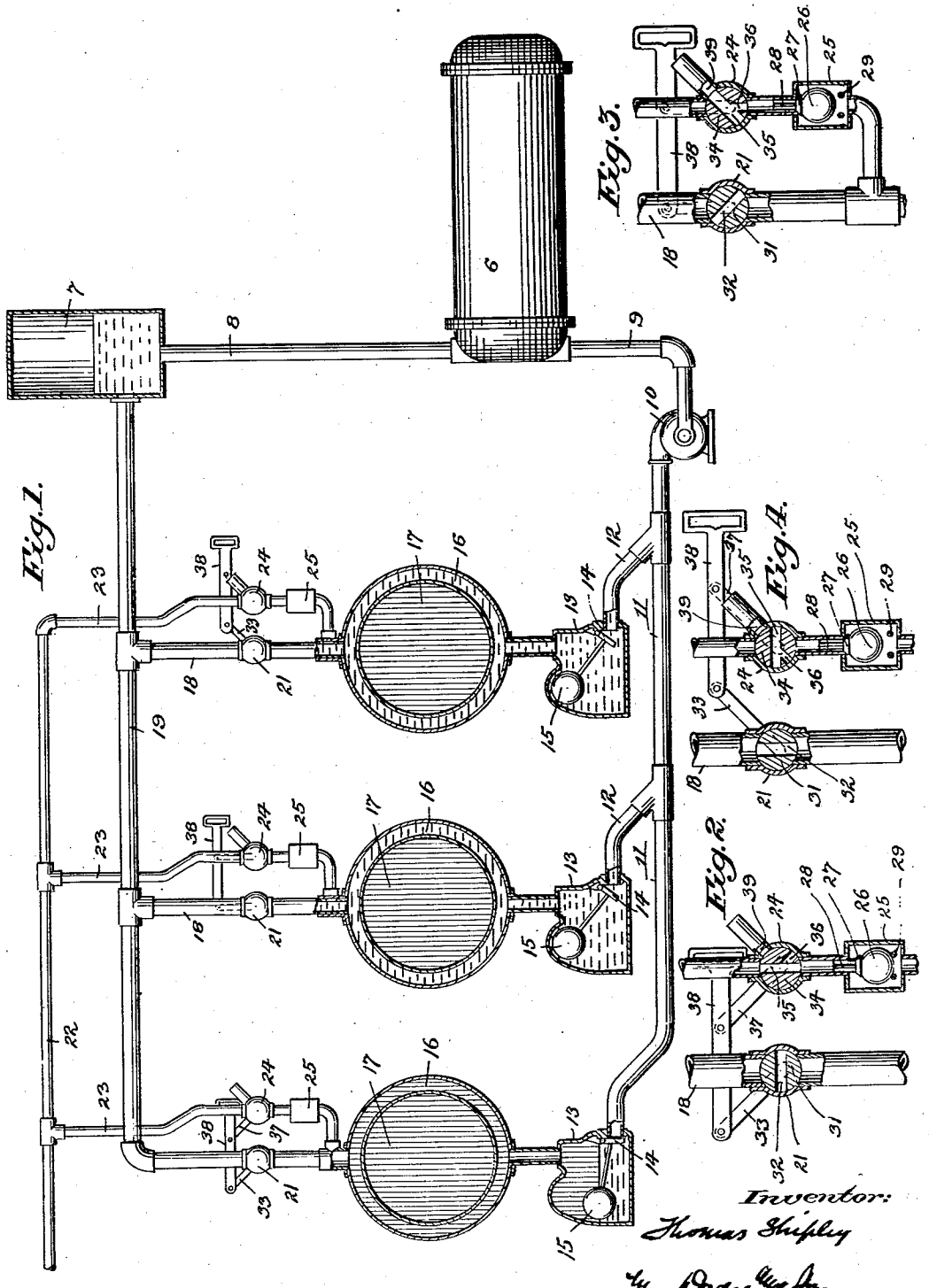
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REFRIGERATION

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REFRIGERATION

Application filed October 12, 1927. Serial No. 225,776.

This invention relates to means for suddenly arresting the refrigerating action of indirect refrigerating systems, i. e., those in which chilled brine or other heat convective liquid is used.

The present application is subordinate to my copending application Serial No. 225,775 filed October 12, 1927 and is limited to certain relatively specific features of the invention more broadly claimed in said application.

The invention has peculiar utility in the ice-cream industry, and will be described as applied to this field, without, however, implying any limitation to this particular field.

