

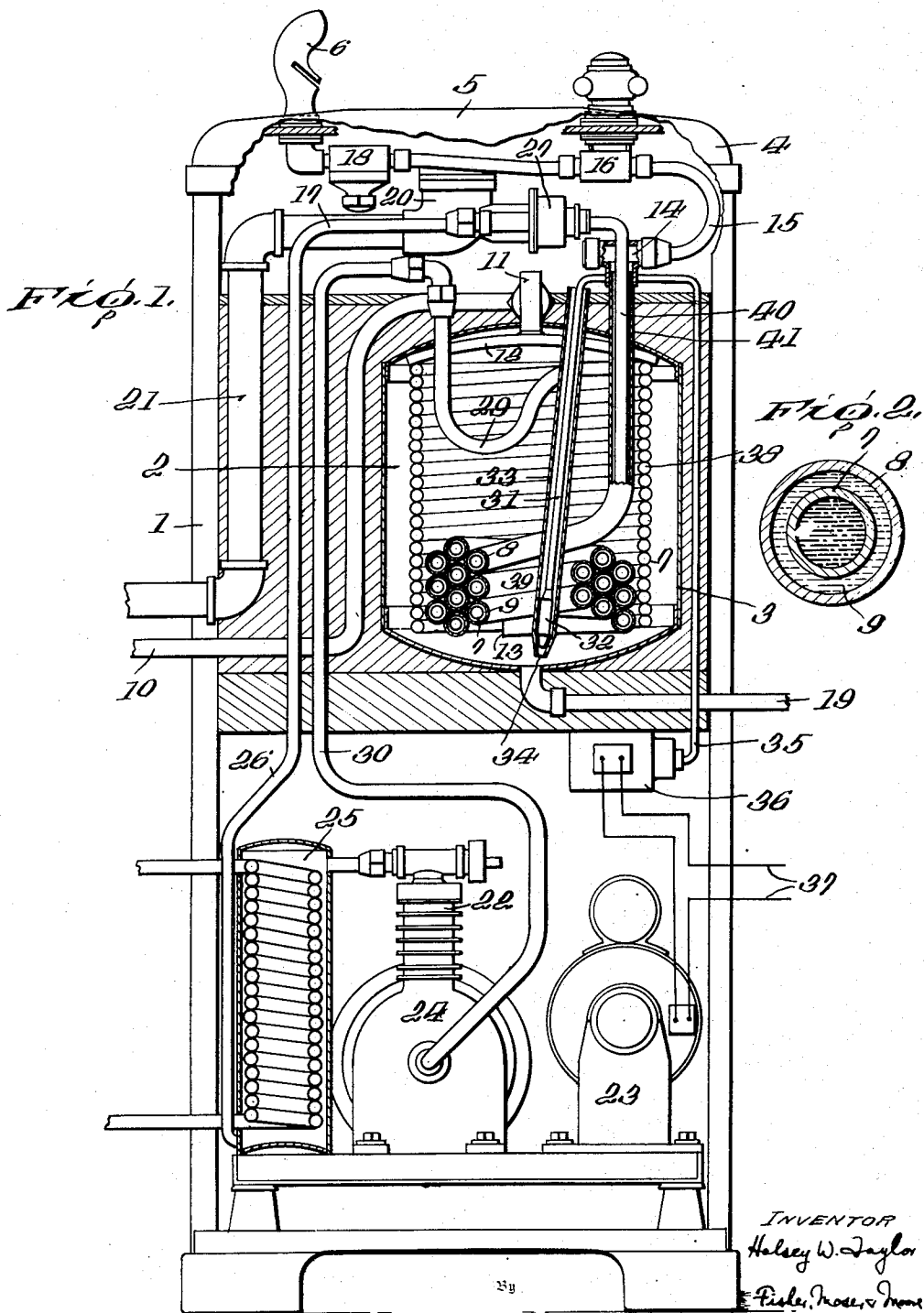
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FLUID COOLER

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FLUID COOLER

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8 Claims. (Cl. 62—141)

This invention relates to an apparatus for cooling liquids.

The principal object of the present invention is to provide an apparatus particularly adapted for cooling liquids in a pressure controlled drinking fountain, wherein the water circulating and refrigerant conduits are so arranged as to assure of the water being maintained at an average and uniform temperature.

Another object is the provision of a novel circulating system for water coolers having means for maintaining an average temperature of the outgoing water so as to avoid the constant and objectionable starting and stopping of the compressor and associated cooling mechanism.

A further object is to provide a water cooler having means for automatically controlling the refrigerating system so that a considerable supply of water may be consumed without raising the temperature of the reserve supply of water to the point where the motor or compressor switch will be actuated.

A still further object is the provision of a fluid cooling apparatus wherein the cooling coils are submerged in the fluid to be cooled and the water and refrigerant are circulated through the coils in opposing directions to assure of the maximum amount of heat exchange.

