VAN DER WEYDE'S Machine for Freezing Water by Mechanical Power.

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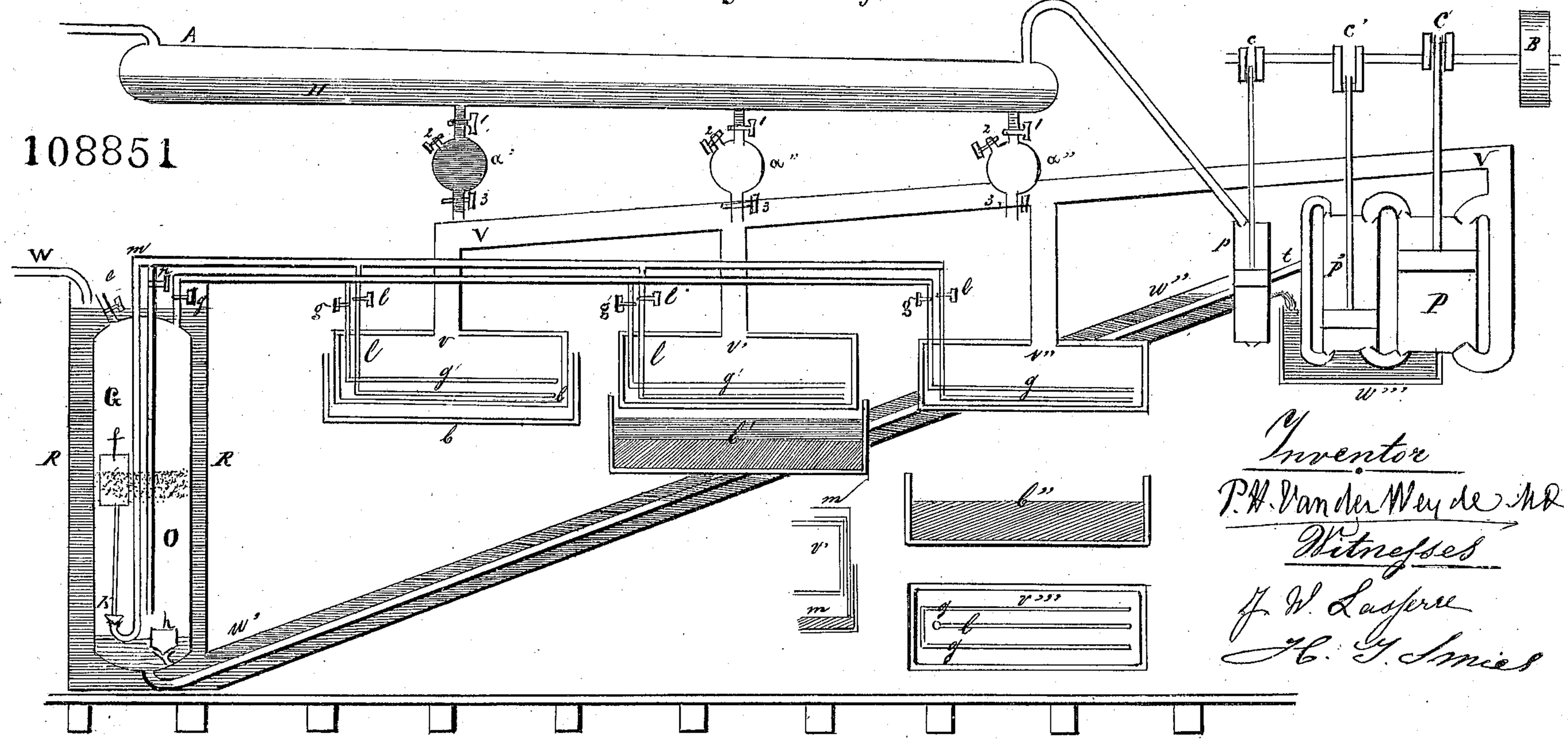

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PETER H. VANDER WEYDE, OF NEW YORK, N. Y.

IMPROVEMENT IN THE MANUFACTURE OF ICE.

Specification forming part of Letters Patent No. **108,851**, dated November 1, 1870.

