Jan. 12, 1932. F. E. HARTMANN 1,840,947

LIQUID DISTRIBUTING TROUGH

Filed July 8, 1927 2 Sheets-Sheet 1

Fig. 1.

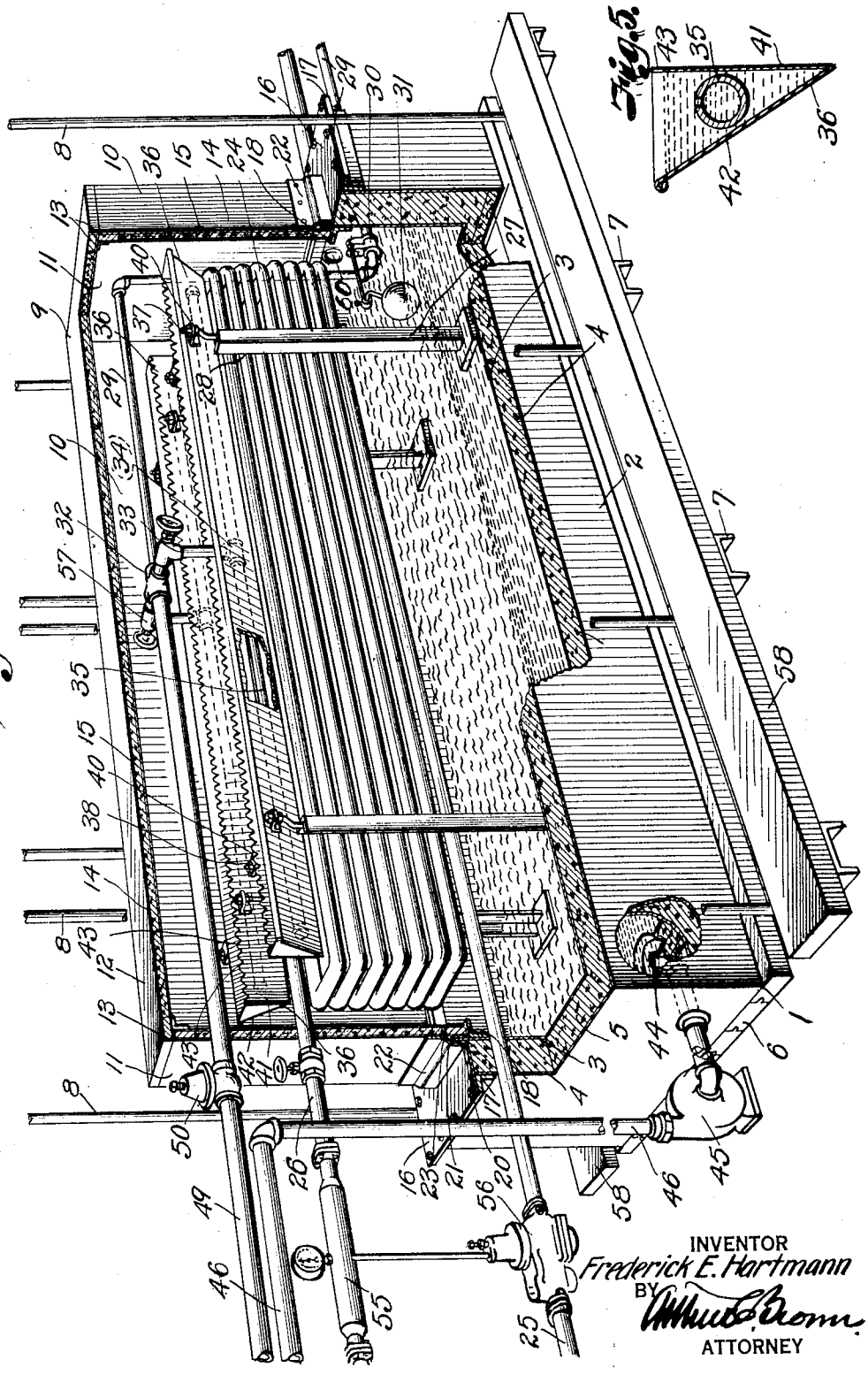

Fig. 5.



