On the Production of Ice and Cold by the Binary Absorption System of C. Tessie du Motay and Aug. I. Rossi. Patented Feb. 3 and June 8, 1880.

In the different systems so far used for the production of ice and cold (excepting the air machine and the Carré machine), recourse has been had to the volatilization of a liquid by relieving the pressure exerted by its vapors on itself by means of a vacuum pump, driven by a steam engine, a mechanical compression, aided by the cooling produced by a circulation of water in a condenser, being invariably the means employed to effect the liquefaction of the vapors, so as to render the cycle of operation continuous. A difficulty has been encountered at the start.

With most of the liquids to which preference has been given the tensions of their vapors, at the temperatures of ordinary running water, reach very high figures. These pressures follow a physical law, keeping an absolute and mathematical relation with the temperatures. In most temperate climates, during the warm season, running waters, or such as are supplied from hydrants in cities, are at a temperature not below 75° Fah., and even more. In these conditions liquid ammonia has a tension of 150 to 160 lb. per square inch; chloride of methyl, 80 lb.; methylic ether, 78 lb.; sulphurous dioxide, 60 lb. In tropical climates, and under many latitudes in the United States where waters are above 85° and 90° Fah., the above figures are higher yet. These may be found the causes of many unsuccessful attempts made to introduce industrially the manufacture of ice.

These pressures render difficult the keeping of joints tight. Hence leaks follow, causing a loss of material and consequent failing in production; in short, the successful operation of these machines is interfered with. The machines have to be carefully constructed, at a great cost, and require for some of these liquids very elaborate and complicated mechanism.

Large quantities of water are necessary for the condensation of the vapors, otherwise the outflowing water will reach temperatures much above 75° Fah., and as a consequence the resulting pressures will be much above the figures above quoted. This question of condensing water plays a very important part in the introduction of ice machines for specific purposes. In certain industries, such as in breweries, where this water is scarce or has to be paid for, it has been found to be a cause of exclusion of many machines. Certain of the liquids employed besides have special chemical properties, which render their use attended with other causes of trouble; among other properties, their action upon metals when in presence of water.

In the "Practical American," vol. 1, No. 5, New York, May, 1880, it is stated that the destruction of a large anhydrous sulphurous oxide machine (system of Mr. R. Pictet, of Geneva), which was in operation in St. Louis during the meeting of the American Association for the Advancement of Science, in 1878, was caused by an accident of this kind; a small pin hole in a casting having given access to more moisture, the sulphurous dioxide employed was transformed into sulphuric acid, causing the moist spot to become more and more corroded, until at last, in one night, all the gas escaped through this hole, and thus was lost the whole charge of the machine, some 4,200 lb., and the condenser destroyed.

About a year ago Messrs. C. M. Tessié du Motay and Auguste I. Rossi, in experimenting on the ethers, have found that, in general, the ethers formed by the acids, as well as their alcoholic radicals, possess the property of absorbing sulphurous dioxide, some of them to the extent of 300 times their volume of gas in certain conditions, ordinary ether standing foremost. They have based on this property a new system for the artificial production of ice and cold, which they have called the "binary absorption system," a graphical description of which has been given in this paper (February 21, 1880).

In this system the liquid employed is the ethylo-sulphurous dioxide obtained from ordinary ether by saturating the latter with sulphurous gas. This liquid, at a temperature of 60° to 65° Fah., has no pressure and can be kept readily in glass bottles at 80° to 90° Fah; it has only a few pounds tension—2 to 5 pounds. Thus a machine charged with it, when stopped, will actually show no pressure on the gauges, and even *a vacuum* at rest, if the temperature is low; while with the other liquids mentioned above, even the stoppage of the machine does not prevent the pressure of the vapors inside to soon reach its point of equilibrium with the temperature outside, and even at as low temperature as 32° Fah., sulphurous dioxide alone, as used in the Pictet machine, has still 15 pounds per square inch of pressure; exerting thus a constant and increasing pressure on the vessels containing it, and in case of a small leak starting causing the entire loss of the charge. What is said here of sulphurous dioxide applies with still more force to the liquid ammonia, methyl chloride, methylic ether, all liquids of which the vapors have higher tensions yet than sulphurous dioxide at the same temperatures.

