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J. CSETE.

FREEZING OR REFRIGERATING MACHINE.

No. 340,031. Patented Apr. 13, 1886.

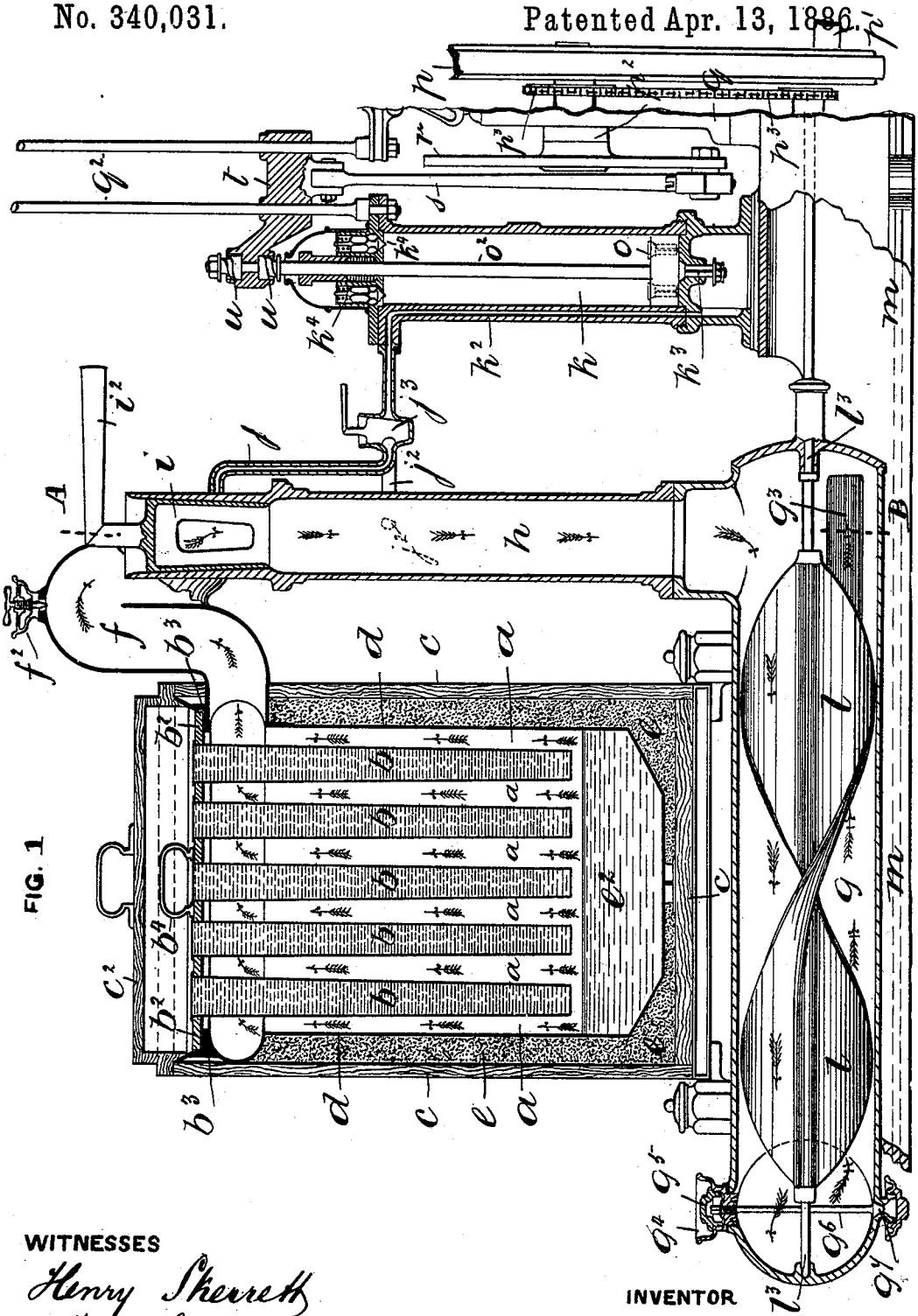

FIG. 1

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FIG. 3

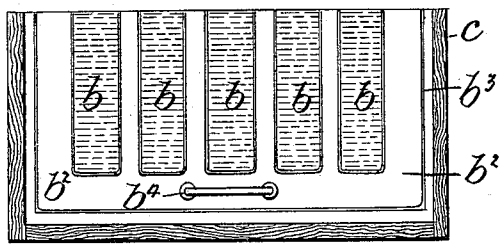


FIG. 5.