In freezing ice-cream, the batch in the freezer is first chilled to a point at which the "swell" commences. At this point freezing must be retarded to allow the swell to occur under the influence of the reduced temperature and the beating action of the dasher. The smooth texture of the finished cream depends on occurrence of the swell and the swell would be arrested if the temperature were further reduced.

Heretofore it has been proposed to arrest the circulation of brine in a system of the character just mentioned, but this is not entirely satisfactory for the reason that the brine in the jacket of the freezer is colder than the cream when the swell starts and is then capable of absorbing considerable heat from the cream so that it occasionally happens that the swell is arrested.

The present invention contemplates the draining of the jackets, and in its preferred form it contemplates the rapid displacement of the brine from the jackets by the admission to the jackets of gas under pressure. In this way the freezing operation is arrested almost instantly.

Other features of the invention relate to the provision of a very simple means for manipulating, by a single actuator all the connections of a single freezer; the arrangement of the piping in such a way that a plurality of freezers are served by a single brine cooler which operates uninterruptedly whether all or only part of the freezers are in action; and the provision of means for venting the displacing gas to allow the reflux of the brine into the jacket.

The preferred embodiment of the invention is illustrated in the accompanying drawing, in which:

Fig. 1 is a diagrammatic elevation, partly in section, showing three freezers connected to a single brine cooler. Any desired number of freezers may be used.

Fig. 2 is a sectional view showing the controlling valve mechanism in the position for displacing the brine from the freezer.

Fig. 3 is a similar view showing the valves in position for venting gas from the jacket to permit the return of the brine.

Fig. 4 is a similar view showing the valves in position for circulation of brine through the freezer, the gas vent being closed.

In the drawing 6 represents a brine cooler of familiar shell and tube type, through which brine circulates and within which the heat is abstracted from the brine by transfer of the heat to an evaporating refrigerant such as anhydrous-ammonia. A variable volume chamber 7 is connected in the brine circuit above the brine cooler 6 and is designed to accommodate the volume of brine which is displaced from one or more of the freezers when the freezing action thereof is arrested. The chamber 7 is connected by a pipe 8 with the brine cooler. The reservoir 7 is merely an excess volume communicating with the system, and available to receive liquid displaced temporarily from one or more freezer jackets. While it is shown in the drawing as a separate unit connected in the circulating system it may be variously arranged. For example, its existence as a separate unit from the cooler with which it is in direct communication, is convenient, but by no means essential.

From the cooler 6 a pipe 9 leads to a rotary circulating pump 10 which is driven by a motor (not shown). The pump 10 discharges into a manifold 11 from which lead branches 12 to float traps 13, there being one branch and one float trap for each ice cream freezer. In each trap 13 is a check valve 14 which opens in the direction of flow through the

branch 12 toward the freezer and which is maintained normally open by a float 15. The float 15 acts normally to hold the valve 14 open, but allows the valve 14 to close against back flow through the branch 12 when the trap 13 is substantially free of liquid (see the left hand trap of Fig. 1).

Trap 13 is connected to the hollow jacket 16 of the freezer, whose cream-receiving space is indicated at 17. The freezer is only diagrammatically shown and may assume various forms. As ordinarily constructed such freezers include a motor driven dasher within the space 17 and some means for charging the unfrozen cream into this chamber and for discharging the frozen cream therefrom.

The connection from the trap 13 enters the bottom of the jacket 16 and from the upper part of each jacket 16 is a branch 18 leading to the return manifold 19, which discharges into variable volume chamber 7. Each branch 18 is controlled by a corresponding cock 21.

Parallelling the manifold 19 is an air line 22 having branches 23, each leading to a corresponding branch 18 between its cock 21 and the jacket 16. Each branch 23 is controlled by a multiple way cock 24 and by a float controlled check valve, indicated in Fig. 1 by the numeral 25, applied to the valve chamber.

The construction of the check valve is shown in Figs. 2, 3 and 4, and is as follows: Within the chamber 25 is a ball float 26, to the upper side of which is attached a valve member 27 guided by a pilot 28. Stop member 29 prevents the float 26 from sealing by its downward movement. The valve is closed by the float against upward flow of liquid, but when unseated by downward flow of gas, remains unseated to permit upward venting flow of gas, until liquid again reaches the float and raises it sufficiently to close the valve.

The cock 21 has a rotary plug 31 with through port 32 and actuating arm 33. The cock 24 has a plug 34 with through port 35, branch 36 and operating arm 37. The arms 33 and 37 are connected by actuating link 38. The body of cock 24 is provided with a vent port 39, which ports 35 and 36 connect with jacket 16 in an intermediate position of the plug 34.

