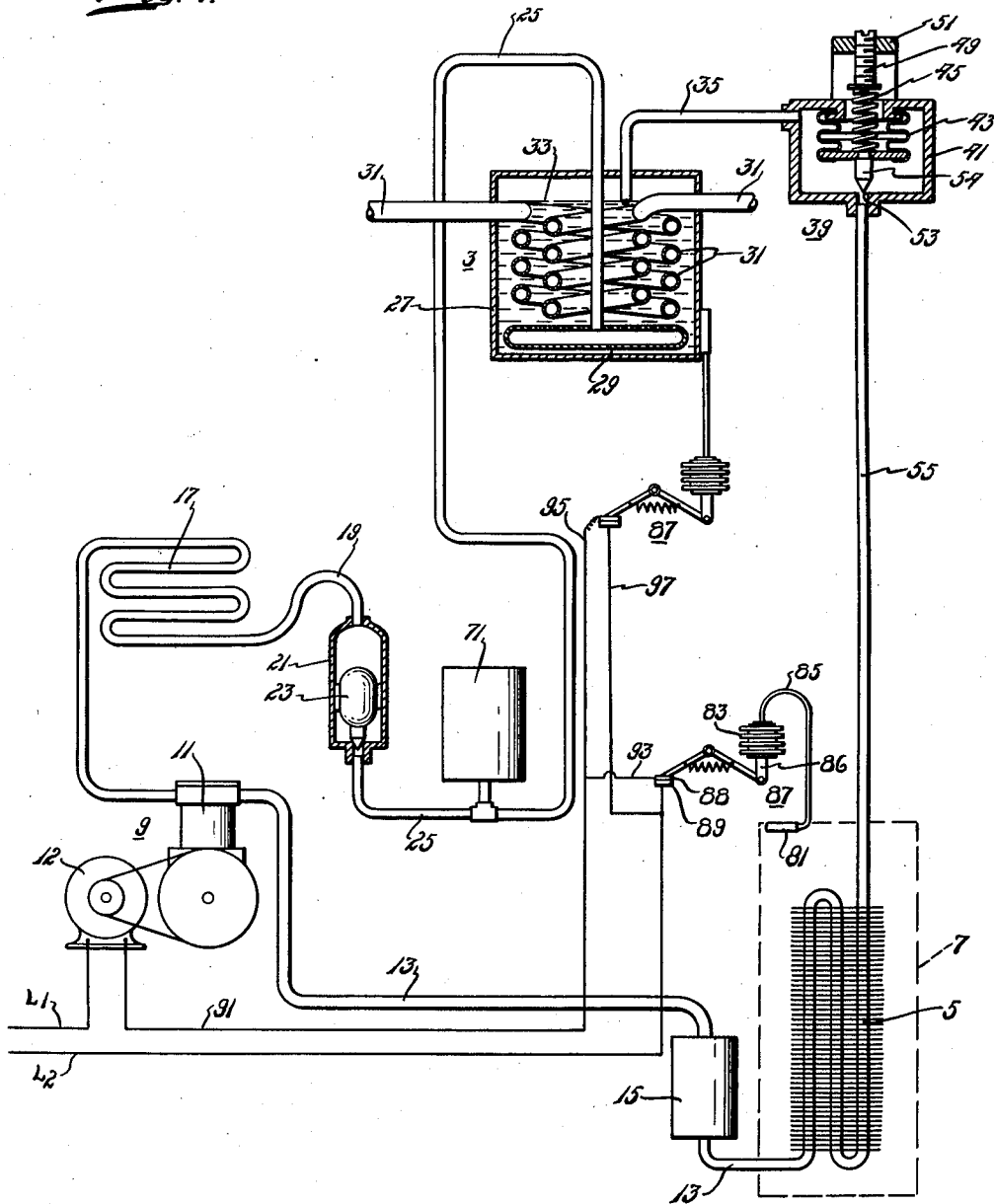
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Fig. 4.



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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

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1 Claim. (Cl. 62-4)

My invention pertains to refrigerated beer coolers and more particularly to a refrigerating system for cooling both draught beer as it is dispensed and bulk beer in storage.

5 It is an object of my invention to provide a refrigerating system comprising a suitable heat exchanger for utilizing a refrigerant to cool, for example, draught beer or the like to the proper temperature for dispensing and a series connected cooler for applying the refrigerant to cool a bulk storage compartment.

10 It is also an object of my invention to provide a system of the type described with refrigerant receiving means for preventing high pressures in the system whereby steam or hot water may be passed through the beer cooling coils for efficiently cleansing the same.

15 It is a further object of my invention to provide a system of the type described with a minimum suction pressure regulating valve interposed between the cooling elements and a sufficient quantity of refrigerant in the system to provide refrigerant for both coolers under all conditions whereby the bulk storage compartment 20 is refrigerated when there is no load on the draught beer cooler or if the pressure regulating valve becomes leaky harmfully low temperatures will not be produced.

25 Another object of my invention is to provide such a system wherein the draught beer heat exchanger comprises a series of beer conducting coils disposed in a refrigerant receiving tank having an outlet through which the refrigerant passes from the upper portion of the tank.

