June 19, 1934. J. A. WARREN 1,963,570

WATER COOLER

Filed Dec. 23, 1927 3 Sheets-Sheet 1

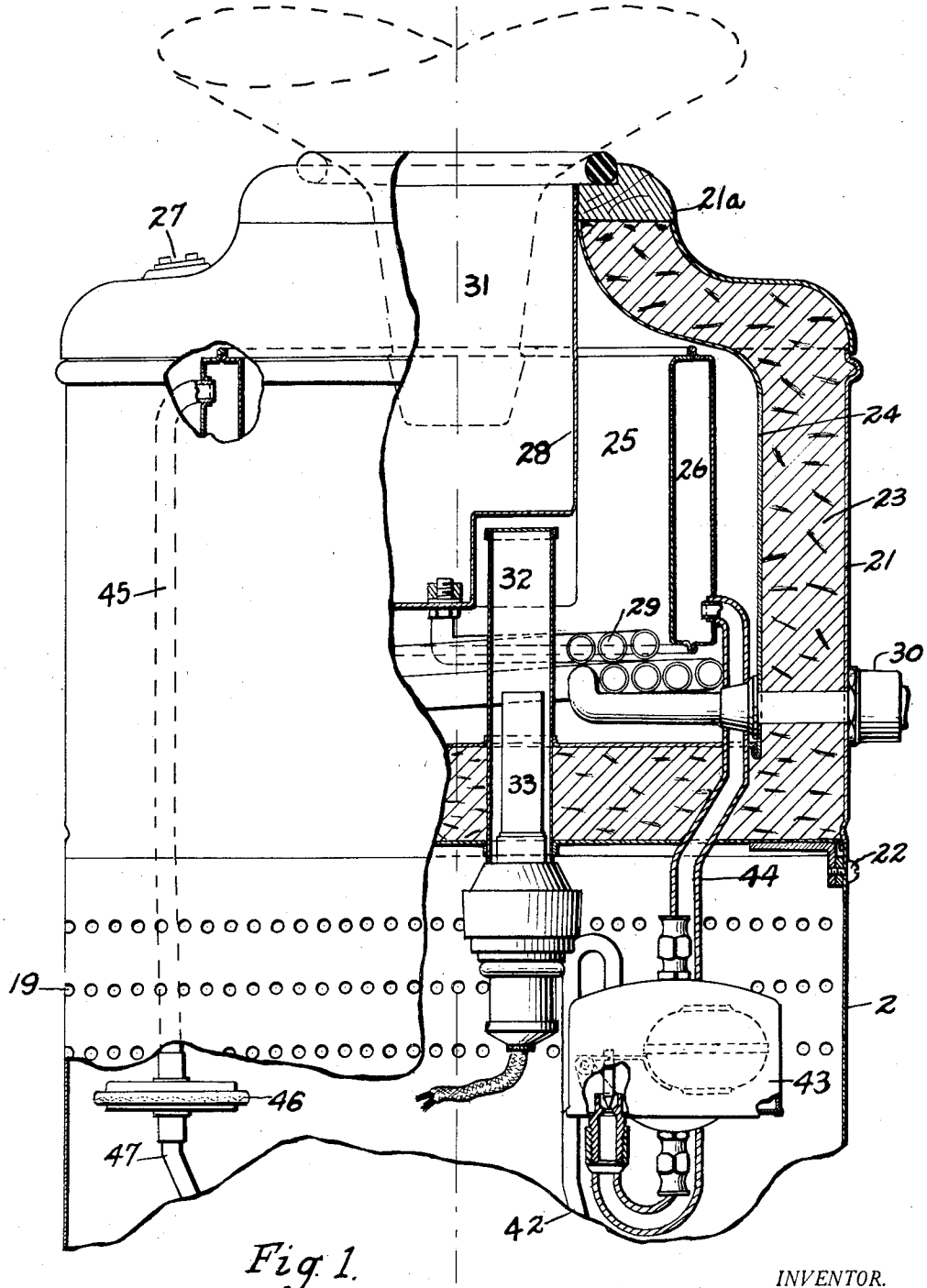


Fig. 1.