To all whom it may concern:

Be it known that I, PETER H. VANDER WEYDE, of the city, county, and State of New York, have invented a new and useful Improvement in the Machines for Making Ice by the freezing of water; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing.

The machine belongs to that class of freezing-machines in which a volatile liquid is used, by the evaporation of which the cold is produced, preference being, of course, given to the chymogene or cryogene, for the manufacture and use of which, for the production of cold, a patent was granted me in 1867, and which I found better adapted for this purpose than any other liquid thus far known. However, my machine may be used for ether, bisulphide of carbon, methylic ether, or any other appropriate liquid.

Thus far, these so-called ice-machines could only produce thin slabs of ice. In my machine I have attempted to imitate nature, and freeze water from above, by bringing near the surface a body of which the temperature has been reduced to such a degree as to form readily on the surface of the water a crust of ice of about half an inch to one inch in thickness. As ice is a bad conductor of heat, and it thus would take too long a time to freeze the water below the crust of ice through the same, I pour an inch of water, less or more, on the top of the ice, and freeze this, repeating this operation every five minutes, when, in the course of one hour, I will have frozen the water to a block of ice one foot in thickness.

The manner in which this is most conveniently accomplished will be evident from the explanation of the drawing of my machine.

The cooling-vessels *v v′ v″* are represented in the middle of the drawing, and are rectangular metallic boxes, with brass or copper bottoms, everywhere covered with non-conducting and water-tight material, except at the bottoms mentioned, which bottoms are slightly rough and blackened with a coat of oxide of copper, in order easily to radiate cold downward. They are well braced, so as to withstand the atmospheric pressure without collapsing when the vacuum is made inside by means of the pumps P P′, connected with the boxes by means of the tube V V′, also covered by non-conducting material, in order to bring the vapor as cold as possible to the pumps. These pumps are moved by means of the cranks C C′, attached to the axis of the pulley B, which derives its motion from any mechanical power, steam, wind, hydraulic power, &c.

The pumps have solid pistons. Their motions alternate by the cranks being attached to the same axis at angles mutually of one hundred and eighty degrees.

The first pump, P, the vacuum-pump, has the largest diameter, and throws the vapor extracted from V in the second smaller pump P′, where it is condensed and ejected by the long tube *t*, which passes through a wider tube, W′ W″, through which the water escapes which is used to cool the reservoir G, placed in the tank R R. This water enters by the tube W, and, descending in the tank R R, passes around the whole length of the tube *t t*, escaping near the pumps P P′ into a tank, *w‴*, where it performs its last function in cooling the condensing-pump P′.

The water to be frozen is first drawn in the cylinder A by means of the cock *a*. This cylinder is also covered by non-conducting material. This water is here previously cooled by the evaporation produced by the air-pump P, moved by a crank on the same shaft. This pump chiefly serves to withdraw the air from the water, so as to have no air-bubbles in the ice, which produce a milky ice, but to obtain an ice without air, and clear as glass.

In order to withdraw water from this vessel without interfering with the vacuum, the globes *a′ a″ a‴* are attached, each of such a size as to contain an amount of water sufficient to cover the bottom of the freezing-tanks C C′ C″ to the desired height of one-half to one inch. To operate these globes they are filled with the water H in A, by first opening the stop-cock 1 above. This cock is so wide that not only the water can descend into the globe, but also the air ascend at the same time from the globe *a′* into the cylinder A.

When filled, the cock 1 is closed, and 2 and 3 opened, when the water will at once escape

by 3, the air taking its place through 2. When empty, 2 and 3 are closed and 1 opened, when the same operation is repeated as often as is required to charge the freezing-vessels. These freezing-vessels are represented at *b*, *b'*, and *b''*. They are made of thin metal, well fitting in a non-conducting box of wood, lined inside with felt or other non-conducting material. They are open at the top, and fit loosely around the cooling-vessels *v v' v''*. They are supported on a movable stand, so that they can easily be raised or lowered, while the cooling-vessels *v v' v''* are suspended in such a way as to be firm and immovable.

When commencing operations, the vessel C is filled with water to the height of only one inch, or less, above its bottom, and raised so as to surround the cooling-vessel *v* to such a height that the cold metallic bottom of *v* is only one-half to one quarter inch above the water in C.

