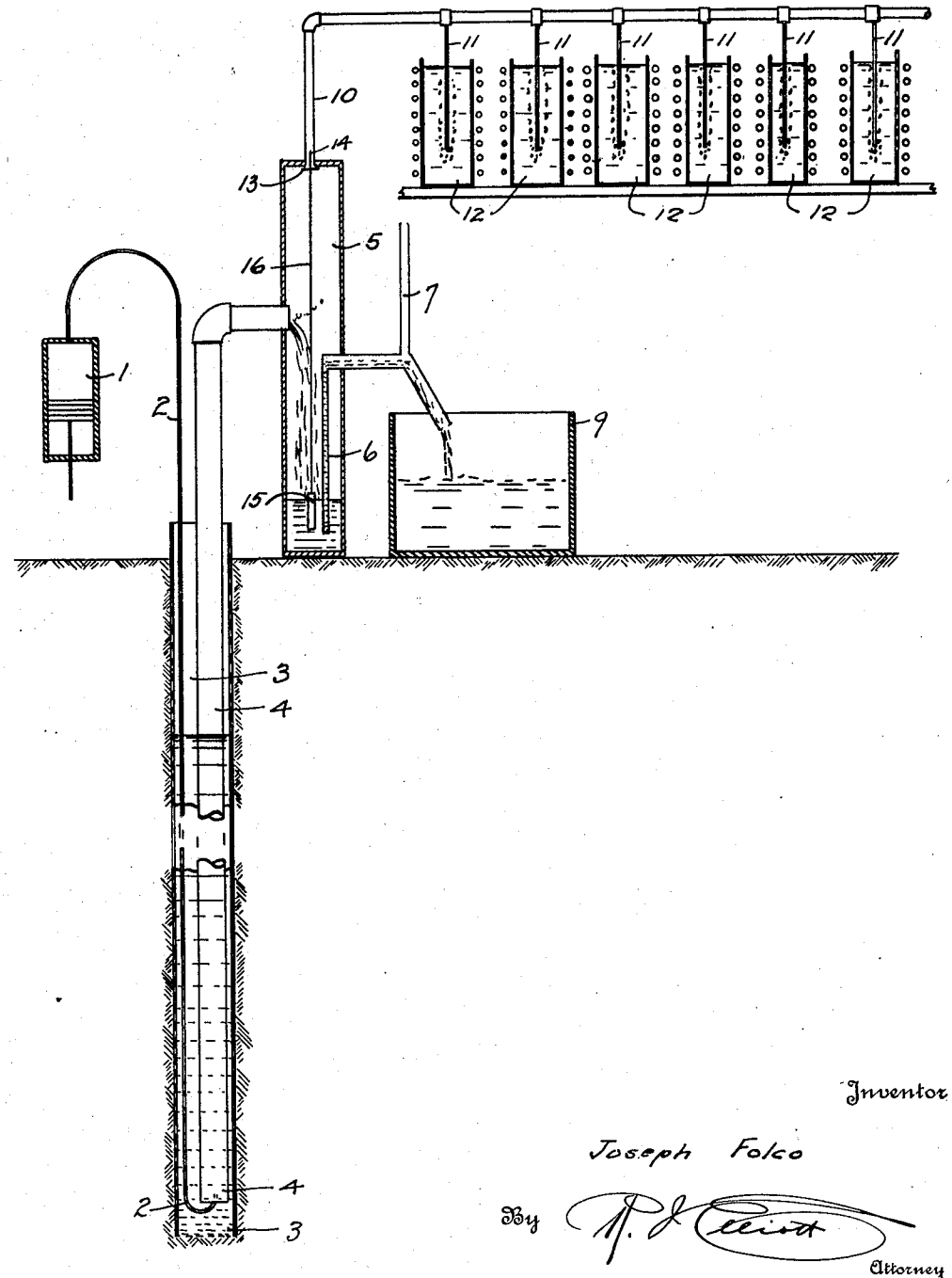
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AIR WASHING AND DRYING PROCESS FOR ICE MAKING MACHINES

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AIR WASHING AND DRYING PROCESS FOR ICE-MAKING MACHINES

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This invention relates to means for providing a supply of air, under pressure, for the agitation of the water being frozen, and has special reference to such ice making plants which use well water. The objects of my invention are, first, to provide such a supply of air to the system without the addition of any mechanism over that needed for pumping the water from the well; second, to provide means for washing and drying the air thus supplied; third, to reduce the power needed for supplying the water and air to such a plant by reducing the amount of machinery used and therefore saving some of the mechanical efficiency of the plant; fourth, to reduce the capital invested and the floor space used by such a plant; and fifth, to provide a simple, cheap and easily installed and controlled means whereby the air is supplied to the ice machine.

I attain these and other objects by the process and apparatus illustrated in a diagrammatic manner in the accompanying drawing.

In the art of making ice by machinery it is usual to inject, into the water being frozen, a stream of clean dry air, whereby the water is agitated, for the purpose of carrying off the air contained in the water and whereby the resulting cake of ice is clear. This supply of air must be clean in order to prevent any contamination from entering the ice, and it must be dry in order to prevent the small tube through which it passes into the water from being choked by ice formed therein.

Referring to the drawing, the air pump 1 supplies a stream of air at high pressure, say 75 lbs. per sq. inch, to the pipe 2, which passes therefrom to the bottom of the well 3. Here the air is released into the bottom of the water pipe 4, in which it rises swiftly and carries some of the water from the well. This is the well-known air-lift well pump.