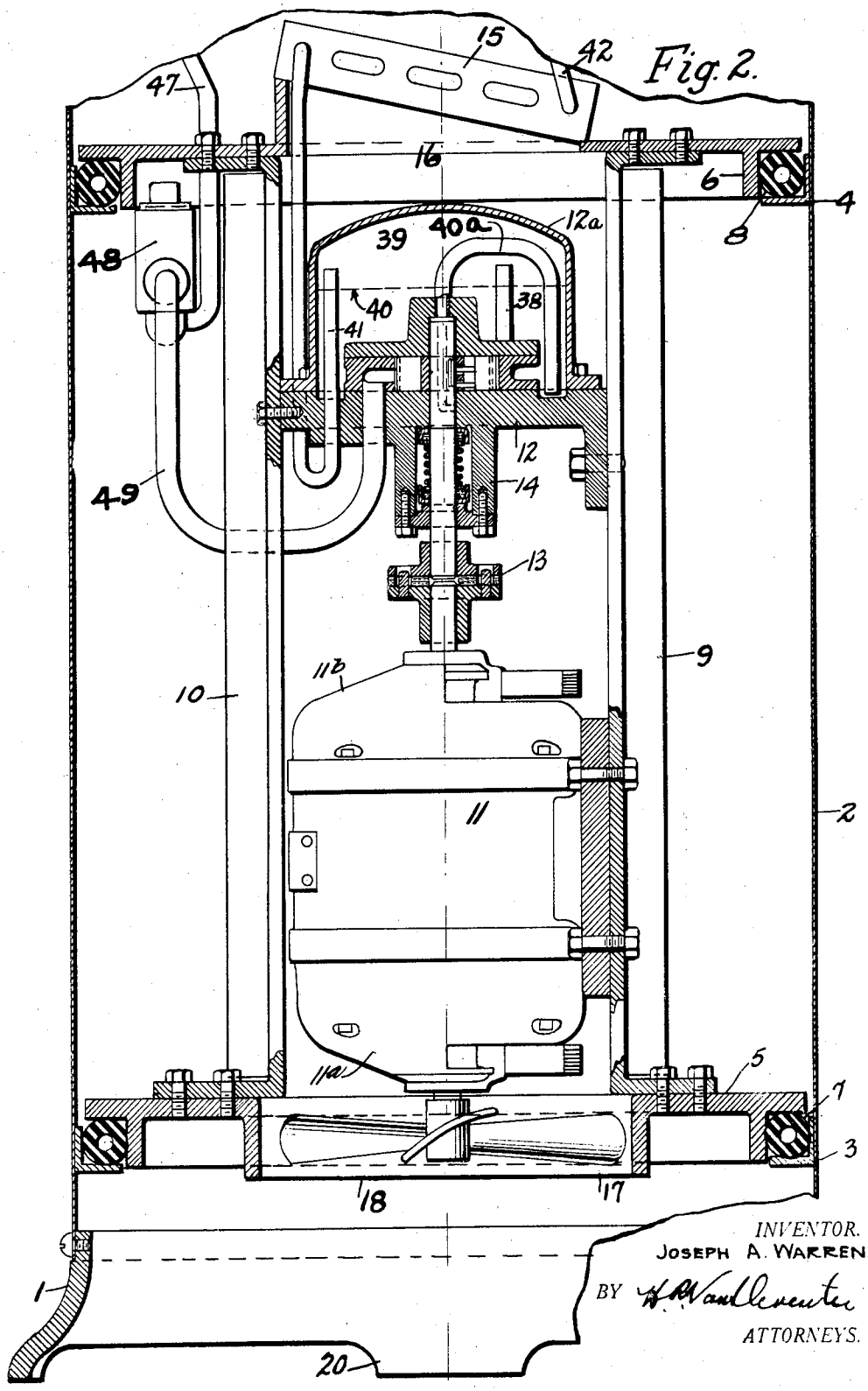
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Fig. 2.