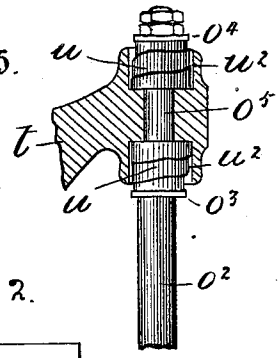


FIG. 4

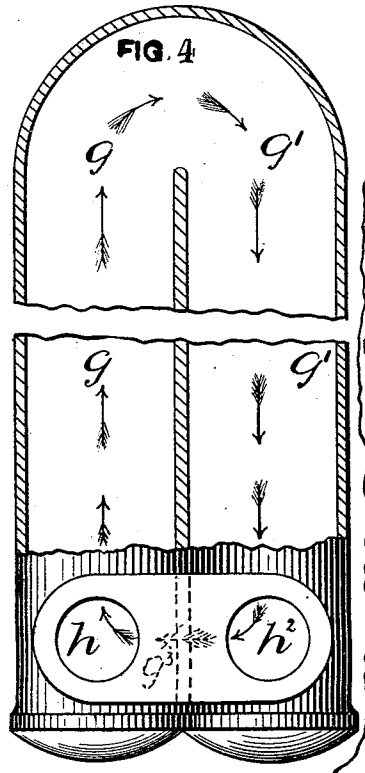
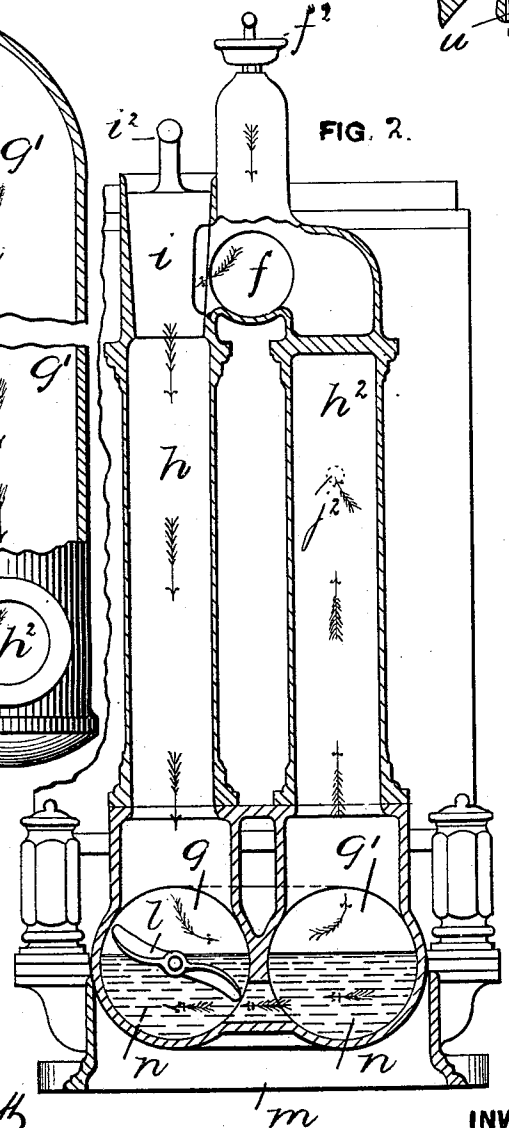


FIG. 2.