These and other objects and advantages of the invention will be apparent as the specification is considered with the accompanying drawing, wherein:

Figure 1 is a sectional elevation partly broken away and partly in section, of a drinking fountain and water dispensing cabinet embodying the present invention; and

Figure 2 is an enlarged sectional view through the refrigerating pipes.

Referring more particularly to the drawing, wherein similar reference numerals designate like parts throughout the several views, the numeral 1 designates generally a drinking fountain and water dispensing cabinet, of any desired construction or design, having a water cooling appliance 2 submerged in a suitably insulated tank 3, beneath a top 4 carrying an overflow bowl 5 for a fountain head or bubbler 6. A waste or drain fitting 20 in the bottom of the bowl 5 is connected to a wasteline 21 to pass off the overflow from the fountain.

The water cooling appliance 2 consists of a continuous coil 7, comprising a single tier 38 of outer superposed convolutions and a nested group 39 of inner convolutions encircled by the lower end of tier 38, which acts as the evap-

orator of the cooling system, all of the convolutions being submerged in water in the tank 3. A length of larger coil 8, larger in diameter than the external diameter of the coil 7, is sleeved over the innermost convolutions of the continuous coil 7 to provide a relatively narrow passage 9 through which a thin film or body of water or other liquid to be cooled may flow in constant contact with the inner coil 7. This length of double tubing constitutes a counterflow cooling coil. The water to be cooled is conducted by a pipe 10 into and through a connection 11 and spreader pipe 12 where the water is discharged into the upper end of the tank 3, adjacent the side wall thereof. The water drops down in the tank, on the outside of coil 7, and enters the open end 13 of the outer coil 8 and passes upwardly through the passage 9 and thence into a terminal fitting 14. From the fitting 14, the cooled water passes through a line 15 to a hand controlled valve 16 and thence to the fountain head or bubbler 6, after passing through connecting line 17 and automatic regulator 18. The outermost convolutions or tier 38 of continuous cooling coil 7 is preferably wound tightly and the coils are secured together by any suitable means, such as solder, to form a baffle-like protection for the counterflow or double coil portion from the warm water delivered by spreader 12. The water in the tank may be drained completely through a pipe 19, in the bottom of the tank, and this line is also adapted for use as an extra cold water outlet.

A suitable condensing unit 22 located in the base of the cabinet 1, beneath the tank 3, consists of a motor 23, compressor 24 and condenser 25. Liquid refrigerant from the condenser 25 flows upwardly through a line 26 to and through automatic expansion valve 27, above the tank 3, where it is converted to a liquid-vapor mixture, the temperature of which drops due to partial evaporation of the refrigerant. The mixture of liquid refrigerant and vapor, both having relatively low temperatures, enters into the upper end of an extension 40 leading upwardly from the nested inner convolutions 39 of cooling coil 7, to and through the fitting 14 and terminating in the expansion valve 27. An extension 41 leading upwardly from the convolutions of large coil 8 places these coils in communication with the fitting 14. The liquid vapor mixture in coil 7 cools the water in the surrounding passage 9 of the outer coil 8, because of the evaporation of the refrigerant which is

caused by the heat from the water in passage 9. Upon circling through the coil 7, the gas leaves the coil 7 and tank 3 by a pipe 29 which is connected to a suction line 30. The suction line 30 carries the gas back to the condensing unit 22 where it is compressed, condensed and converted to liquid so that the cycle may be repeated. It will be noted that, due to the position of the outermost convolutions of the coil 7 adjacent the side wall of the tank 3, this portion of coil 7 acts as dryer for the gas and also serves to pre-cool the incoming water from spreader 12.

The warm inlet water, entering at the top of the tank through spreader 12, drops down on the outside of and is cooled by refrigerant gas in the outermost section of the coil 7. The pre-cooled water reaches the bottom of tank 3 and enters the open end 13 of passage 9, between the inner and outer coils 7 and 8, at a point adjacent to the center of the tank and at the bottom thereof, the coldest section of the tank. Passing through the passage 9, the pre-cooled water is completely cooled by coming in contact with the evaporating gas from expansion valve 27. The greatest efficiency and maximum cooling of the outlet water is attained by separating the warm inlet water, coming out of the spreader 12, from the cooled outlet water flowing into the terminal fitting 14 on top of the tank.

The temperature in the system is automatically and uniformly maintained by means of a capillary tube 31 and bulb 32, located in a vertically disposed bulb well 33 in the tank 3, the open lower end 34 of the well terminating at a point adjacent and in the middle of the bottom of the tank, that is, the coldest section of the tank. The capillary tube 31 is connected by a line 35 to a temperature responsive switch 36, which in turn is connected to the motor 23 and power lines 37. It will thus be understood that when the temperature of the water in the tank falls below a predetermined degree, say 45°, the thermostatic bulb 32 serves to open the motor switch 36 and shut off the compressor 24, and when the temperature of the water rises above a predetermined degree, say 50°, the thermostatic bulb acts to close the switch 36 and actuates the compressor. As the thermostatic bulb 32 is located at the bottom of the tank, where the water is coldest, the bulb is not as sensitive to rising temperature change as would be the case if the same was positioned elsewhere. It is, therefore, possible to consume or draw off considerable water without raising the temperature of the water to the point where the motor switch will be actuated.