When this water is frozen, a layer of water of one inch, or less, is poured on top of the ice formed, taking care previously to lower C one inch, or less, so that the water will not touch the bottom of the freezing-vessel, as they would freeze together, and the further progress be interrupted.

After repeating this lowering of C and the addition of water a few times, we will have the vessel in the condition represented in *c' v'*, when the last layer of water on top of a cake of ice is submitted to the freezing process. When this is frozen, the vessel is removed downward, (see *v'' c''*,) and, by warming the sides of the metallic inside box, the block of ice is removed; inverting the box it will drop out.

It is seen that I imitate here the natural process of freezing as it is applied in skating-ponds, making use of cold air over the water, and covering the ice formed with successive layers of cold water to be frozen.

The peculiar arrangement of the freezing-vessels, and of the reservoir for the condensed liquid, needs description, as it presents a few new features.

The reservoir placed in the water-tank R R has an inlet below where the condensed liquid from the pumps enters by the long tube *t t*, (which also may be a coil, as in my former machines,) and it has four outlets from the top; one, *e*, gives exit to gas or air filling the upper part G of the reservoir, in order to get rid of incidental excess of pressure consequent to leaks in the vacuum part of the apparatus; one exit, *g'*, admitting gas or air into the freezing-vessels, to serve as an agitator of the liquid there; and two exits, *m n*, to admit the liquid to the same freezing-vessels. One of the latter, *m*, acts automatically, being at the lower part, where the tube dips in the liquid, provided with a valve or stop-cock, *k*, closed by a weight, *f*, which, at the same time is a hollow float, opening the valve or stop-cock *k* by lifting it, when the fluid O fills more than half the reservoir. The other exit, *n*, is worked by hand, by means of a stop-cock above, so as to be capable of drawing liquid from the reservoir when less than half filled, if circumstances require this.

There is another exit provided for water, which experience has shown to collect at the bottom of the reservoir, in case the pumps work in water, which is very desirable to keep them cool.

A float, *h*, is made of tin, of such specific gravity that, with its valve attached, it will sink in chymogene, (specific gravity, 0.6,) and float on water, (specific gravity, 1.) This float will keep the valve (attached below to it) closed as long as it is immersed in chymogene, or the water does not reach it; but as soon as the quantity of water increases, so as to reach the float *h*, and immerse it in water, it will be lifted and open the valve or stop-cock below, which before closed an exit-tube. This tube opened, lets the water escape till the settling of the float closes the valve or stop-cock.

The interior arrangement of the cooling-vessels *v v' v''* is represented in *v'''*. The tube *l* connects with *m n*, and admits the volatile liquid. It is perforated with small holes or slits at the sides, so as to admit jets of the liquid in the mass of the liquid which fills the freezer for about one-third or one-half. This tube *l* is only about half an inch from the bottom, and passes longitudinally through its center line. The other tube *g* is bifurcated a little farther from the bottom, and has holes or slits in its lower portion, so as to project gas or air from the reservoir G downward, and to agitate the liquid, and cool the copper or brass bottom of the cooling-vessels *v v' v''*. The cocks admitting the liquid or gas are worked alternately during the freezing process.

In order to lower the freezing-vessels *b b' b''* exactly to the right amount, so that the water added from *a' a'' a'''* will just fill the space between the ice and the bottom of the freezer, without touching the latter, a measuring-stick, *m*, is passed over the edge of the freezer, the lower part of which touches the ice formed, and projects so far below as to bring this ice to the right distance downward, for admitting over it the new dose of water to be frozen in a layer of one inch, more or less.

One person can attend to about a dozen of such freezers, all connected with one pump system, P, and one reservoir, R, provided the mechanical details are adapted to the necessities of the case.

What I claim, and wish to secure by Letters Patent, is—

1. The method described of making large blocks of ice by freezing water artificially,

radiating cold downward on its surface, on successive superposed layers.

2. The suspended immovable non-conducting cooling-vessels *v v'*, with their conducting and radiating bottoms and systems of internal tubes and jets *g l*.

3. The freezing-tanks *b b'*, movable upward, to embrace said immovable coolers *v v'*.

4. The floats *f'* and *h*, with their stop-cocks or valves attached, for the purposes specified.

5. The system of double pumps, in connection with the vacuum and condensing operations, as described.

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