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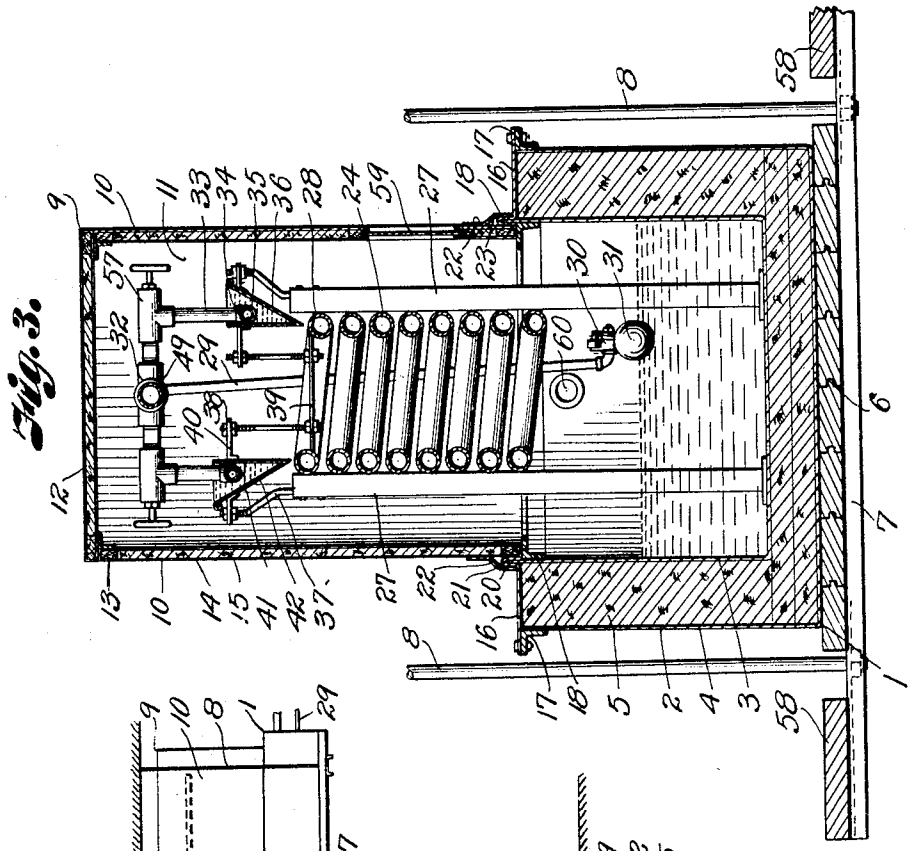

Fig. 3.

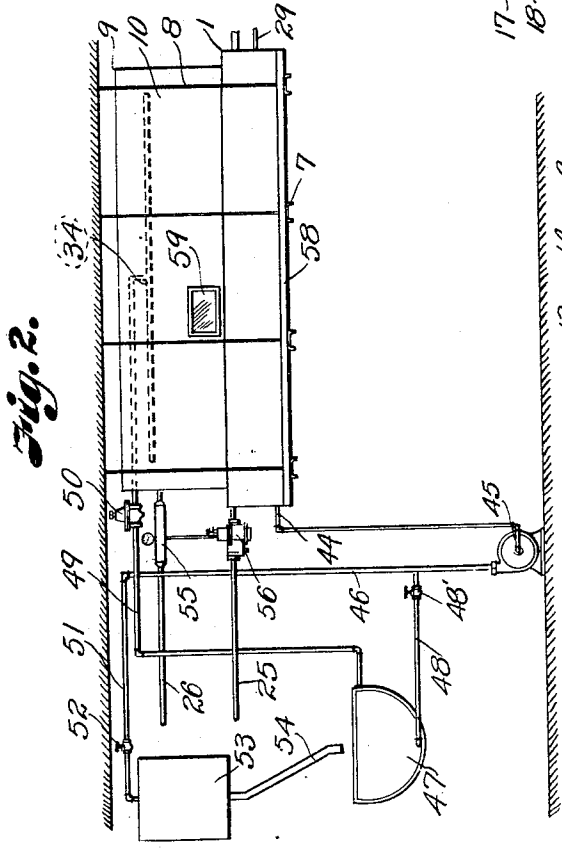

Fig. 2.

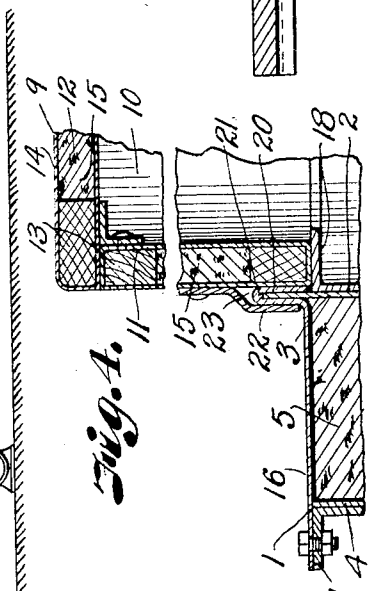

Fig. 4.

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# UNITED STATES PATENT OFFICE

FREDERICK E. HARTMANN, OF OMAHA, NEBRASKA, ASSIGNOR TO BAKER ICE MACHINE CO., INC., OF OMAHA, NEBRASKA, A CORPORATION OF NEBRASKA

## LIQUID DISTRIBUTING TROUGH

Application filed July 8, 1927. Serial No. 204,257.