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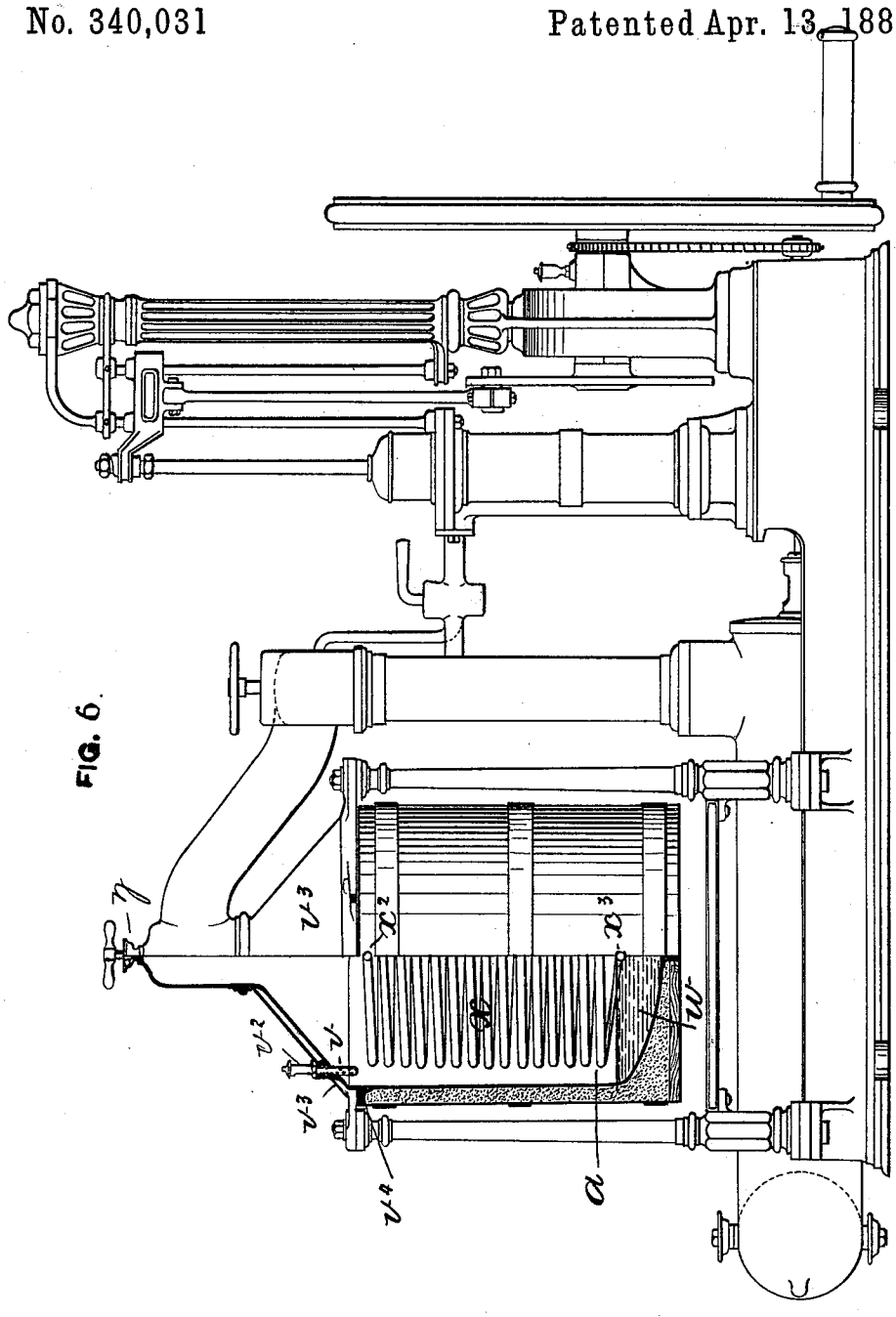

FIG. 6.

