

Oct. 27, 1931.

J. G. KING

1,829,408

REFRIGERATING APPARATUS

Filed Jan. 30, 1928

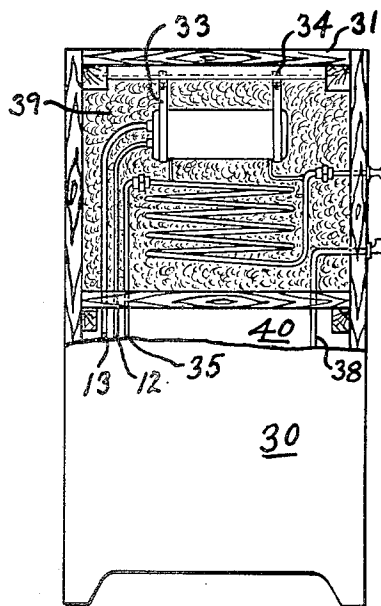


Fig. 1

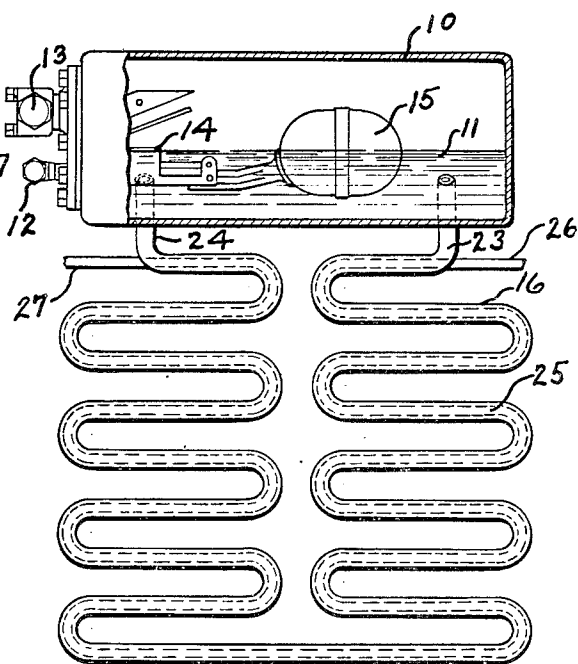


Fig. 3

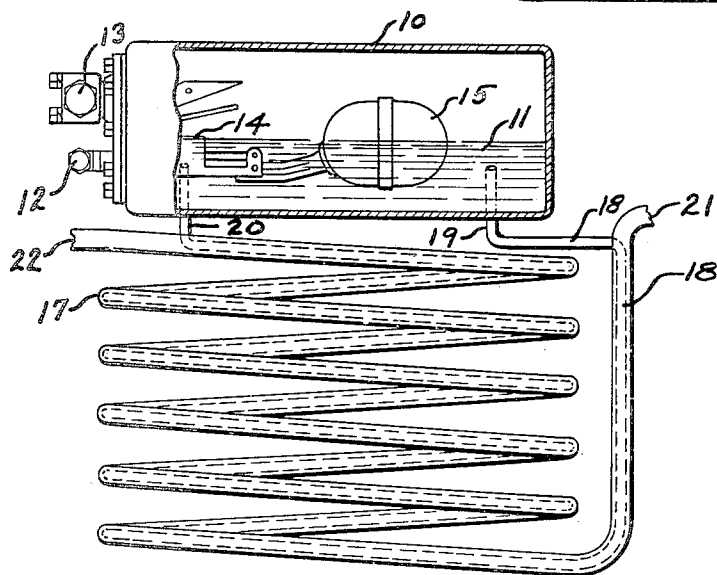


Fig. 2

Inventor

Jesse L. King

By Spencer, Hardman & Fehr

Attorney

UNITED STATES PATENT OFFICE

JESSE G. KING, OF DAYTON, OHIO, ASSIGNOR TO FRIGIDAIRE CORPORATION, OF DAYTON, OHIO, A CORPORATION OF DELAWARE

REFRIGERATING APPARATUS

Application filed January 30, 1928. Serial No. 250,406.

The present invention relates to improvements in refrigerating apparatus and more particularly to devices adapted for rapidly cooling drinking water or other liquids.

It is an object of the invention to provide a refrigerating apparatus by means of which a relatively continuous supply of cold water may be secured without requiring large capacity storage containers.

It is another object of the invention to arrange the water and refrigerant circulating elements of the device so that in case of accidental freezing of the water and breaking of the water-carrying pipes the refrigerating circuit will not be deranged.

With these and further objects in view the invention contemplates providing a refrigerating device in which a series of concentric pipes are used for circulating the water and refrigerant and which are connected to a refrigerant circulating system and a source of water supply in such a manner as to provide a compact structure and efficient and rapid heat exchange between the refrigerant and the liquid to be cooled.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 illustrates the improved refrigerating device mounted for use in a cabinet of the water cooler type;

Fig. 2 is a cross-section through the improved refrigerating element of the invention and its associated coils, showing a preferred embodiment of the invention, and

Fig. 3 is a similar view of a variation of the refrigerating element.