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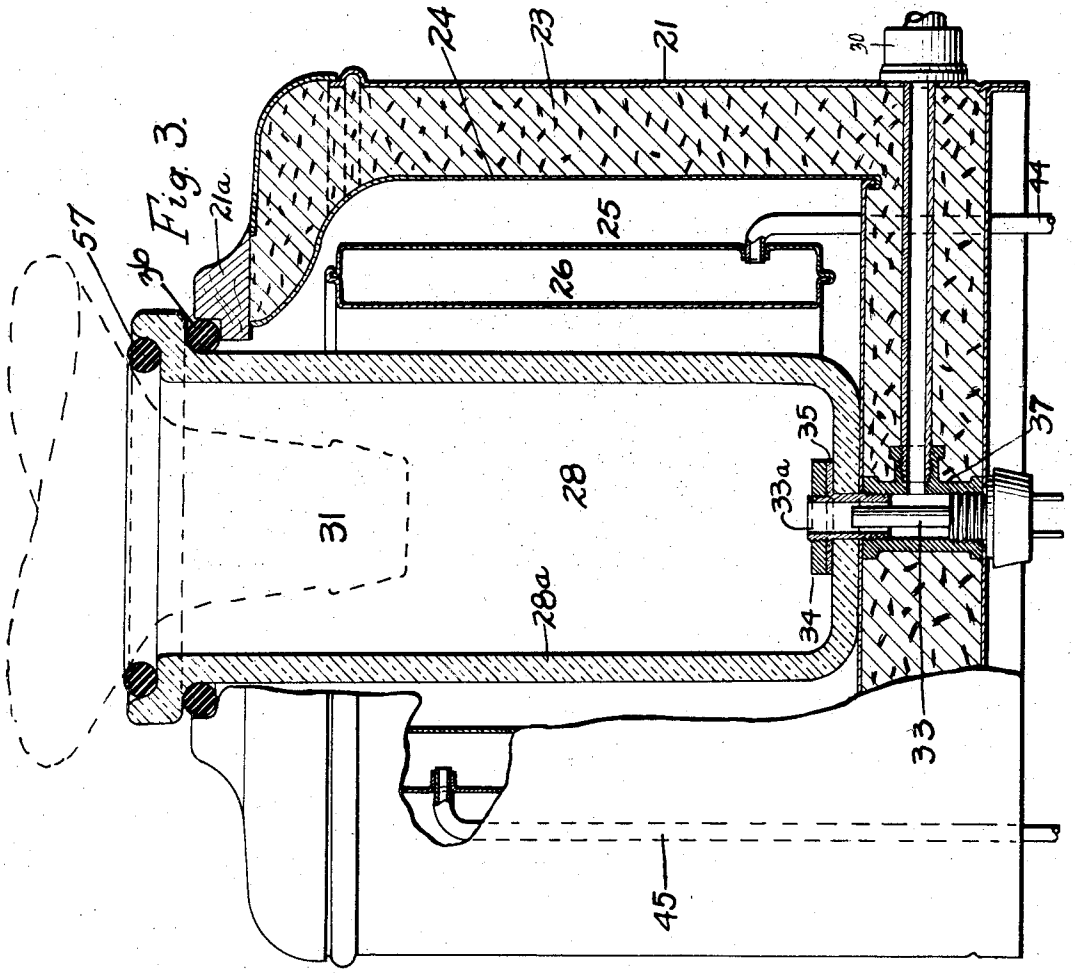


Fig. 3.

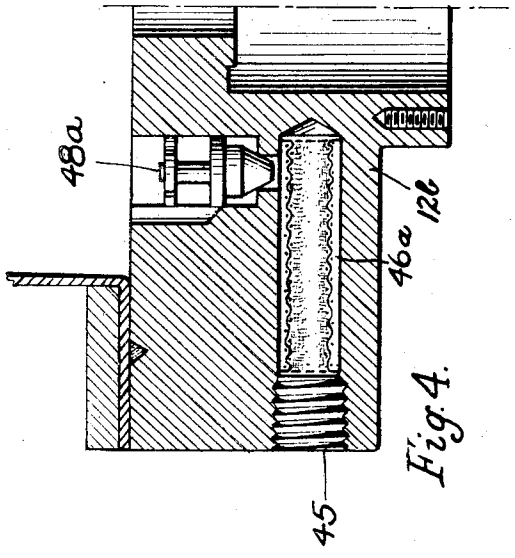


Fig. 4.