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FIG. 7

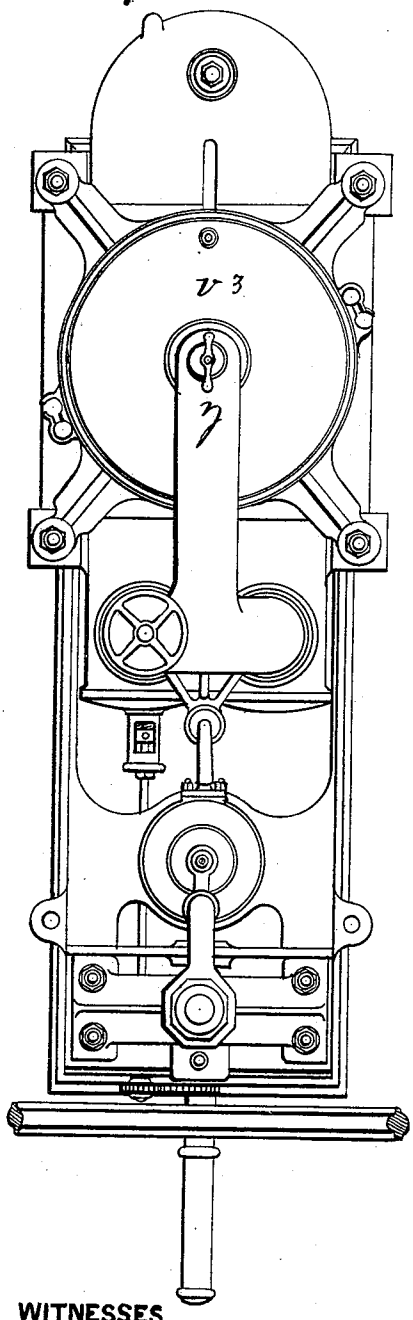


FIG. 8.

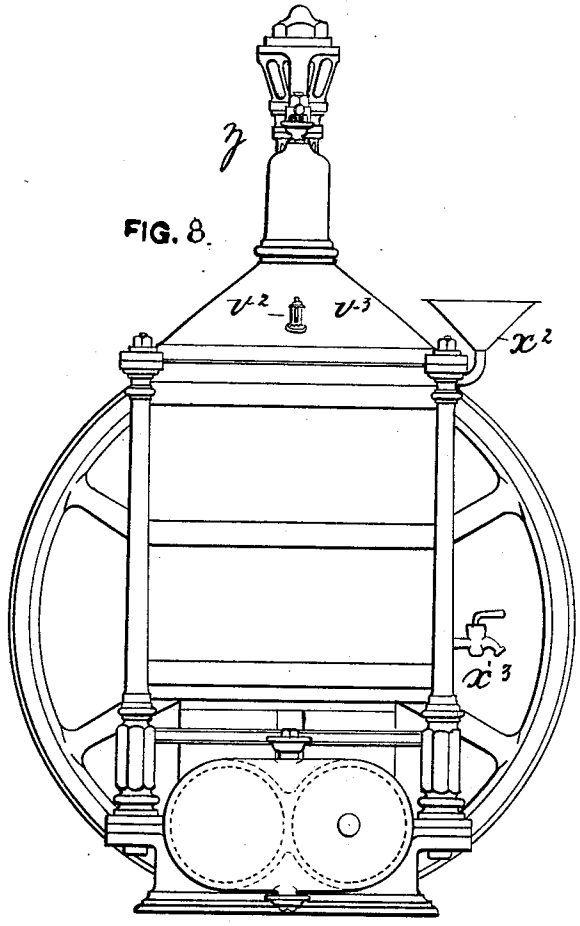


FIG. 10.

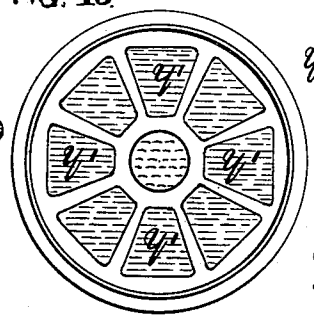
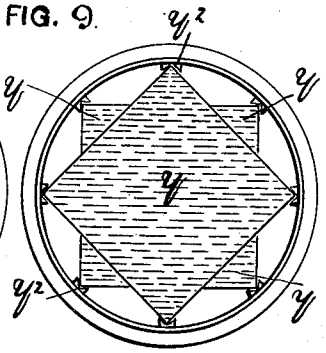


FIG. 9.



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UNITED STATES PATENT OFFICE.

JULIUS CSETE, OF ASTON, NEAR BIRMINGHAM, COUNTY OF WARWICK, ENGLAND.

FREEZING OR REFRIGERATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 340,031, dated April 13, 1886.

Application filed October 24, 1885. Serial No. 180,893. (No model.) Patented in England March 14, 1885, No. 3,317.

To all whom it may concern:

Be it known that I, JULIUS CSETE, of 41 Pugh Road, Aston, near Birmingham, in the county of Warwick, England, mechanical engineer, have invented an Improvement in Freezing or Refrigerating Machines, (for which Letters Patent have been applied for in Great Britain, No. 3,317, dated the 14th day of March, 1885,) and of which the following is a specification.