Now, if such a binary liquid is evaporated under a vacuum it is resolved into its two constituents, the mixed vapors entering the pump together, then under a small compression ether liquefies first, a few pounds pressure being sufficient for it, even with waters such as are met in tropical climates. The ether thus liquefied absorbs in the condenser the vapors of sulphurous dioxide, reconstituting the "binary liquid," and thereby avoiding the excess of mechanical compression which would have been otherwise necessary to effect this liquefaction of the dioxide. Thus to the *work of compression of the pump* is substituted a *power of chemical affinity and absorption* of the less volatile absorbent for the vapors of the most volatile. Thus, to the advantages of low pressure of ether are combined the advantages of intensity of cold produced by the volatilization of the sulphurous dioxide, avoiding its drawbacks. In presence of water and of the ether the sulphurous dioxide is transformed, not into "sulphuric acid," as before, but into "sulphorinic acid," the action of which acid upon meta's is insignificant if not absolutely null. The sulphurous acid being an extinctor relieves the ether of one of the drawbacks of its use, and acting as self-lubricant renders the greasing of the working parts unnecessary.

In a machine on exhibition at Messrs. C. H. Delamater & Co.'s, foot of 14th street, N. R., which has been running several months, making 6 tons of ice daily, the pressures in the condenser in normal and regular running have been of 14 to 15 pounds, reaching as low as 10 and 11 pounds in best conditions, and not higher than 20 to 23 pounds in the most unfavorable conditions of water, etc.

The water used for condensation has been ¼ to ⅓ that used and necessary for a Pictet machine of same production, the pressures being ½ to ⅓.

In these conditions of pressure the machine has worked easily and without wearing, the gauges stopping at 0 when machine was stopped, thus rendering leaks impossible at rest, and reducing them to a practical minimum when running. After several weeks of running, day and night, the machine was examined and the different parts working were found in perfect order, showing that there has not been any corrosive action of the liquid upon metals.

Owing to the small pressures, these machines are much simpler in their details of construction; all complicated valves, cocks, or other mechanical contrivances required for others can be dispensed with, three ordinary globe valves, such as are used for steam, being all that is necessary. Their attendance is easy, as it can be ascertained from parties who have them in use in breweries.

The machine working at C. H. Delamater & Co. since April, has been making 6 tons daily of solid, merchantable ice, which was readily disposed of in the market as fast as made, at prices leaving a large margin for profits. This machine, which is still in full operation, is open to the examination of the public.

The New York Ice Machine Co. (Room 54, Coal and Iron Exchange Building), which has bought the rights to the patents of Messrs. C. Tessié du Motay and Aug. I. Rossi for the United States, have one of these machines working successfully at Ph. Schaefer's Brewery, 59th street and 10th avenue, where it gives entire satisfaction. The proprietors consider it a "simple, practical, easily attended machine," doing all it was guaranteed to do. It cools the cellars of said brewery, keeping them at 40° Fah.

Several other machines are either in course of construction or being put up at other breweries or for making ice in and outside of this city.

Another machine which is completed now and will be ready to work at Hotel Vendome, in Boston, Mass., as soon as this hotel will be opened to the public, will have to cool provision rooms, wine rooms, cellars, making besides half a ton of ice for consumption and 200 carafes daily.

Hose Pipe Nozzles.

Who is going to invent the nozzle of the future? There is no nozzle that we have ever seen that seems to us to control the stream it delivers as it should do. Instead of projecting a solid stream for a long distance, the water breaks soon after leaving the nozzle, and soon sprays and breaks up altogether. We often hear of steamers throwing 250 and 300 feet, but we recently heard a veteran chief say that he had yet to see the apparatus of any kind that would throw a solid stream 100 feet. The difficulty may be all with the water, which is naturally inclined to separate, but we are of the opinion that part of the trouble lies in the construction of the nozzle. An experiment made at Boston by putting a core into a play pipe, and thus dividing the stream into four parts, depriving it of its rotary motion, showed a gain of thirty feet in distance playing. But even this does not seem sufficient. Our steamers give us power enough for throwing, and the hose in use gives every facility for carrying a large volume of water; there should be some means devised for delivering that volume in a solid stream at long distances. Great difficulty has been found in making nozzles operate uniformly at all times. A manufacturer of steamers once found a nozzle that gave him great satisfaction; with it his steamers could throw greater distances than with any he had ever tried before. He ordered half a dozen just like it. The half a dozen were made precisely like the first, but never equaled it in delivering water. There is much to be learned yet regarding this question of delivering water on fires, and the exact relations existing between pressure, hose, play pipes, nozzles, and the friction of water more clearly understood.—*Fireman's Journal.*

Dried Potatoes in California.

A California inventor has made a machine for pressing and drying potatoes so that they will keep for years, yet preserve their natural flavor. No chemicals are used in the operation of curing, everything being done by a simple machine capable of pressing six hundred bushels of potatoes in twenty-four hours. The machine not only presses the potatoes, but lays them on a tray in a concave form with the hollow side down. After the pressure they are put into a drying apparatus, where they remain for two hours, then they are ground into coarse meal resembling cracked rice.