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WATER COOLER

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11 Claims. (Cl. 62—115)

This invention relates to refrigerating apparatus and particularly to such apparatus in portable form for cooling water or other liquids, and has for its object the provision of a simple and cheap form of cooler wherein the mechanism is easily accessible.

Another object is to provide an operating mechanism for refrigerating apparatus wherein the compressor, commonly called the pump, and the motor are direct connected and many of the parts heretofore mounted separately are assembled together to form a unit easily removable as a whole from the casing enclosing them.

Other objects of the invention will be apparent from the following description of one form of the device taken in connection with the accompanying drawings.

Figure 1 is a view partly in section of the "low side".

Figure 2 is a view partly in section of the "high side".

Figures 1 and 2 taken together present a view partly in section of a complete cooler embodying this invention.

Figure 3 is a view partly in section through an alternate construction of the liquid container and evaporator, the "low side" of Figure 1.

Figure 4 is an enlarged detail of the end plate of a pump showing a novel method of mounting the strainer and check valve of a refrigerating system.

In the drawings, the numeral 1 indicates a base to which is secured to sheet metal casing 2, having an opening or door (not shown) permitting access to its interior and of such size as to allow the removal of the entire machine unit hereinafter described.

Secured to the casing 2 are the supports 3 and 4 of angle iron or the like. These need not extend completely around the inside of the casing, but may be cut away in part to allow the plates 5 and 6 supporting the machine unit to pass upwards or downwards by axially turning the same, the edges of these plates or supports being cut away or "castelled" to pass the outwardly extending portions of supports 3 and 4. Between these supports is placed the rubber or other resilient members 7 and 8, whereby vibrations of the machine unit are kept from passing to the casing 2.

Connecting the supports 5 and 6 are the vertical members 9 and 10 secured to the supports in any suitable manner and upon these members the electric motor or other suitable source of power 11, and the compressor or pump, (the complete assembly of which is indicated by the numeral 12) are mounted. The pump shown is of the rotary vane type, but any suitable type of pump may be used. If an electric motor is used it may be of any suitable construction such as the type shown in Fig. 2 having the usual end plates 11*a*, 11*b*. Such motors are ordinarily sold complete ready for operation and may be bolted or otherwise attached to the upright 9, as shown in Figure 2, and may be removed and replaced on the said upright without disassembling the end plates of the motor.

The shafts of the pump and motor are axially aligned and connected by any suitable means such as the usual flexible coupling 13, the shaft of the pump passing through a suitable gland or stuffing box 14 whereby the liquid or gaseous contents of the pump are prevented from finding egress.

A suitable condenser 15 is positioned above the opening 16 in support or plate 6 and mounted thereon. The plate 6 closes off the upper portion of casing 2 from the lower portion except for the opening 16.

The support or plate 5 like 6 forms a partition in the casing 2, and is apertured at 17 and the fan 18 is positioned therein, this fan being operated by the motor 11 or a separate fan motor may be employed.

When in operation this fan draws air through the apertures 19 in casing 2 downward across or through plate 6 (which acts as a partition separating the spaces above and below it) over the condenser 15, the pump casing 12*a*, over motor 11, and finally ejecting the air through the partition 5 via opening 17, to the base, where it flows from underneath the machine which is raised from the floor by means of feet 20, as shown.

The foregoing arrangement insures (while the machine is in operation) a constant flow of air over the surface of the condenser 15 which is the part to be cooled first to insure the highest efficiency and further insures that the cooling blast of air will pass over the pump and motor, a forced draft being secured over all parts as distinguished from a mere churning or stirring up of the air within the casing 2. Further the necessity of employing a separate motor for the fan as is done when the fan is differently positioned, is obviated.

The foregoing parts are commonly termed the "high side" and constitute a unit assembly which may include check and expansion valves hereinafter referred to.

Mounted upon the top of casing 2 is the "low side" comprising the liquid container, evaporator

and thermostat. These parts are mounted upon a casing 21 secured to casing 2 by screws, one of which is shown at 22 or in any other suitable manner. Within 21 is the insulating lining 23 such as cork or the like. On the inside of this lining is the wall 24.