My invention has reference to means or apparatus for producing artificial cold in a simpler and more efficient manner than it has heretofore been done, and thereby the production of ice in solid blocks, the process of freezing or refrigerating being effected by evaporation, as hereinafter particularly described.

Figure 1 is a longitudinal vertical section of a freezing or refrigerating machine constructed according to my invention. Fig. 2 is a transverse vertical section of the said machine upon the dotted lines A B, Fig. 1—that is, the section is taken across the double pillar and acid-receiver. Fig. 3 is a plan of the freezing-chamber, showing how the ice-molds are disposed with respect to each other, so as to admit of rapid freezing by leaving intervening spaces between and around the molds. Fig. 4 is a horizontal section of the acid-receiver, showing the duplex-pillar end of the said receiver partly in elevation.

The same letters of reference indicate corresponding parts in the several figures of the drawings.

a is the freezing-chamber, preferably square in horizontal and vertical cross-section, as shown at Figs. 1 and 3, wherein the ice-molds *b* hang or depend. The said molds are soldered and carried by the supporting-plate b^2, which rests upon an india-rubber seating, b^3, on the upper part of the freezing-chamber, so as to close communication between the chamber *a* and the atmosphere. The removable top or lid c^2 serves to keep radiation of heat and dust from the surface of fresh water in the molds. The freezing-chamber *a* is surrounded by wood casing or lagging *c*. The hanging or suspended molds *b* are separated on all sides by intervening spaces between and around them.

d is a partition inclosing or surrounding the freezing-chamber, and the intervening space between the said partition *d* and the outer casing is filled with salt *e*. The freezing-chamber *a* has resting at its bottom a strong brine solution, e^2, the surface of which comes within a short distance of the bottom of the suspended molds, but leaving sufficient space for free circulation. The mold-plate b^2 is provided with handles b^4, for convenience of lifting the molds from the freezing-chamber on the cover being removed. The joint b^3, of india-rubber, which is interposed between the mold-plate b^2 and the freezing-chamber top, is for the purpose of hermetically sealing the junctions of the parts.

f is a pipe or passage leading from the freezing-chamber to the acid-chamber *g g'*.

f^2 is a valve on the summit of the passage *f*, to admit air into freezing-chamber for destroying the vacuum after ice has been made. When this air-valve is screwed down to its seat, when the machine is in use, the top chamber of it is covered with clear water.

h h^2 are pillar-passages leading to and from the acid chamber or receiver *g g'*, and to and from the freezing or refrigerating chamber *a*. The pillar-passage *h* is provided at its upper end with a plug-valve or cock, *i*, which shuts off communications, or opens and closes the connection between the freezing and acid chambers, so that when the cock is in the position shown at Fig. 1 the air-pump can be in communication with both the freezing and acid chambers, and when turned at right angles to its former position the air-pump can only be in communication with the freezing-chamber. This is for the purpose of extracting from the freezing-chamber all rising moisture contained therein prior to the freezing and acid chambers being allowed to be in communication with each other. This is a most essential element in the arrangement of the machine, as the freezing-chamber is only open when exhaustion is taking place. Were it not for this preliminary exhaustion, the moisture arising from the brine would be absorbed by the acid, which would consequently become greatly diluted and weakened, and its refrigerating effect lessened.

When the cock i is closed, communication between the pump and freezing-chamber is effected through the pipe j, and connection between the pump and the acid-chamber through the pipe j^2, which leads into the pillar-chamber h^2. The top of the said pillar h^2 is partitioned or stopped off, the opening and closing of the passages being determined by the two-way or outlet valve j^3, the pump-passage being marked k^2, while the air-pump barrel is marked k.