The parts are so proportioned and arranged that in normal position (Fig. 4) port 32 registers while ports 35 and 36 are blanked. Thus the brine circulates in a closed circuit through the brine cooler 6 and jacket 16.

In unloading position (Fig. 2) ports 32 and 36 are blanked and port 35 registers. Thus gas (usually air) under pressure enters through pipe 22 and displaces brine from jacket 16 through valve 14 and branch 12. The displaced brine accumulates in tank 7.

After such unloading the gas must be vented to permit resumption of circulation. This venting occurs in an intermediate position (Fig. 3) in which port 32 is blanked and ports 35 and 36 offer a vent through port 39.

To operate normally the valves are set to the position of Fig. 4. To unload they are moved to the position of Fig. 2. To resume circulation, they are first moved to the position of Fig. 3 until valve 25 closes as indicated by the cessation of venting flow; whereupon the valves are shifted to the position of Fig. 4 and circulation is resumed.

What is claimed is:—

1. In a refrigerating system, the combination of a liquid cooled refrigerating device; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of the liquid; a circulating pump; liquid conducting connections between the above enumerated parts serving normally to direct the liquid through the refrigerating device, cooler and pump in a closed circuit said circuit, excepting said reservoir, being normally filled with liquid; and means including a valve mechanism associated with said circuit operable to arrest flow through said refrigerating device and control discharge therefrom into said reservoir.

2. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; and means including a valve mechanism, one corresponding to each refrigerating device, and each operable to arrest circulation through such device and to discharge liquid from said device to said reservoir.

3. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir, and the pump being intermediate the reservoir and the liquid entrance to the refrigerating devices, and means including a valve mechanism, one corresponding to each refrigerating device, and each operable to arrest circulation through such device and to discharge liquid from said device to said reservoir.

4. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liqud; a reservoir adapted to contain

a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom: valves, one for interrupting the circuit through each refrigerant device; and valves, one controlling each pressure gas connection.

5. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; and valve means, each corresponding to a refrigerating device, and each operable alternately to interrupt circulation and admit pressure gas, or to interrupt the inflow of pressure gas and permit circulation.

6. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; and multiple valve means, each corresponding to a refrigerating device, and each capable of three settings, in one position serving to interrupt circulation and simultaneously admit pressure gas; in another position to cut off the pressure gas and simultaneously permit circulation; and in another position to cut off the pressure gas, interrupt circulation and vent pressure gas.

7. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; multiple valve means, each corresponding to a refrigerating device, and each capable of three settings, in one position serving to interrupt circulation and simultaneously admit pressure gas; in another position to cut off the pressure gas and simultaneously permit circulation; and in another position to cut off the pressure gas, interrupt circulation and vent pressure gas; and an automatic valve arranged to close against liquid flow and controlling the gas vent through said multiple valve means.

8. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; a float controlled check valve in each of said circuits adjacent the inlet to each refrigerating device, arranged to permit back flow of liquid and to close against back flow of gas; and valve means, each corresponding to a refrigerating device, and each operable alternately to interrupt circulation and admit pressure gas, or to interrupt the inflow of pressure gas and permit circulation.

9. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reservoir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; a float controlled check valve in each of said circuits adjacent the inlet to each refrigerating device, arranged to permit back flow of liquid and to close against back flow of gas; and multiple valve means, each corresponding to a refrigerating device, and each capable of three settings, in one position serving to interrupt circulation and simultaneously admit pressure gas; in another position to cut off the pressure gas and simultaneously permit circulation; and in another position to cut off the pressure gas, interrupt circulation and vent pressure gas.

10. In a refrigerating system, the combination of a plurality of liquid cooled refrigerating devices; a cooler for abstracting heat from a liquid; a reservoir adapted to contain a variable volume of liquid; a circulating pump; connections establishing parallel circuits through said refrigerating devices, all of said circuits passing through said cooler and pump and connecting with said reser-

voir; connections, one to each refrigerating device for supplying thereto gas under a pressure sufficient to displace the liquid therefrom; a float controlled check valve in each of said circuits adjacent the inlet to each refrigerating device, arranged to permit back flow of liquid and to close against back flow of gas; multiple valve means, each corresponding to a refrigerating device, and each capable of three settings, in one position serving to interrupt circulation and simultaneously admit pressure gas; in another position to cut off the pressure gas and simultaneously permit circulation; and in another position to cut off the pressure gas, interrupt circulation and vent pressure gas; and an automatic valve arranged to close against liquid flow and controlling the gas vent through said multiple valve means.

In testimony whereof I have signed my name to this specification.

THOMAS SHIPLEY.