May 3, 1932. L. BUEHLER, JR., ET AL 1,857,078

REFRIGERATING SYSTEM

Filed Jan. 6, 1930

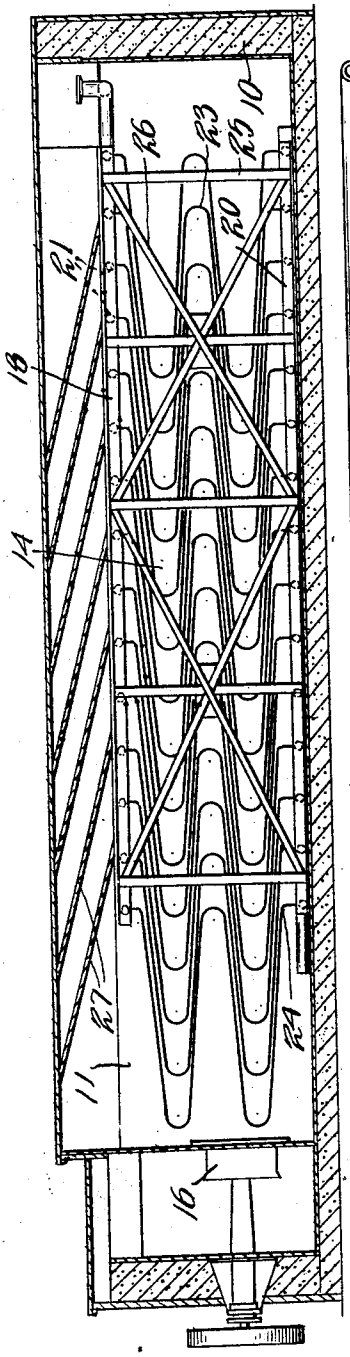

Fig. 1.

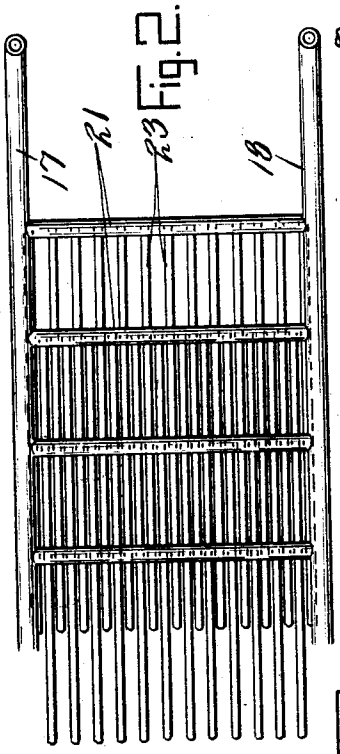

Fig. 2.

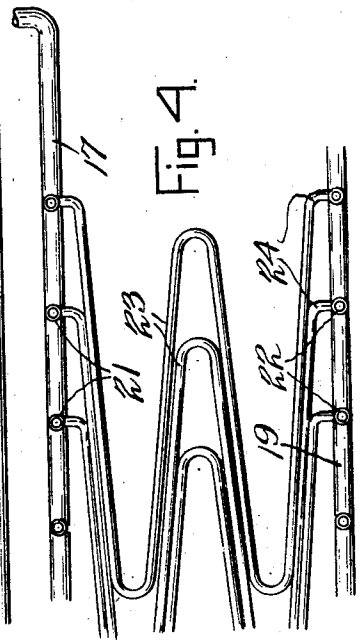

Fig. 4.

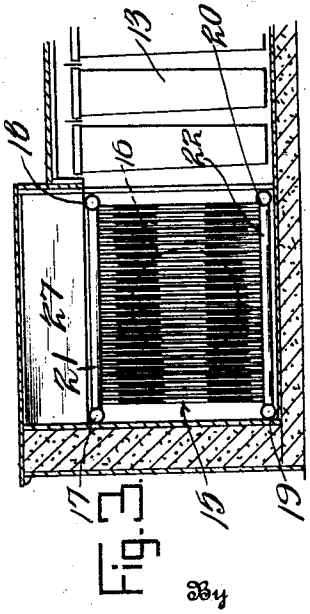

Fig. 3.

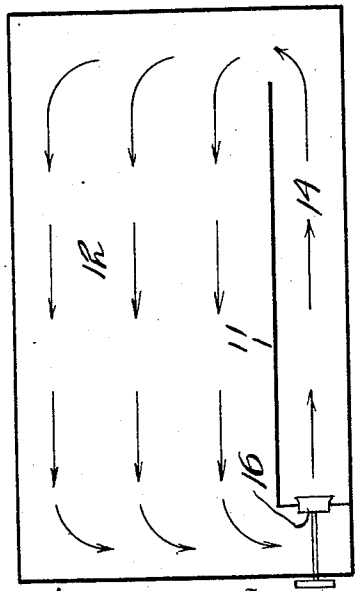

Fig. 5.

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1,857,078

UNITED STATES PATENT OFFICE

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REFRIGERATING SYSTEM

Application filed January 6, 1930. Serial No. 418,932.

This invention relates to the art of refrigeration and is concerned primarily with the cooling of a fluid by circulating it over a refrigerant evaporator.

Among the objects of the invention is to provide a new and improved type of evaporating unit which will contribute to a more free circulation of the refrigerating fluid such as carbon dioxide, ammonia, sulphur dioxide, etc., and in which the relative proportions of length, transverse area, and surface of the refrigerant paths are such as to permit contact of liquid refrigerant with the greater portion of the evaporating surface without carrying liquid refrigerant in objectionable amounts out of the evaporator.

Another object of the invention is to provide a suitable channel hereinafter called race to permit rapid circulation of the fluid to be cooled over the evaporating unit.