My invention relates to apparatus for cooling and circulating a liquid, its object being to so control the supply of refrigerant and the supply of the liquid that the apparatus will operate at the highest degree of efficiency and at the lowest cost.

In accomplishing these objects I provide improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a cooling apparatus provided with my improvements, parts of the walls and other elements being broken away the better to disclose other parts.

Fig. 2 is a diagrammatic view of my device associated with vessels being cooled by water cooled by a refrigerant.

Fig. 3 is a vertical, transverse, sectional view of my device.

Fig. 4 is a detail sectional view of portions of a wall showing the means of joining wall members and means of seating the cover on the tank.

Fig. 5 is a detail sectional view of a header and a trough into which liquid is delivered through the header.

Referring in detail to the drawings:

1 designates a tank comprising walls 2 consisting of spaced metal plates inside 3 and outside 4, between which is deposited the insulating filler, preferably cork 5; and a base portion 6, the tank resting on channel irons 7 and suspended by rods 8 in elevated position from the floor. The tank may be considered as formed of inside plates or lining 3, and the outside plates may be metal lagging to hold the insulation 5 in place.

A housing or cover member 9 is provided, comprising side walls 10, end walls 11 and a lid 12, the members 10 and 11 being preferably secured together and the lid being separable. The walls and lid are severally constructed of frame members 13 which may be boards, and metal sheets 14 secured to the frame members, with insulation material 15 retained by the sheets.

The tank walls 2 are relatively thick for the purpose of serving as a reservoir or container for cooled liquid. A plate 16 rests horizontally on the upper edge of the tank walls sheltering the insulating filler, and angle irons 17 secured to the outer metal plate or lagging 4 of the walls support the overhanging edges of the plate 16. Similar angle irons 18 are fixed inside the tank on the inner plate 3 to provide a shelf to support the cover. Said inner plate 3 is extended upwardly, beyond the outer plate 4 and the filling, to be received in a groove 20 formed by bending the inner edge of the plate 16. The bent inner edge of the plate is disposed adjacent said angle iron 18 and constitutes a reinforced vertical flange 21 of the tank wall.

The housing 9 is provided with a lip 22 consisting of a metal strip attached to the lower edge of the cover walls around the periphery thereof and outbent to provide the recess 23. The cover walls are positioned resting upon the angle iron 18 and with said lip 22 engaging the flange 21 of the tank.

The arrangement described is provided to effect as secure a joint as feasible to support the housing firmly on the tank and to exclude moisture, heat, dust, vermin and other influences from admission around the areas of attachment of the cover to the tank and to the insulation between the walls.

The refrigerating apparatus comprises a coil 24 disposed longitudinally above the tank, a refrigerant supply line 25 and a refrigerant return line 26. The coil comprises a plurality of loops supported by posts 27 erected on the tank base and to which the loops are welded, as at 28.

Water or liquid to be cooled by the apparatus is admitted through an inlet pipe 29, controlled by a valve 30. The valve is actuated by a float 31 positioned within the tank and designed to float on the liquid therein, to cause delivery of water to the system or to suspend delivery, so that a desired level of cooled liquid may be maintained in the tank; the apparatus, as will be described, being adapted either for circulation of the cooled liquid back into the tank or for dissemination of the cooled liquid.

The water supply pipe terminates above the coil, in a coupling 32, and water is dispersed over the refrigerating coil by being conducted through branches 33 into headers

34 comprising slotted pipes 35 longitudinally extended above the coil. Troughs 36 are provided in which the headers are arranged, the troughs being supported by brackets 37 erected on said posts 27, and other threaded bracket elements 38 erected on straps 39 extending across and attached to relatively parallel elements of the loops. The threaded brackets are adjustably engaged with flanges 40 secured to the walls of the troughs. The troughs are preferably tapered in cross section, having inside vertical walls 41 and outside tapering walls 42, the inside walls being serrated as indicated at 43 so that water delivered to the troughs flows over the inside walls in substantially equal amounts throughout the lengths of the troughs onto the loops of the refrigerating coil to be cooled thereby, and to fall in the tank or reservoir.

The troughs are supported thus on threaded brackets so that the troughs may be adjusted both in longitudinal position and with reference to relative height of the vertical and tapering sides.

The cooled water is withdrawn from the tank through an outlet 44 by a pump 45, and conducted by a pipe 46 to supply elements to be cooled, examples of which are shown in the diagram of Fig. 2, such as a water jacket surrounding a vessel containing milk or like substance, through a branch 48 controlled by a valve 48′. A return pipe 49 conducts the water from the jacket back to the coupling 32 whereby the cooled water from the tank, after acting in the water jacket, is returned through the headers to the troughs and tank. The route of the cooled water just described discloses a circulating system; and when the said circulating system is in operation, the float 33 tends to be maintained at a relatively permanent level to restrain water from entrance through the inlet.

