Sept. 19, 1950 W. J. HOFFMANN 2,522,948

LIQUID COOLING AND STORAGE APPARATUS

Filed July 29, 1948

Fig. 1

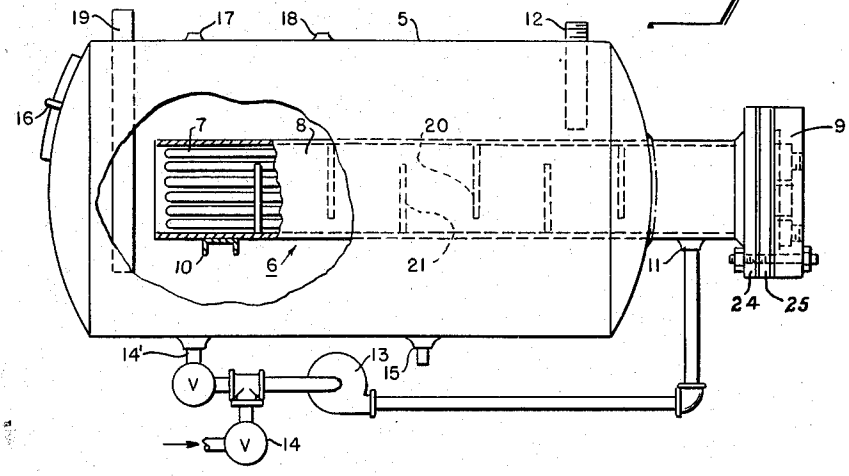


Fig. 2

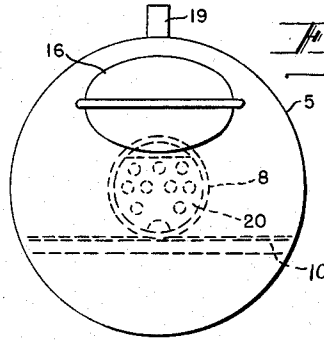
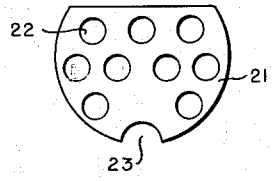


Fig. 3



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LIQUID COOLING AND STORAGE APPARATUS

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3 Claims. (Cl. 62—141)

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My invention relates to apparatus for cooling water or other liquids and storing the cooled liquid for use when desired.

In apparatus for this purpose currently in use failure of the circulating pump frequently results in freezing the liquid and consequent rupture of the storage tank or cooler.

It is my purpose to provide a simple and efficient form of apparatus free from danger of congealing and rupturing the tank or container and associated parts.

I accordingly provide a storage container for the liquid having suitable connections for circulation and control of the liquid and having a special cooling unit mounted in the container through which the water supply passes into the container. The details will be found illustrated in the accompanying drawings and described in the following specification.

Fig. 1 is a side view and partial section of apparatus embodying one form of my invention.

Fig. 2 is an end view of the same apparatus showing interior parts of the container dotted.

Fig. 3 is a detail view of an interior baffle plate.

The reservoir, tank or container 5 may be of any suitable type and has a cooling unit 6 mounted in one end. This cooling unit has tubes or coils 7 through which a suitable refrigerant is circulated and these coils or tubes are surrounded by a shell 8 through which the liquid to be cooled circulates. The shell extends partly inside and partly outside the tank and the external portion terminates in a flange 24 to which the tube sheet 25 and header 9 are bolted, thus providing a suitable connection with a source of supply of refrigerant. The inner end of the shell is open and suitably supported at 10 in the reservoir. Liquid is introduced at 11 into the shell 8 and withdrawn when needed at 12. The supply of liquid may be forced into the reservoir by a pump 13 which may draw the liquid from any source 14 and preferably is connected at 14' to the reservoir so that the liquid may be circulated from the reservoir at 14' to the reservoir at 11 when liquid is not being discharged through the outlet 12.

The reservoir may have a drain at 15, a manhole 16, a vent 17 and a thermostatic device 18 for regulating the liquid circulation and a galvanic anode 19 for protecting the reservoir and parts in case of the use of dissimilar metals.

Inside the shell 8, I provide baffle plates 20 and 21 in the upper and lower parts of the shell which compel better circulation of the liquid. These plates may have passages 22 for the cooling tubes and semi-circular notches 23 for circulation of the liquid.

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The pump 13 circulates water or other fluid to be cooled through shell 8, at high velocity to increase the coefficient of heat transfer and improve rate of cooling and to continue the flow of this coolant to a point distant from tank 5 where the coolant may be utilized for any desired purpose.

The pump 13 operates continuously while refrigeration is applied in coils 7 or while cooling is required from the coolant at a distant point.

The liquid to be cooled is pumped through the space between the refrigerant pipes, tubes or coils and into and through the reservoir. The open ended shell, perforated baffles and surrounding warmer liquid in the storage tank permit convection currents to move the liquid and prevent freezing. The perforated lower baffles with passages at the lowest point permit convection currents to circulate while cooling surfaces contain refrigerant below liquid temperature or are coated with ice.

By this arrangement liquid can be cooled and stored for continuous or intermittent use without danger of congealing and rupturing the tank 5 or shell 8 and the design is such that a high heat transfer coefficient results which is desirable for commercial use.

I claim:

1. Liquid cooling and storage apparatus comprising an elongated closed liquid tank having a main outlet and an auxiliary outlet, an elongated tubular shell inside said tank and having a portion extending outwardly of the tank with an inlet to said tank, tubes for a refrigerant supported in said shell and having means of connection to a supply of refrigerant, a pipe line outside the tank connecting the inlet for the tank and said auxiliary outlet, a liquid supply pipe connected to said pipe line between said inlet and said auxiliary outlet and a pump interposed in said pipe line between said latter connection and said inlet whereby the liquid in the tank may be circulated through the tank, shell and external pipe line when the liquid is not being discharged through said main outlet.

2. Liquid cooling and storage apparatus comprising an elongated closed liquid tank having an outlet, an elongated tubular shell in said tank and having a portion extending externally of the tank, said external portion having an opening forming an inlet for the tank, spaced discs constituting baffle plates supported by said shell and extending alternately upwardly and downwardly partially across the interior thereof in the path of movement of the liquid to be cooled, each disc having a number of spaced openings and a notch

in its periphery forming a passage, tubes extending through the openings in said discs lengthwise of the shell to receive a refrigerant for cooling the liquid to be cooled, and a pipe connected to said inlet for supplying the liquid to be cooled.

3. Liquid cooling and storage apparatus comprising a tank, a tubular shell supported by said tank and having a portion extending outside of said tank and a portion opening inside of said tank, tubes for circulation of a refrigerant within said shell, means supported by said shell for the connection of a supply of refrigerant to said tubes, a pump with connection to said shell for the circulation of liquid through said shell, around said tubes and into said tank, a main outlet for the discharge of cooled liquid from said tank and an auxiliary outlet from said tank

with connection to said pump for recirculation of liquid through said shell and tank when liquid is not being discharged through the main outlet.

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