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METHOD OF COOLING LIQUIDS

Original Filed June 30, 1927

FIG. 1

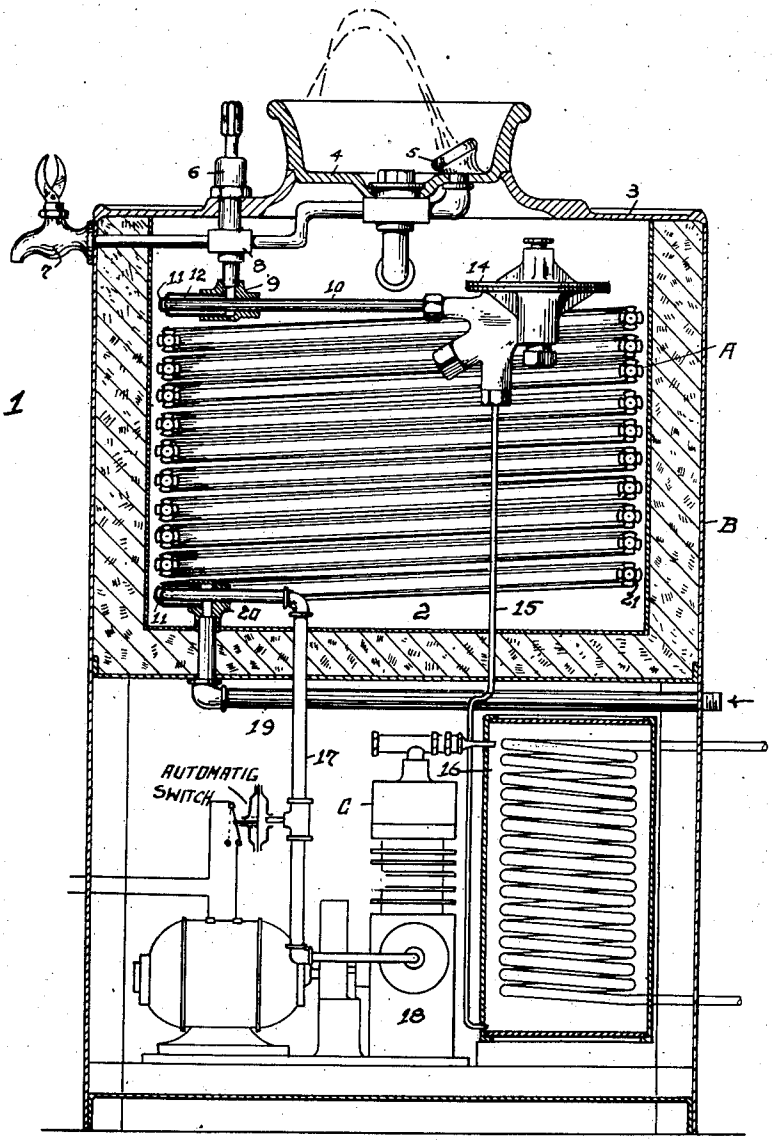
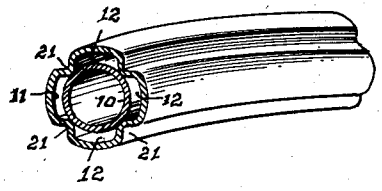


FIG. 2



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METHOD OF COOLING LIQUIDS

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Original application June 30, 1927, Serial No. 202,553. Divided and this application October 1, 1928. Serial No. 309,592

1 Claim. (Cl. 62—116)

The present invention relates to a new and improved method of cooling liquids, particularly liquids dispensed from taps, faucets or other fixtures and cooled to a desirable drinking temperature by automatic refrigerating means, apparatus, for example as exemplified in our copending application, Serial No. 202,553, issued on Oct. 30th, 1928 as Patent No. 1,689,461 of which this application is a division.

Thus, in the accompanying drawing, Fig. 1 is a sectional view of a drinking fountain and cooling apparatus with which the present method may be practiced, and Fig. 2 is a sectional view of a cooling pipe or tube used in that particular apparatus.