Within the chamber 25 formed by the wall 24 is the evaporator 26 through which the cooling is accomplished. Chamber 25 is filled through opening 27 with any suitable liquid or brine mixture to surround the evaporator and absorb heat from the liquid container 28 immersed therein.

A coil of pipe 29 may be interposed between container 28 and the usual faucet outlet 30 and as this coil is immersed in the brine additional cooling surface is secured.

The usual inverted bottle 31 may be placed in the top of 28 as shown so that the contents thereof will replenish the liquid in 28 as fast as drawn off. As this arrangement is old it is not described in detail.

The thermostat well 32 may project into a cavity in the chamber 28 and the thermostat 33 may be positioned therein, the space in 32 being filled with oil or the like to afford good conduction so that the thermostat will operate quickly in accordance with the temperature of 28.

The continuity between the outside metal casing 21 and inner wall 24 is broken at 21*a* by means of an insulating strip of any suitable character. This prevents heat by conduction from the casing 21 entering into the interior of the device, via 24.

In Figure 3 is shown a modification of the "low side" shown in Figure 2. Here the liquid container 28*a* is preferably of porcelain or steel enameled, removably positioned within the chamber 25. This is accomplished by bringing pipe 33*a* up through the bottom of the container 28*a* as shown, and securing the container thereto by means of nut 34 provided with the rubber gasket 35. The top of 28*a* is supported by the rubber gasket 36 which prevents conduction from the casing 21. The method of removing 28*a* from the assembly for cleaning or replacement is obvious.

Figure 3 also shows a method of mounting the thermostat (which may be of any suitable type) so it will respond directly to the temperature of the liquid in 28*a*. This is accomplished by providing the T 37 in which the thermostat 33 is mounted as shown. This T also connects with spigot 30. By this arrangement the thermostat is always directly in contact with the liquid to be cooled and will therefore accurately control the temperature thereof by controlling the operation of the motor in the usual manner.

Referring to Fig. 4, an arrangement is illustrated for effecting a considerable saving in manufacturing cost. In the machine of Fig. 1, reference has been made to the strainer 46 and check valve 48 as separate units. In Fig. 4 I have illustrated an end plate 12*b* of a pump having a longitudinally extending chamber in which is located the cylindrical strainer 46*a*, the chamber communicating with the return pipe 45 from the evaporator chamber 26. Communicating with the strainer chamber is a second or vertically disposed chamber in which is located the movable element 48*a* of a check valve. The strainer and check valve may be of any of the well known constructions for although housed in the end plate of the pump their respective functions are identical with the function of each now well known in the refrigeration art.

In operation any suitable refrigerant and refrigerating cycle may be employed.

The motor being connected in the usual manner in series with the thermostat and a source of power and the device being properly charged with a suitable refrigerant the pump 12 will discharge compressed refrigerant gas via pipe 38 into the chamber 39 which may be filled with lubricant to the line 40. The gas now passes via pipe 41 to condenser 15 where, owing to the cooling action of the air upon the condenser it liquefies, and then passes via pipe 42 to the expansion valve 43 of any suitable type. Here the liquid refrigerant begins to expand, it passes via pipe 44 (preferably covered) to the evaporator 26.

In the evaporator the refrigerant absorbs heat from the brine in 25, which in turn absorbs heat from the liquid to be cooled in 28; the refrigerant in 26 will continue to flow via pipe 45 through the usual strainer 46, via pipe 47 to the usual check valve 48, via pipe 49 to the suction side of the pump where it is recompressed and proceeds to continue its cycle of operations, as just described. This action continues until a certain temperature is reached which causes the thermostat 33 to open its contacts thereby stopping the motor.

When the "low side" warms up to the point where the thermostat closes its contacts, the motor will again operate and repeat the cycle just described.

Lubrication of the pump is accomplished by reason of the pressure existing in the upper part of 39 forcing the lubricant through 40*a* into the pump where it seals as well as lubricates the same. Because of the vertical arrangement of the parts the stuffing box 14 is below the body of lubricant at 40 and is sealed at all times. The motor bearings may be lubricated in any suitable manner.

