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V. THAUSING.

REFRIGERATING APPARATUS FOR COOLING AIR.

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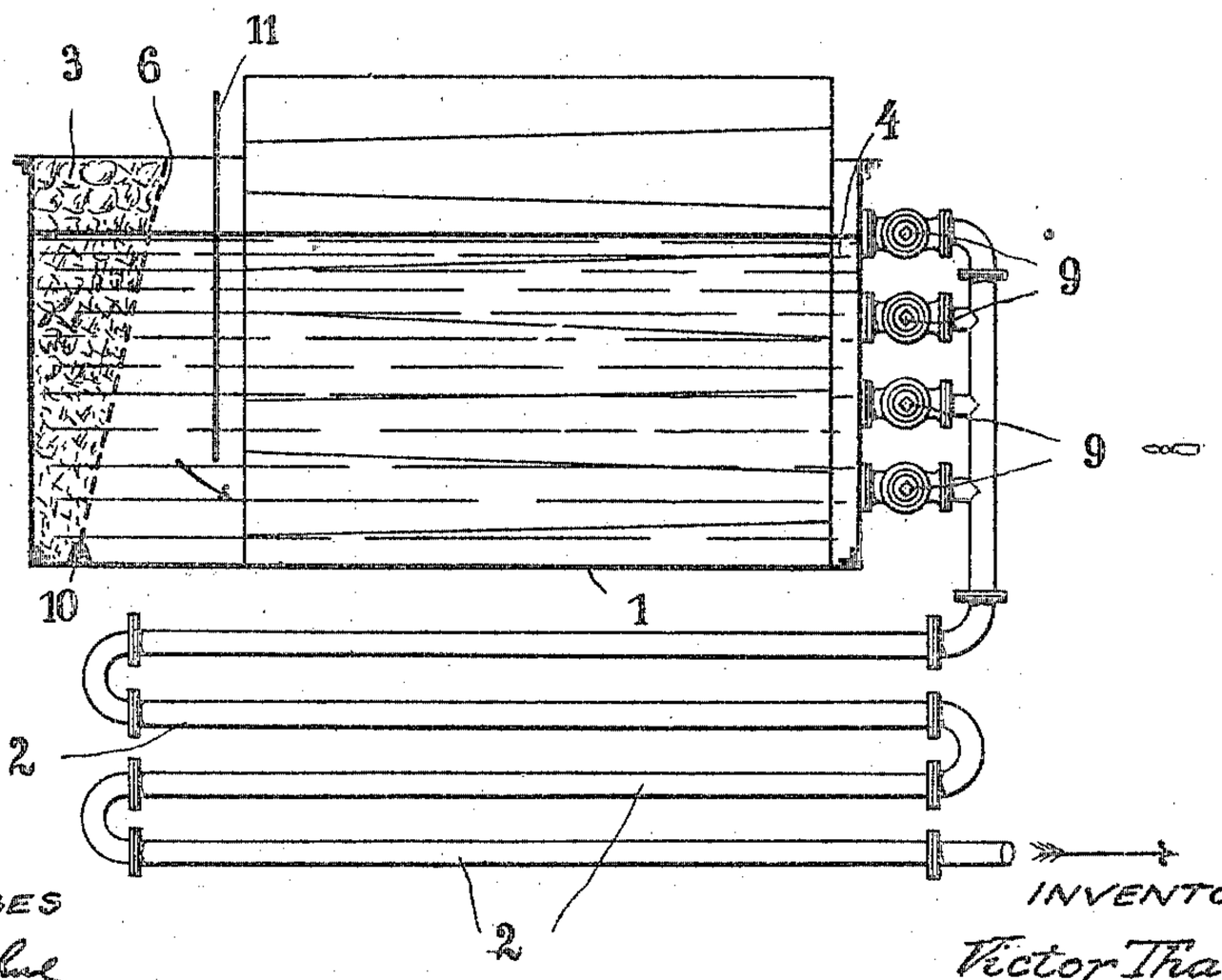


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## REFRIGERATING APPARATUS FOR COOLING AIR.

No. 811,596. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed March 25, 1904. Serial No. 200,023.

*To all whom it may concern:*

Be it known that I, VICTOR THAUSING, engineer, of VI Magdalenenstrasse 55, Vienna, Austria-Hungary, have invented certain new and useful Improvements in Refrigerating Apparatus for Cooling Air, of which the following is a specification.

This invention relates to improvements in refrigerating apparatus containing cooling mixtures, the refrigerating action of which is obtained in a well-known manner by the reaction of cold, produced in the interior of the apparatus, upon the walls of the latter. Salt and ice necessary for preparing the cooling mixture are fed into the apparatus separately one from the other, and a regulated mixing of these materials is effected only in the interior of the apparatus by the aid of the water resulting from the melting ice, the level of this water being adjustable. By adjusting this level into different heights I may obtain not only variation of the outer active cooling-surfaces of the apparatus, but of the cooling action in the interior of the apparatus, too. By these means the degree of refrigerating of the surrounding space may be regulated at will.

The drawing shows diagrammatically the apparatus in a vertical elevation.