The water is delivered at a low temperature suitable for drinking purposes, and one of the objects of the present method is to cool the water in graduated degree to the desired low temperature by causing it to flow in a relatively long attenuated stream in heat exchange relation with a relatively long attenuated stream of refrigerant, preferably by counterflow. A further object is to effect water cooling in the way herein described whereby heavy irregular demands may be properly taken care of inexpensively by a small and compact refrigerating apparatus adapted to operate automatically. Another object is to produce water cooling as hereinafter set forth without endangering the apparatus itself or the persons drinking water dispensed by the apparatus should freezing of the water occur due to accidental malfunction of the automatic refrigerating apparatus.

As shown, the cooling appliance A is installed in a drinking fountain and water dispensing cabinet B, which cabinet may be of any desired construction or design. Suitable refrigerating appliances C are also contained in the base of this cabinet, the showing being in part diagrammatic. It should be understood, however, that the refrigerating appliance or operating unit C may be located outside of the cabinet, more or less remotely therefrom, as is the practice in some installations, and that the compressor thereof may be either air or water-cooled. In brief, appliance C may be of any known type or kind adapted to supply the water cooling appliance or coil A with a liquid or gaseous refrigerant, and preferably I use mechanism whereby refrigerating operations are controlled automatically, either by the pressure or temperature produced in the system.

The water cooling appliance A consists of a coil of double pipe of any desired length, the coil as a whole being of a diameter adapted to be confined within a compartment 2 in cabinet B beneath a top 3 carrying an overflow bowl 4 for a fountain head or nozzle 5. A valve 6 may be used to control the flow of water to nozzle 5, or this valve may be omitted when a continuous flow is desired. In the present instance, a faucet 7 is also connected to a discharge fitting 8 having pipe connection with the water discharge head 9 of cooling coil A, and which coil is composed of two sleeved pipes 10 and 11, respectively. The inner pipe 10 is of somewhat smaller diameter externally than the internal diameter of outer pipe 11 to provide a relatively narrow passage 12 through which a thin film or body of water or other liquid to be cooled may flow in constant contact with inner pipe 10. The refrigerant is caused to flow through the inner pipe in a direction counter to the flow of water through passage 12, and in the present instance the refrigerant intake end of pipe 10 passes through head 9 and connects with an expansion valve 14. A small pipe 15 conducts a liquid refrigerant from a condensing unit 16 to expansion valve 14, and the evaporating refrigerant passes from the expansion valve to inner pipe 10 and thence to the lower or outlet end 17 of this pipe where connected to the compressor 18 for return to the condensing unit 16. The water to be cooled is conducted by a pipe 19 to a hollow head 20 on the outlet end of inner pipe 10 and thence through the entrance to outer pipe 11 where connected to said head, the water flowing upwardly in a thin body through an annular space or passage 12 between the inner and outer pipes 10 and 11, respectively.

The life and operativeness of such a double coil is largely dependent upon the size of the water circulating space or passage 12. By making this space very narrow the water may be caused to flow in a thin film or layer over pipe 10 containing the refrigerant, so that the heat may be readily and quickly removed. The velocity of flow of the water is also increased, which is useful in breaking up high resistance at the surface of inner pipe 11 where the actual heat transfer takes place. Moreover, a narrow water passage or series of small passages will not permit an ice body of dangerous thickness to be produced should the thin body of water between the two pipes freeze solidly, and in practice it is desirable to limit the size, that is, the thickness, of the water passage between the pipes to such dimensions that the maximum expansion of any ice body formed in the passage will not expand

outer pipe 12 beyond its own elastic limit, that is, beyond the elastic limit of the metal wall of the pipe itself. In this way rupture of the outer pipe is prevented in case the thin sheet of water should freeze solidly due to accidental malfunction of the automatic refrigerating appliances C.

Outer pipe 11 is preferably fluted or corrugated to provide a series of spacing and contacting ribs 21, whereby the two pipes are spaced uniformly in respect to each other. These flutes or corrugations extend longitudinally of pipe 11 but may be spirally formed therein, and in addition to serving as spacing elements they also serve other useful purposes, that is, they provide yielding or flexible places in the circular wall to permit the pipe to expand without rupture should ice form and expand within passage 12, and they also extend the heat exchange area of the inner pipe at numerous radial places thereof and divide the annular space between the two pipes into separate passages through which separate small streams of water may circulate with advantageous cooling results.

What we claim is:

A method of cooling a liquid under draft, consisting in forming a tubular stream of liquid and subdividing said tubular stream into separate individual streams and co-incidently passing a refrigerating fluid centrally through said tubular stream and in establishing heat exchange relations with each stream intermediate the respective streams of liquid.

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