Modifications may be made in the arrangement and location of parts within the spirit and scope of my invention and such modifications are intended to be covered by the appended claims.

I claim:

1. A refrigerating apparatus comprising a base adapted to support the following parts, a casing secured to said base and forming the outer casing for the apparatus, a supporting framework removably mounted within said outer casing and supported therein at its upper and lower ends and adapted to be removed therefrom as a unit, refrigerating mechanism wholly supported by said framework and removable therewith including a condenser, an electric motor removably secured to said framework and removable therefrom as a unit, a fan driven by said motor to cause air to pass over said condenser, an evaporator within said casing, and a liquid container within said evaporator spaced apart therefrom and supported by said casing.

2. A refrigerating apparatus comprising a base adapted to support the following parts, a casing secured to said base and forming the outer casing for the apparatus, a supporting framework removably mounted within said outer casing and supported therein at its upper and lower ends and adapted to be removed therefrom as a unit, said framework including an apertured plate, refrigerating mechanism wholly supported by said framework and removable therewith including a condenser mounted upon said plate, an electric motor removably secured to said framework and removable therefrom as a unit, a fan driven by said motor to cause air to pass through said apertured plate and over said condenser, an evaporator within said casing, and a liquid container

within said evaporator spaced apart therefrom and supported by said casing.

3. In a refrigerating device having a casing, a "high side" mechanism and supporting frame therefor removable from said casing as a unit including a condenser, a pump, a motor having end plates independent of said frame whereby said motor is removable from said frame as a unit, a cooling fan driven by said motor, a "low side" mechanism supported within said casing including an evaporator and a liquid container, and means for connecting said "high" and "low" sides in operative relation.

4. In a refrigerating apparatus having a base and a casing supported thereby, a framework having a base and a top plate and vertical supports therebetween forming a unit structure adapted to be mounted within said casing, means for circulating refrigerant carried by said unit structure, resilient means between said unit structure and said casing to prevent vibrations from said circulating means being transmitted to the latter, and an evaporator in said casing in fluid connection with said circulating means.

5. In a refrigerating apparatus having an outer casing and a base supporting the same, a support within the casing comprising a plate having an opening therein, members secured to said plate and removable therewith from said outer casing as a unit, a pump and motor secured to said members, a condenser secured to said support and removable from said apparatus therewith, and a fan driven by said motor for causing air to circulate through the opening in said plate and over the condenser.

6. In a refrigerating apparatus, a cylindrical tank forming an evaporator, and a liquid container removably mounted within the central space of the evaporator having a draw-off connection extending therefrom so as to pass radially through the plane of the wall of said evaporator without extending through the wall of the evaporator.

7. In a refrigerating apparatus, a casing forming a chamber, an evaporator adapted to hold a liquid refrigerant positioned within said chamber and spaced apart from the inner walls thereof, and a liquid container removably positioned within said evaporator, and adapted to form a closure for the chamber in said casing.

8. In a refrigerating apparatus, a casing forming a chamber, an evaporator adapted to contain a liquid refrigerant within said chamber and spaced apart from the inner walls thereof, a liquid within said chamber adapted to be cooled by said evaporator and surrounding the same, and a liquid container forming a closure for the chamber in said casing immersed in said liquid and spaced apart from said evaporator and the inner walls of said chamber and in heat transfer relation to said evaporator through said liquid.

9. A refrigerating apparatus as claimed in claim 8, in which the liquid container is made of vitreous material removably positioned within said casing and supported thereby.

10. In a refrigerating apparatus, a casing forming a chamber, an evaporator adapted to hold a liquid refrigerant positioned within said chamber and spaced apart from the inner walls thereof, a liquid container positioned within said evaporator, a pipe connected to said container and having coils within said chamber, and a draw-off connection to said pipe extending through said casing.

11. In a refrigerating apparatus a casing forming a chamber having inner walls, an evaporator within said chamber spaced apart from the inner walls thereof, a liquid container within the evaporator and spaced apart therefrom, a pipe communicating with the bottom of said container and extending through said casing, and means cooperating with said container and pipe whereby the container is readily removable from said evaporator and casing substantially as described.

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