The pipe 4 leads from the well into a closed separator chamber 5, into which the water and air is discharged. This separating chamber 5 is of considerable vertical depth and the water from the discharge end of the pipe 4 falls to the bottom thereof and is thus separated from the air which is discharged from the said pipe 4. A water outlet pipe 6 leads upward from the bottom of the closed separating chamber 5 and has an open air pipe 7 connected to it near its free outlet, which empties the water from the closed separating chamber into a tank 9, or other receptacle, as needed. An air pipe 10 leaves the top of the separator chamber 5 and passes to the ice making plant, and is provided with a series of small tubes 11, each entering one of the ice cans 12 and blowing the air into the water therein, to agitate it and thus to carry off the air imprisoned in the water. A valve 13 is positioned in the entrance of the said pipe 10 and is guided by means of a stem 14 therein. This valve 13 is supported by means of a float 15, resting in the water in said chamber 5 and connected to the valve 13 by means of a rod 16. Thus the flow of air from the chamber 5 is increased when the pressure therein is increased to lower the level of the water therein, thus lowering the float 15 and opening the valve 13; or the air flow is cut down when the pressure is reduced, permitting the water level to rise and thus raise the float and partly close the valve.

The air thus supplied to the ice cans was formerly supplied by an independent air pump and had to be independently cooled, washed and dried.

The pressure of the air in the closed separating chambers 5 depends on the difference in the levels of the surface of the water therein and in the outlet pipe 6 at the open air pipe 7. If the level of the water in the bottom of the closed separating chamber 5 is kept constant, the air pressure therein and in the air pipe 10 will be constant, and the weight of air passing out of the pipe 10 will equal the weight of air supplied by the air pump 1, but its pressure and volume will be different.

When the air is compressed in the air pump 1 its temperature is raised as its volume is reduced. This air is forced down in the well 3, against the water pressure at its end. As it thus passes downward in the well, its temperature is reduced to about that of the surrounding water. The humidity of the air increases as the temperature is lowered and reaches the saturation or dew point for the

particular pressure and temperature of the water. When the air is released into the water pipe 4 it comes in close contact with the water, and is usually broken up into plungers, by means of baffles or otherwise, which alternate with plungers of water. Each plunger of air thus formed comes in contact with the cold water and condenses all the remaining moisture thereon and, as it rises in the pipe 4, very quickly, its pressure, and consequently its temperature, is reduced and it continues in this dry state, without absorbing moisture from the adjacent water plunger until it is released into the closed separating chamber 5. The air in this chamber is substantially dry, that is to say it has substantially only that amount of moisture therein corresponding with the high pressure and low temperature of the bottom of the well, and frost does not form in the tubes 11 as it is used. Also, since it has passed through a body of water in forming the air plungers, at the bottom of the well 3, it has been thoroughly washed and all contamination has been removed therefrom.

Thus it will be seen that by means of this apparatus I am able to eliminate an air pump, with its air washing and drying apparatus, and to provide a clean and dry supply of air to the ice machine with only the slight additional power required to pump the water against the back pressure of the closed separating chamber 5.

Having, therefore, described my invention, what I claim is:—

1. The process of supplying clean dry air to an ice machine comprising, passing air under high pressure through cooling means and thereby condensing the water therein; partially releasing the pressure of the air while maintaining it above atmospheric pressure; and conducting the air at such reduced pressure to the ice machine.

2. The process of supplying clean dry air to an ice machine comprising, passing air under high pressure through a pipe immersed in cold water, thereby cooling the air and condensing the moisture therein; releasing said air into a water pipe and thereby raising the water therein as the air rises; pouring the mixed air and water from said water pipe into a separating chamber, whereby the water is permitted to fall to a lower level than the outlet of said water pipe and whereby the air leaves the water as it is poured into the chamber; maintaining the air pressure therein at a pressure above atmospheric pressure but lower than said high pressure; and conducting said air at such reduced pressure to the ice machine.

3. The process of supplying clean dry air to an ice machine comprising, operating an air-lift water well by pouring the mixed air and water from the well into a separating chamber; maintaining an air pressure in said chamber above the atmospheric pressure, whereby the air-lift water well is operated against an air back-pressure; separating the air and water from the well under said back pressure; and conducting said separated air to the ice machine.

4. An apparatus for supplying clean dry air to an ice machine comprising, an air pump; an air-lift water well operated by said air pump and provided with an outlet pipe; a closed separating chamber into which said outlet pipe pours its mixed air and water; a water pipe having its outlet above its intake within said separating chamber whereby, when a sufficient air pressure is maintained in said chamber, the water will flow therefrom; means for maintaining the level of the water in said separating chamber at a level below the outlet pipe of the air-lift water well; and an air pipe leading from the upper end of said chamber and adapted to convey the air therefrom to the ice machine.

5. An apparatus for supplying clean dry air to an ice machine comprising, an air pump; an air-lift water well operated by said air pump and provided with an outlet pipe; a closed separating chamber into which said outlet pipe empties; a water pipe having its outlet above its intake within said separating chamber and adapted to empty the water therefrom under pressure therein; an air pipe leading from the upper end of said chamber and adapted to convey the air therefrom to the ice machine; and a valve between said separating chamber and said air pipe and operated by the level of the water in the separating chamber, whereby the air pressure in the separating chamber is kept constant.

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