Referring in detail to the drawings, the refrigerating element comprises a heat exchange device in which a refrigerating medium such as sulphur dioxide is caused to expand producing a reduction of temperature in the well-known manner. In the preferred embodiment of the invention as illustrated an evaporator of the flooded system with its associated coil of pipe constitutes the

heat exchange device, although it will be understood that any suitable refrigerating system may be used in carrying out the invention and that an expansion valve or an absorption system may likewise be used. When the evaporator or flooded type of device is used the refrigerating element consists as shown in the drawings, of a container or tank 10 containing a suitable refrigerant such as liquid sulphur dioxide indicated by 11 which is supplied to the tank by means of pipe 12 and which in a gaseous state is withdrawn from the tank by means of pipe 13 connected with a compressor unit not shown. The level of the liquid within the tank 10 is kept constant by means of a valve 14 controlled by a float 15.

Suspended from the tank 10, which may also be termed a header, and preferably below said tank, is a pipe system comprising a coil 17 in the case of the structure shown in Fig. 2 and bent loops 16 arranged in a to-and-fro manner in two sets as shown in Fig. 3.

Disposed within and concentric or telescoping with the coil 17 in the case of Fig. 2 is another coil 18 shown by the dotted lines. This coil is connected to the header by means of pipe sections 19, 20 and serves to hold refrigerating medium. The coil 17 which telescopes or surrounds the pipe 18 serves for the circulation of water, the inlet and outlet of which are indicated by 21, 22.

In the modification shown in Fig. 3 the pipe 16 is connected to the header by means of branches 23, 24 and serves to contain refrigerant, while a pipe 25 concentric or telescoping with pipe 16 and located inside thereof as shown by the dotted line is used for conveying water, its extremities 26, 27 representing the water inlet and outlet points.

It will be observed therefore that the refrigerating element comprises coils of concentric pipes, one of which conducts a refrigerant and the other of which conveys water. The water in either case gives up its heat to the refrigerating medium which boils off in its own tube and returns to the header as a gas which bubbles up through the body of liquid in the header. It is withdrawn from the header through pipe 13 and subsequently

condensed and returned as a liquid through pipe 12.

It is obvious that in Fig. 2 the water-carrying pipe 17 is exterior with respect to the refrigerant pipe 18. This modification is preferable for cases where the temperature of the water is to be reduced to a substantially low degree and where there is a possibility of the water congealing and possibly rupturing the water-carrying pipe. In such a case it is desirable to prevent damage to the refrigerant carrying pipe and consequent entry of water into the refrigerant circulating circuit.

By placing the water pipe exteriorly to the refrigerant-carrying pipe such danger is obviated since if the water congeals it will tend to burst outwardly and while the resulting leakage of water may be annoying the break will cause less damage than if the water should find its way into the refrigerant pumping circuit, which might occur if the refrigerant-carrying pipe was ruptured.

In cases where such danger of congealing does not exist, such as in installations where the water is merely cooled to a predetermined degree, it may be advantageous to use the structure shown in Fig. 3 wherein the refrigerant circulating coil is disposed exteriorly with respect to the water-carrying pipe.

Referring to Fig. 1 the water cooling apparatus of the invention is shown mounted in a cabinet of the water cooler type. The cooler comprises a cabinet 30 having walls 31 enclosing a chamber in which the refrigerating element is mounted. The element may be supported within the cabinet as by means of straps or hangers 33 passing around the body of the header 10 and fastened to a portion of the body of the cabinet by means of bolts 34. The header is connected with the refrigerant-pumping circuit or unit by means of the supply and withdrawal pipes 12, 13 above referred to. Water may be supplied to the cooling coil through pipe 35 and may be withdrawn from a faucet 36 or the like, a glass holder 37 and drain pipe 38 being provided if desired, or else a fountain mouthpiece of the bubbling variety.

The interior of the compartment 39 is filled with a heat insulating material such as kapok or the like. The compressor unit which is used to circulate the refrigerating medium may be disposed in the machine compartment 40 of the cabinet.

By means of the device illustrated and described, it is possible to secure a relatively continuous supply of cooled water without the use of storage containers. By the structure of concentric pipes shown, a rapid heat exchange is effected between the refrigerant and the water to be cooled. In addition danger of damage to the refrigerating circuit is obviated by means of the pipe construction shown in which the congealing water

exerts its expansive force outwardly and thus prevents rupture of the refrigerant-carrying pipe.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A liquid cooler comprising a refrigerant level maintaining header, a depending pipe system associated therewith including a plurality of pipes, one telescoping with the other, one of said pipes being connected to said header at both ends to maintain refrigerant liquid circulating within said pipe and the other of said pipes being adapted to circulate the liquid to be cooled within said pipe, the liquid in one of said pipes being in contact with the other pipe.

2. A liquid cooler comprising a refrigerant level maintaining header and a depending coil of pipe associated therewith at both ends in refrigerant circulating relation, and a coil exterior thereto and telescoping therewith and adapted to circulate the liquid to be cooled in contact with said refrigerant circulating coil.

3. A liquid cooler comprising a refrigerant container and means for supplying said container with a constant quantity of liquid refrigerant, a helical coil depending from said container and connected in refrigerant circulating relation therewith at both ends and a coil exterior thereto and telescoping therewith and adapted to circulate the liquid to be cooled in contact with said refrigerant circulating coil.

4. A liquid cooler comprising a container for holding a refrigerating medium, means for maintaining a constant level of refrigerant in said container, a pipe system associated with said container and including a plurality of pipes, one telescoping with the other, one of said pipes being connected to said container at a plurality of points to maintain refrigerant liquid circulating within said pipe and the other of said pipes being adapted to circulate the liquid to be cooled within said pipe, the liquid in one of said pipes being in contact with the other pipe.

In testimony whereof I hereto affix my signature.

TESSE G. KING.