30 A further object of my invention is to provide such a system with a heat exchanger for cooling draught beer comprising a pair of conduits disposed in parallel relation and joined throughout their length in intimate heat exchanging engagement.

35 The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments, when read in conjunction with the accompanying drawings, in which:

40 Fig. 1 is a diagrammatic view in which the various elements of my beer cooler refrigerating system are schematically represented in their interconnected cooperative relation;

45 Fig. 2 is a similar view showing another embodiment of my invention in which similar elements are designated by similar reference characters;

Fig. 3 is a cross sectional detail view thereof showing how the conduits of the heat exchanger are united in intimate thermal coupled relation; and

Fig. 4 is a diagrammatic view representing a 5 system provided with a modified automatic temperature control.

Referring more specifically to the drawings the apparatus shown in Fig. 1 comprises a heat exchanger 3 for cooling draught beer to a temperature suitable for dispensing, and finned cooling coils 5 for cooling a storage compartment 7 in which bottled beer or other bulk goods may be stored. For supplying volatile refrigerant to the system a refrigerant condenser unit 9 is provided comprising a compressor 11, which draws the refrigerant vapor from the finned cooling coils 5 through a suction line 13 which includes a liquid accumulator 15 in series therewith for collecting any of the liquid refrigerant which escapes from the last cooling coil. In the compressor 11 the refrigerant vapor is compressed to a high pressure and it is then passed through a condenser 17 where its latent heat of vaporization is dissipated to the surrounding atmosphere 25 and it is condensed to a liquid.

After the refrigerant is liquefied in the condenser 17 it then passes through a conduit 19 into the chamber 21 of a high-side float expansion valve 23 from which it is gradually discharged 30 through a conduit 25 into the draught beer cooler. The heat exchanger for cooling the draught beer comprises a refrigerant tank 27 which receives the liquid refrigerant from the conduit 25 which terminates in an apertured nozzle 29 of flat conformation disposed on the bottom of the tank. 35 The draught beer to be cooled passes through a conduit 31 of block tin, tinned copper, or other suitable material which is disposed in a series of coils submerged in intimate heat exchanging relation in the liquid refrigerant 33 in the tank 27. At one end the beer conduit 31 is connected to a keg of beer in which a suitable pressure of air or carbon dioxide gas is maintained in any well known manner and the other end thereof 45 may be connected to the spigot or faucet for dispensing the beer at the bar. Refrigerant passes from the refrigerant tank 27 through an outlet conduit 35 in the upper portion thereof, the lower end of which is positioned to determine the level of the refrigerant in the tank. Compressor lubricating oil which passes into the refrigerant tank 27 floats on the refrigerant and it is thus effectively removed therefrom.

In order to accurately regulate the refrigerant 55

vaporizing pressure and hence the temperature in the draught beer cooler tank 27 a pressure regulating valve 39 is connected to the outlet conduit 35 therefrom. The pressure regulating valve 39 comprises a valve chamber 41 into which the outlet conduit 35 is directly connected and a flexible metal bellows 43 mounted therein having an open end hermetically sealed to the outer end of the valve chamber and a closed end projecting into the chamber whereby fluid pressures in the chamber 41 react directly upon the metal bellows 43 and tend to contract it. To provide a biasing force tending to resist the contracting force applied by the pressures on the end of the metal bellows 43 a helical compression spring 45 is concentrically disposed in the bellows between the closed end thereof and a stop 47 supported on the end of a threaded shaft 49 which may be turned in a threaded bracket 51 to adjustably compress the spring. An outlet port 53 opens from the closed end of the valve chamber 41 and provides a valve seat disposed in alignment with a valve 54 which projects from the closed end of the bellows 43 for cooperative engagement therewith.

The finned coils 5 for cooling the storage compartment 7 receive the refrigerant which is discharged from the outlet port 53 of the pressure regulating valve chamber 41 through a conduit 55 which is connected therebetween. The outlet end of the finned cooling coils 5 is connected through the suction line 13 and the interposed accumulator 15 to the low pressure side of the compressor 11 which removes the refrigerant vapor and maintains suitable pressure and temperature conditions therein. It will be apparent that the keg (not shown) from which the draught beer is supplied may also be pre-cooled in the storage compartment if desired.

The operation of the compressor unit 9 is controlled automatically in accordance with conditions in the system by means of a pressure responsive device comprising a flexible metal bellows 61 connected through a conduit 63 to the suction line 13. A snap action switch 65 is connected to the bellows for actuation thereby to intermittently complete an energizing circuit through conductor 66 and energize the compressor motor 12 from the service lines L-1 and L-2 and operate the refrigerant compressor 11 to satisfy the demands of the system.

In order to provide for effectively cleansing the beer coils 31 with steam or hot water I have provided a clean-out receiver 71 comprising a relatively large closed receptacle which is connected to the refrigerant line 25 between the high-side float type valve 23 and the refrigerant tank 27. When steam or hot water is passed through the beer coil for cleansing, the heat causes vaporization of the refrigerant 33 in the tank 27 and the pressures generated cause the refrigerant to be forced back through the refrigerant conduit 25 into the clean-out receiver 71. Thus the system is protected from high pressures which would rupture the refrigerant tank 27 and the lines and accessories associated therewith.