The apparatus consists, essentially, of a receiver 1 and a set of tubes 2, the surfaces of which are to serve as cooling-surfaces for the surrounding air in such a manner that the walls of the receiver 1 are to transmit the cold produced in consequence of melting of the ice while the serpentine 2 delivers in a known manner only that part of cold inherent to the ice-water running off from the apparatus. In order to lower the temperature of the cooling-surfaces to the desired point of some degrees under zero and afterward to maintain this temperature, the receiver 1 is divided into vertical compartments 3 and 4, the former one, 3, to receive salt (sea-salt, chlorid of sodium, chlorid of magnesium, chlorid of calcium, and similar materials,) the other one, 4, to receive snow or ice as constituent parts of the refrigerating mixture to be prepared. The partition 6 of the two compartments is permeable and for this purpose is formed by a perforated sheet or by a sieve or wire-gauze or the like. By this means a direct contact of the ice with salt is prevented and contact of the two materials is made only through the intermediate of the solution of the cooling material used in the water coming from the melting ice. In a similar way the cold of the melting ice is transmitted by this solution to the outer walls of the apparatus forming cooling-surfaces. The dimensions of the surface of contact between salt and ice-water, as well as of ice and salt solution and of this salt solution with the outer walls of the apparatus, depend upon the height of the liquid in the apparatus. Hence it follows that the efficiency of the whole apparatus depends upon the height of the level of the salt solution in the apparatus.

In consequence of the construction of the apparatus ice and salt may at any time be supplied into the apparatus and at the same time the temperature in the space to be cooled may be regulated at will.

As already stated, variation—that is to say, increasing or diminishing of the surface of contact of salt and water, and respectively, of the solution of salt with ice—may be effected by raising and respectively lowering of the level of the liquid. This may be effected by means of a cock-battery 9 or in any other convenient manner. By adjusting the level of the water coming from the melting ice to a suitable height in the receiver 1 the dimension of the surface of contact between water and salt and consequently the quantity of salt dissolved in the unity of time may be varied. In a similar manner the surface of contact between salt solution and ice may be varied. From the foregoing it follows that by raising the level of the liquid dissolution of salt and consequently density of the solution as well as melting of the ice are increased, and thereby the temperature in the interior of the apparatus and of the space surrounding the apparatus is lowered. This action is increased by giving the compartment a tapered form for the reception of salt, as shown, so that the higher the level of the liquid is adjusted the capacity of the space containing salt is increased in proportion to the capacity of the space containing ice. The permeable partition-wall 6 between the spaces containing ice and salt, respectively, is pivoted at 10 and adjusted in different inclined positions. In case this partition-wall occupies an inclined position and the level of the liquid is a more elevated one then a larger quantity of salt in proportion to the quantity of ice is brought into contact with the water (coming from the melting ice) and temperature is lowered in the apparatus in consequence of the higher

density of the solution. This variation of temperature can be regulated by varying inclination of the wall 6 in as far as the more inclined this wall is the quicker lowering of temperature will be obtained when the water-level is raised. By the adjustment of the height of the liquid-level there is at the same time regulated the dimension of the cooling-surface acting to the outside, and consequently the supply of cold to the air contained in the surrounding space, and this for the reason as the walls of the receiver serving as cooling-surfaces are of the low temperature of the salt solution only to the height of the water-level. By raising and respectively lowering of the liquid-level are varied, first, the degree of concentration (density) of salt solution and the temperature in the apparatus, too; second, the surface of contact between the salt solution and the outer walls of the receiver—that is to say, of the cooling-surface acting to the outside—so that temperature of the space to be cooled may be efficiently regulated by a simultaneous variation of the temperature in the apparatus and of the dimension of the cooling-surface. The other part of the receiver, which is not occupied by water coming from the melting ice, serves as a reservoir for salt and ice. That part of salt and ice being under water is continually dissolved and respectively melted, and thus produces the refrigerating mixture, while that part above the water-level in same measure continuously sinks down and may be replaced. In order to reduce consumption of salt, there are disposed vertically-adjustable and impermeable partition-walls 11 between the spaces containing ice and salt, respectively, as shown. Those walls have for their only purpose to allow circulation between the salt solution and the ice-water. By this arrangement a salt solution of different density is produced in the receiver. The solution of higher density, and consequently of higher specific gravity, accumulates at the bottom, so that the layers of liquid above the solution before mentioned are not in the position to absorb larger quantities of salt. The battery of cocks 9 then joins directly to the wall of the receiver, so that when adjusting the level of the liquid the higher layers of that liquid—that is to say, those containing less salt—are drawn off. Also the water coming from the melting ice is accumulated above the salt solution and is drawn off through the uppermost tap before the same has absorbed salt. By this way consumption of salt is less than when using solution of a uniform concentration and of an average density. The unequal concentration of the solution offers the further advantage that the ice when sinking down in the apparatus dips into a solution of higher concentration the deeper it sinks, and consequently the temperature in the apparatus decreases toward the bottom. The cooling action of the apparatus is thus increased, the surrounding air passing downward along and outside the apparatus and in its travel comes into contact with surfaces more and more colder and thereby becomes cooled as much as possible.

By adjusting the vertical partition-wall and in consequence by varying of the area of the opening of communication between the spaces containing ice and salt—that is to say, by varying circulation in the apparatus—the quantity of salt to be dissolved and hence temperature may be regulated.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A refrigerating apparatus comprising a receptacle, a perforated partition 6 separating the receptacle into two chambers, one adapted to receive solid saline material and the other a solution of the same, a vertically-adjustable partition in the latter compartment so that upon raising or lowering the partition the strength of the liquid on one side of the partition may be varied, and means for drawing off the liquid at different heights.

2. A refrigerator comprising a receptacle and a perforated partition pivoted to the bottom thereof and extending upwardly so as to divide said receptacle into two compartments adjustable as to their relative size.

3. A refrigerator comprising a receptacle and a partition pivotally connected to the bottom thereof, said partition being perforated and extending at an inclination to form a salt-chamber and an ice-chamber whereby the liquid resulting from the melting ice in rising in the two chambers renders variable the relative quantity of salt and ice which is effective, substantially as described.

In witness whereof I have hereunto signed my name, this 12th day of March, 1904, in the presence of two subscribing witnesses.

VICTOR THAUSING.

Witnesses:
JOHANN LUXE,
ALVESTO S. HOGUE.