Referring to the accompanying drawings, which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a vertical section through the evaporating unit and race,

Figure 2 is a plan view showing a portion of the evaporating coils,

Figure 3 is an end view of the evaporating unit and race as applied to an ice making tank and shows a portion of the chamber in which the ice cans are mounted,

Figure 4 is an enlarged detail showing the nesting of evaporating coils, and

Figure 5 is a diagrammatic plan view of the race in a tank for cooling liquid such as brine in an ice making tank, water, oil, etc.

In the drawings, numeral 10 indicates a tank having a partition 11 running either lengthwise as shown in Figure 5 or crosswise to provide a chamber 12 in which ice cans 13 may be placed or which may act as a liquid storage space and a race 14 in which an evaporating unit 15 may be placed. A pump 16 of any suitable construction may be provided for circulating liquid through the race 14 to bring it into contact with the evaporator 15 and to circulate it through the brine chamber 12. Instead of one partition 11 together with tank side 10 forming the sides of the race, two partitions 11 may be run through the middle of the tank to form the race.

The evaporator unit 15 will now be described. This consists of a pair of upper headers 17 and 18 and lower headers 19 and 20, the latter being connected with a source of liquid refrigerant in a receiver not shown and the upper headers being connected to the suction side of the refrigerant compressing and cooling system. The upper headers are connected by transverse pipes 21 and the lower headers by similar transverse pipes 22. Bowed tubes 23 are connected to the upper and lower transverse pipes 21 and 22 and these tubes are bent so as to nest one within the other, being here shown as bent into W-shaped pipes. These pipes may and preferably are bent near their ends as shown at 24 as they enter the transverse pipes 21 and 22. The purpose of this is to simplify the problem of securing these tubes to the transverse pipes. As shown in Figures 2 and 4 the tubes 22 are staggered thus entering alternate transverse pipes so as to provide sufficient space between adjacent tubes 23 to permit attaching to transverse pipes 21 and 22 and still get very close nesting of tubes in the unit. If the desired spacing of tubes in the unit is wider, the tubes need not be staggered.

The headers 17, 18, 19 and 20 may be supported by a suitable frame work constituting supports 25 and braces 26 arranged in any convenient form and of sufficient strength to support tubes of the necessary size. The coil unit 15 therefore may be readily removed from the brine tank and replaced by additional coil units or be removed to repair or replace a single tube from the coils which for any reason may become damaged.

Secured to the top of the race 14 are baffle plates 27 which extend from the top of the evaporator unit 15 towards the top of the race and whose function is to maintain relatively still liquid in the race above the evaporator unit 15 with a relatively rapid flow of liquid past the evaporator 15. The tendency of the agitator 16, of course, is to have a rather high liquid level at the inlet end of the race 14 with a lower level at the outlet end. In order that the evaporator unit 15 be covered with

liquid at the race outlet, the level must be above the evaporator unit at the inlet and the flow above the evaporator unit must be retarded to have fairly uniform flow past the evaporator unit. The baffle plates 27 are preferably sloped downward towards the race outlet as shown as this tends to assist the flow of liquid pulling the liquid out from between the baffles and reduces the difference in level between race inlet and outlet. The relative sizes of the race 14 and tank 12 should be noted. It is desired to circulate the liquid through the race 14 at a much greater rate than that with which it travels through the tank. The relative speeds with which the liquid may pass through the race 14 and chamber 12 may be determined by their relative sizes. While we have shown a single race and a single agitator, we may find it desirable to place a number of races and agitators in various locations in the tank.

While in the above description we have dealt with liquids, any other fluids such as gases or finely divided solids which will flow may be cooled with the evaporating unit described. It is obvious that for gases, the race would be replaced by a gas tight enclosing duct. While with liquids, the flow imposing means would be pumps, propellers, paddles, etc.; fans, blowers or compressors would be used for gases; and conveyors or screws for the solids.

It is obvious that by omitting the race and placing the evaporating unit near the top of the fluid space, circulation of the fluid may be accomplished by natural means without the use of mechanical pumps, etc.

It will be obvious to those skilled in the art that various changes may be made in our device without departing from the spirit of the invention and therefore we do not limit ourselves to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

Having thus fully described our said invention, what we claim as new and desire to secure by Letters Patent, is:

1. An evaporator for a refrigerating system comprising a pair of upper headers having transverse headers connecting them, a pair of lower headers having transverse headers connecting them, a plurality of bowed tubes connected in spaced relation to the upper and lower transverse headers, the said bowed tubes being bent in the form of W's and having their ends slightly bent to enter the transverse headers, substantially as set forth.

2. A cooling system for liquids having a channel with an evaporating unit therein for cooling the liquids, baffles across the top of the channel extending from the top of the evaporating unit upwards, and means for circulating the liquid through the channel, substantially as set forth.

3. A cooling system for liquids having a channel with an evaporating unit therein for cooling the liquid, baffles across the top of the channel sloping upward from the evaporating unit toward the channel entrance, and means for circulating the liquid through the channel, substantially as set forth.

4. An evaporator for a refrigerating system comprising a plurality of upper and lower headers having a plurality of nested bowed tubes connecting them, means for directing a fluid to be cooled about said tubes, and a plurality of relatively short baffle plates positioned adjacent the tubes and oblique with respect to the headers and the normal direction of the fluid through the tubes for directing the said fluid into better heat exchange contact with the tubes, substantially as set forth.

In witness whereof, we have hereunto set our hands at Waynesboro, Pennsylvania this 23rd day of December, A. D. nineteen hundred and twenty-nine.

LEON BUEHLER, JR.
WILLIAM H. AUBREY.