In operation the system is provided with a quantity of the refrigerant 33 greater than the amount which can accumulate in the refrigerant tank 27 of the draught beer cooler and the associated conduits and accessories under any set of operating conditions. Consequently there will always be refrigerant in the portion of the system between the reducing valve 39 and the low-side of the compressor whereby the storage com-

partment 7 will be cooled even when no draught beer is dispensed and no refrigerant is vaporized in the refrigerant tank 27 to open the pressure regulating valve 39. Also with this arrangement leakage of the pressure regulating valve 39 cannot cause any seriously harmful temperatures in the finned cooling coils 5.

In another embodiment of my invention the heat exchanger for cooling the draught beer comprises a pair of conduits 71 and 73 disposed in adjacent parallel relation throughout their length and joined in intimate thermal coupled engagement as by soldering or welding, as shown in Figs. 2 and 3. One of the conduits 71 is relatively large and is provided with a groove like depression along one side, as shown in Fig. 3, for receiving the smaller conduit 73 in close engagement therein whereby a very efficient thermal coupling is provided and the capacity of the cooler is increased.

The larger conduit 71 carries the beer or similar beverage to be cooled and the smaller conduit 73 carries the refrigerant. The conduits 71 and 73 may be disposed in a series of coils or other suitable conformation to provide as compact an arrangement as possible.

In this embodiment a weighted pressure reducing valve 75 is inserted between the refrigerant feeding line 25 from the high-side type valve 23 and the conduit 73 which carries the refrigerant through the heat exchanger. A refrigerant receiver drum 71 is also connected to the refrigerant line 25 between the float valve 23 and the weighted valve 75 to receive refrigerant therefrom.

The liquid refrigerant and the vapor flow through the pressure valve 39 into the finned coils 5 to cool the bulk storage compartment 7. Thus even if the valve 39 should leak with no load on the draught beer cooler, refrigeration is produced in the finned coil 5 without danger of freezing the beer. The pressure regulating valve 39 is preferably adjusted by turning stop 47 to provide a pressure of about 9 pounds per square inch in the beer cooling unit.

The operation of the refrigerant compressor 11 may be controlled by thermostatic control devices associated with the beer cooling coils, as shown in Fig. 4. One of these control devices comprises a thermo bulb 81 disposed in the compartment 7 cooled by the finned cooling coils 5. An expansible fluid or vaporizable liquid such as refrigerant is provided in the bulb 81 to set up pressures which vary in accordance with the temperatures and which accordingly actuate an expansible metal bellows 83 through an interconnecting conduit 85. For controlling the starting and stopping of the electric motor 12 which drives the compressor 11 a snap action switch 87 is connected to the expansible bellows 83 through a suitable link 86 and its circuit controlling contacts 88 and 89 are connected by conductors 91 and 93 to complete the motor energizing circuit, from line conductors L-1 and L-2. A second thermostatic switch of similar construction is controlled by a thermo-bulb which is so disposed that it is responsive to the temperature of the draught beer cooler. The second thermostatically controlled switch has its circuit controlling contacts connected by conductors 95 and 97 in parallel with the contacts of the first thermostatic control switch described above.

When the temperature rises in either cooler it causes the pressure to increase in the associated expansible bellows 83 thereby actuating the asso-

ciated switch to closed position and starting the compressor motor 12. When the temperature has been properly reduced the bellows contracts thereby opening the switch and stopping the compressor. By this arrangement the compressor 11 is operated as long as the temperature in either evaporator is above the desired temperature range for which the thermal control devices have been adjusted.

10 It will be seen that I have provided a refrigerating system for cooling draught beer and bulk storage beer which comprises cooling elements connected in series relation into a system from which they are supplied with refrigerant under all conditions, in which the beer coils may be 15 safely cleansed by means of steam or hot water, in which the adverse effects of leaky pressure regulating valves have been minimized, and which is reliable and positive in its operation under all 20 conditions.

Aside from the specific embodiments of the invention herein shown and described, it will be understood that numerous details of the construction may be altered or omitted without departing from the spirit and scope of the invention as disclosed and claimed, and that I do not

desire to limit the invention to the exact constructions herein set forth.

I claim:

In combination, in a refrigerating system a pair of evaporators, a coil beverage cooling conduit associated with one of said evaporators, a refrigerant condenser unit for withdrawing gaseous refrigerant from the evaporators and condensing the same and conducting the condensed refrigerant to the evaporators, means for controlling the flow of refrigerant from the condenser to the evaporators one of said evaporators being connected in series circuit relation with the other evaporator and the compressor unit, a conduit interconnecting said means and the first 15 evaporator to receive refrigerant from the condenser, a relatively large tank associated with said conduit between said means and the first evaporator to receive refrigerant, means for controlling the flow of refrigerant from one of said 20 evaporators to the other, and thermostatic means associated with each evaporator for controlling the operation of the condensing unit in such a manner that the same will continue to operate so long as the temperature of either evaporator 25 is above a certain high value.

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