The first shipment of these preserved potatoes to Liverpool, last year, brought a large profit. The average price of potatoes in San Francisco is about twenty-five cents a bushel. Dried, they brought in England forty-five shillings a hundredweight, or at the rate of a dollar and a half a bushel for green potatoes. This year preparation has been made for drying and shipping large quantities. It is said that there are three hundred thousand acres of uncultivated land on the western slope of the Coast Range, near San Francisco, especially adapted to potato growing. The fogs and mists from the ocean supply sufficient moisture, and the soil yields bountifully. The only problem heretofore has been where to market the product.

MECHANICAL INVENTIONS.

Mr. August P. J. Bossel, of Virginia City, Nev, has patented an improvement in bench planes which consists, first, in a novel construction, arrangement, and combination, with the plane bit, of a toothed plate or rack, and a pinion for adjusting the bit, and a wedge for holding it when adjusted; and also in a novel arrangement of the handle of the plane and devices connected therewith for adjusting said handle at different positions.

An improved baling press has been patented by Mr. John Grizzel, of Augusta, Ark. The object of this invention is to furnish presses for baling cotton and other materials, so constructed as to compress the material very quickly, and which can be conveniently and easily operated. The invention cannot be readily described without engravings.

Mr. George W. McArthur, of Laingsburg, Mich., has patented a machine for cutting hoops from poles, which is so constructed as to adjust the knife automatically to the bends of the pole and cut the hoops of uniform thickness.

An elevated scale beam for head blocks has been patented by Mr. John A. Reynolds, of Danville, Penn. The object of this invention is to provide the head block of a saw-mill with an elevated scale beam that may be at all times plainly visible, and upon which may be boldly marked the scale measurements, so that the mill operative may at a glance ascertain the thickness of the log upon the head block and readily adjust the log relatively to the saw in order to cut from it any required thickness of material.

The Blanket Brigade.

While in Boston attending the great celebration, Chief Leshure had a fine opportunity of seeing the working of the blanket brigade of that city, as applied to a fire in an elegant Park-street club house. The furniture, which was of the most costly description, was gathered together in the center of each room and covered with the carpets as they were stripped from the floor, and then the mammoth rubber blankets were spread over the whole, before the streams from six different hose pipes were let on the burning roof. The whole building was of course deluged, so that the water ran down the stairways in rivulets, but owing to the protection of the blankets, the percentage of loss on the furniture was comparatively small. Mr. Leshure came back more enthusiastic than ever concerning the organization of a Springfield blanket brigade.—*Springfield Republican.*

Ocean Temperatures in the Pacific and Atlantic.

Herr von Boguslawski has been led, from a comparison of the results of recent deep sea investigations, to the following conclusions respecting the temperatures of the Atlantic and Pacific oceans: 1. The water of the North Pacific is, in its whole mass, colder than that of the North Atlantic. 2. The water of the South Pacific is, down to 1,300 meters (4,225 feet), somewhat warmer than that of the Atlantic, but below the depth colder. 3. The bottom temperatures are generally lower in the Pacific than the Atlantic at the same depths and in the same degree of latitude; but nowhere in the Pacific are found such low bottom temperatures as in the Antarctic portion of the South Atlantic, between 36° and 38° south and 48° and 33° west longitude, in which bottom temperatures of —0·3° C. to —0·6° C. have been measured. 4. In the western parts of the Pacific, and the adjoining parts of the East Indian Archipelago, the temperature of the water reaches its minimum at depths between 550 and 2,750 meters (1,787 and 8,937 feet) remaining the same from this depth to the bottom. In the whole of the Atlantic the temperature from 2,750 meters (8,937 feet) to the bottom gradually though very slowly decreases.

A REMARKABLE instance of lightning ascending vertically is reported to the French Academy of Sciences as having occurred last month at Paris. M. Trecul relates that during a violent storm just at nightfall of the 19th ult., he saw flashes rising vertically, and apparently starting from the tips of lighting rods, though he is not sure that they started from them. The flashes went out in a kind of luminous ball, diminishing in the intensity of the light from the center toward the circumference. One of the smallest of these had an oval shape of from 8 to 10 inches in width, terminating the column of fire. On two occasions two of these luminous columns, having risen at a distance apart about equal to the space between two lightning rods, suddenly darted toward each other at right angles to their vertical course and went out on uniting, making no flash and no noise.