A pressure relief valve 50 is positioned in the return line to permit the cooled water to recirculate when not being used elsewhere or drawn off, and to admit cooled water to the return pipe when withdrawal is of slight extent.

A second conductor of cooled water comprises the pipe 51 through which cooled water may be caused to flow by opening the valve 52 therein and cooled water flows into a measuring vessel 53, from which it is discharged through a spout 54.

While the cooled water is being discharged, the level of the water in the tank is being lowered, due to withdrawal thereof without replenishment, and the float 31 falls, thereby actuating the valve 30 to admit water under pressure to flow through the inlet 29 into the headers, and thence to fall over the coil into the tank, thereby replenishing and maintaining the supply of water.

When the level of water in the tank rises responsive to adequate supply for the demand, the float is elevated and the valve is automatically closed to restrain inflow.

A variable load control device is associated with the refrigerant lines, comprising a thermostatic element 55 interposed in the return line, and a valve element 56 positioned in the refrigerant supply line and actuated by said thermostatic element, whereby the supply of refrigerant to the coil is regulated in accordance with the fluctuations of temperature of the refrigerant departing from the coil.

When a small demand for refrigerant occurs, due to the return of relatively cool water in the operating circulating system for passage over the coil, the temperature of the return refrigerant is relatively low and the thermostatic element operates to reduce the effective area of the valve in the supply line to limit the supply of refrigerant. When the temperature of the return refrigerant rises, due to the withdrawal of cool water from the tank and the discharge of relatively warm water over the coil, the thermostatic element actuates said valve to open to a greater degree for admission of a larger supply of refrigerant.

I provide as ordinary and incidental features manually operated valves 57 in the water line, runways or shelves 58 laid on the extended channel irons that support the apparatus, and a window 59 installed in a suitable opening in the wall of the housing 9 for access to the apparatus and for observation of conditions within the housing. An overflow pipe 60 is also provided for the tank.

The structure having been provided as described, the valve 52 in the second named of the cooled water conductors may be closed, the valve 48′ opened and water admitted through the inlet to the headers. The water filling the trough, overflows the serrated edges and falls on and over the cooling coil in a thin film, the water being evenly distributed over the top surface of the coil by means of the elongated header and trough. It is understood that the refrigerant is being supplied to the coil at maximum capacity during the initial step for putting the apparatus into operation. The warm liquid is gradually cooled as it flows over the outside surface of the coil, then dropping into the catch basin or reservoir tank. It is then drawn from the reservoir by the pump and circulated to the cooling jacket or similar place of service, returning through the circulating conductor to the headers and over the coil to the tank. When the quantity of water which the tank is designed to accommodate has accumulated, the float automatically suspends the inflow of warm water; and when the circulating water has been sufficiently cooled, the thermostatic element reduces the valve opening in the refrigerant supply line to prevent wasteful delivery of refrigerant.

Should there be occasion for withdrawal

of cool water for any purpose, such as a supply to be removed, the valve 52 is opened and the valve 48′ may then be closed or may remain open, as expedient for the particular occasion.

When the valve 52 is open and cool water departs from the system, the water level in the tank declines and the float valve operates to admit additional supply of water. The warmer additional supply may cause a temporary demand for additional refrigerant and such additional refrigerant is automatically supplied by the operation of the thermostatic element susceptible to the rising temperature of the return refrigerant, which opens the supply refrigerant valve.

Attention is called to the structure whereby the housing or cover element 9 may be easily and conveniently installed or removed and when installed, is attached to the tank through the effective sealing elements comprised in the reinforced flange of the wall member and the lip-like flange member of the housing.

What I claim and desire to secure by Letters Patent is:

1. In a device of the character described, a pair of headers each comprising an elongated slotted pipe, means for supporting the pipes in horizontal position with the slots thereof presented upwardly, a plurality of supports including spaced parallel series of spaced parallel vertical posts, members supported by said posts having portions arranged respectively adjacent each of said series of posts to receive liquid delivered from said headers, plates mounted on said water receiving members, spaced troughs including diverging outside and inside walls arranged respectively parallel with the respective series of posts and containing the headers, brackets projecting oppositely from said walls of the troughs, and means including members fixed to said posts and having threaded connection with the said outside trough wall brackets, and members fixed to said plates and having threaded connection with said inside trough wall brackets, for adjustably supporting the troughs.

2. In a water cooler, a header including an elongated slotted pipe, means for supporting the pipe horizontally with the slot thereof presented upwardly, supporting means including vertical posts and members supported by the posts below the header, a trough, brackets projecting oppositely from the trough, and sets of rods mounted respectively on the posts and on said members and having threaded connections with said brackets for adjustably supporting the trough.

In testimony whereof I affix my signature.

FREDERICK E. HARTMANN.