What I claim is:

1. An apparatus for cooling liquid comprising a chambered body having a drinking fountain at its top, and a cooling coil confined and submerged within said chambered body, a fluid coil sleeved over and encasing a portion of said cooling coil to provide a water circulating passage, said fluid coil having a water intake opening adjacent the bottom and substantially in the middle of said chambered body and a discharge connection at its upper end, and said cooling coil having intake and discharge connections for a refrigerating fluid.

2. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into said tank, a circular cooling coil having its convolutions confined and submerged within the liquid in said tank, a liquid coil sleeved over and encasing some

of the convolutions of said cooling coil to provide a water circulating passage, said liquid coil having an inlet opening adjacent the bottom and substantially in the middle of said tank and a discharge connection at its upper end, and said cooling coil having intake and discharge connections for a refrigerating fluid.

3. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into said tank, a circular cooling coil having a series of superposed convolutions and a series of nested convolutions, said superposed convolutions forming a housing for said nested convolutions, a liquid coil sleeved over and encasing said nested convolutions to provide a water circulating passage, inlet and outlet connections for said liquid coil, and said cooling coil having intake and discharge connections for a refrigerating fluid, said nested convolutions and said liquid coil being baffled from the warm inlet water by said superposed convolutions.

4. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into the top of said tank, a circular cooling coil having a series of superposed convolutions and a series of nested convolutions, said nested convolutions being positioned adjacent the bottom of said tank and being housed within the superposed convolutions, a liquid coil sleeved over and encasing said nested convolutions to provide a water circulating passage, inlet and outlet connections for said liquid coil, and said cooling coil having intake and discharge connections for a refrigerating fluid, said nested convolutions and said liquid coil being baffled from the warm inlet water in the upper end of the tank by said superposed convolutions.

5. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into the upper end of said tank adjacent the side wall thereof, a circular cooling coil having a series of superposed convolutions and a series of nested convolutions confined and submerged within the liquid in said tank, said nested convolutions being housed within the superposed convolutions, a liquid coil sleeved over and encasing some of the convolutions of the cooling coil to provide a circular water circulating passage, said liquid coil having an inlet opening adjacent the bottom and substantially in the middle of said tank and a discharge connection at its upper end, and said cooling coil having intake and discharge connections for a refrigerating fluid.

6. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into the upper end of said tank adjacent the side wall thereof, a circular cooling coil having a series of outer superposed convolutions and a nested group of inner convolutions confined and submerged within the liquid in said tank, said superposed convolutions forming an enclosure for said nested convolutions, intake and discharge connections in said cooling coil for circulating a refrigerating fluid through said coil and precooling the liquid flowing downwardly through the tank, a liquid coil sleeved over and encasing the nested group of inner convolutions of the cooling coil to provide a water circulating passage, said liquid coil having an inlet opening adjacent the bottom and substantially in the middle of said tank whereby said precooled liquid is further cooled by said cooling coil, and a discharge connection in the upper end of the tank for said liquid coil.

7. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into the upper end of said tank adjacent the side wall thereof, a circular cooling coil having a series of outer superposed tightly wound convolutions and a nested group of inner convolutions confined and submerged within the liquid in said tank, said superposed convolutions forming an enclosure for the nested convolutions, intake and discharge connection in said cooling coil for circulating a refrigerating fluid through said coil and precooling the liquid flowing downwardly through the tank on the outside of the outer superposed convolutions of the cooling coil, a circular liquid coil sleeved over and encasing the nested group of inner convolutions of the cooling coil to provide a relatively narrow circular water circulating passage, said liquid coil having an inlet opening adjacent the bottom and substantially in the middle of said tank whereby said precooled liquid is further cooled by said

cooling coil, and a discharge connection in the upper end of the tank for said liquid coil.

8. An apparatus for cooling liquid comprising a cabinet having a tank therein, an inlet connection for discharging liquid into said tank, a circular cooling coil having its convolutions confined and submerged within the liquid in said tank, a liquid coil sleeved over and encasing some of the convolutions of said cooling coil to provide a water circulating passage, said liquid coil having an inlet opening adjacent the bottom and substantially in the middle of said tank and a discharge connection at its upper end, said cooling coil having intake and discharge connections for a refrigerating fluid and a refrigerant condensing unit for supplying refrigerant to said cooling coil intake, said unit including a temperature responsive switch, and a thermostatic bulb for actuating said switch, said bulb being located at the bottom of said tank.

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