Working within the acid-chambers g of combined chambers $g\,g'$ is a spiral vane or acid-agitator, l, mounted upon an axis, l^2, working in bearings $l^3\,l^3$ in the fixed framing carried by the base-plate m.

g^3 is an aperture or opening leading from one acid-chamber to the other. The surface of the sulphuric acid or other chemical equivalent, n, lies above the said aperture, so that on the vane or endless screw being rotated the acid in the chambers is displaced and fresh acid exposed under the hollow pillar h.

g^4 is the inlet-aperture for introducing acid into the chamber.

g^5 is a screw-cap, and g^6 a screw-spindle having a cone end fitting into the seat of the orifice at the outlet g^7. The cup-spaces at both top and bottom are filled with glycerine.

o is a piston provided with equalizing-valves, which work within the air-pump barrel k.

k^3 is an inlet-valve situated at the bottom of the pump, and $k^4\,k^4$ are two outlet-valves situated at the top of the pump, and through these valves the air and moisture in suspension drawn from the freezing-acid chambers is conducted to the atmosphere.

p is a pump-wheel with handle p' mounted upon a crank-axis, p^2, which turns in bearings in the frame q.

r is a crank-plate, and s is a connecting-rod connected at one end to the crank-plate r and at the other end to the cross-head t of pump-guide and piston. The said cross-head works upon guides $q^2\,q^2$.

The crank-axis p^2, which drives the single-acting air-pump, has a chain-wheel mounted upon it, so as to drive the chain p^3, which communicates motion to the chain-wheel on the axis l^3, for giving to the endless screw or acid agitator a slow rotary motion.

Instead of the air-pump being worked, as described, by hand, it may be worked by steam or other power.

The pump-guide cross head t is fitted with ribbon or volute springs $u\,u$, to admit of the piston o touching the top or bottom of the air-pump barrel. The length of the said air-pump barrel is shorter than the stroke of the crank-plate; consequently the piston is gently forced to the top or bottom of the pump, and any concussion relieved by the springs before the turn of the crank-pin at the dead-centers. The yielding of the springs, thus enabling the turning of the crank-pin over the dead-centers, admits of the piston being pressed to the utmost extent of the barrel, and thereby obtaining almost a perfect vacuum, and consequently a very rapid freezing or refrigerating.

The process of freezing or refrigerating is conducted as follows: Remove the screw-cap g^5, screw down the spindle g^6, stopping the orifice g^7. Then pour in the sulphuric acid, filling the chamber g a little above the outlet g^3, and close again the cap g^5. Then fill the top and bottom spaces with oil. Pour strong brine into the freezing-chamber, and place the mold-carrying plate in position, as represented in the vertical section, Fig. 1. Now pour water into the molds b, which water is to be subsequently refrigerated or transformed into ice. The weight of the combined water and molds presses the plate b^2 closely upon the top of the framing c, thereby effecting a sound joint. The cover or lid c^2 is then placed in position, when the apparatus is ready for use on the air-valve f^2 being closed. The handle l^2 of the cock i is turned so as to separate the acid-chamber from the freezing-chamber. The handle of the valve j^3 is next turned in a direction that will admit only of a passage through the pipe j^2, which leads to the acid-chamber. The air-pump k is then worked, so as to draw all the air from the acid-chamber, which said air passes directly to the air-pump through the two-way cock j^3 and air-pump k^2 into the pump-cylinder k, and from thence discharged through the outlet-valves k^4 into the atmosphere. Thus on the exhaustion of the air from the acid-chamber turn again the cock i, so as to open communication between the freezing-chamber and air-pump only, so as to compel the air and moisture to be drawn out of the freezing-chamber a through the passage j to the barrel of the air-pump, and from thence to the atmosphere. The air-pump being worked until no resistance is felt, the cock i is now again turned into the position represented in Fig. 1 and the cock j^3 into a position to allow communication between the acid-chamber through the pipe j^2. The air now remaining is extracted or drawn out in a direction indicated by the arrows, viz.: first from the freezing-chamber, then up the passage f through the cock i, down the hollow pillar h into the acid-chamber g, around the bend of the said chamber, and through the chamber g', and up the passage h^2, and through the outlet j^3 to the air-pump. The worm or endless screw l is slowly rotated at the same time within the axis of the casing g, thereby compelling the acid to be moved forward or ahead, and thereby agitated in the reverse direction in which the air is being withdrawn, as indicated with arrows with cross-strokes, so as to expose fresh acid under the pillar leading to the freezing-chamber. By the said agitation a complete circulation of the acid is set up by its passage through the opening g^3 and back again to the endless screw. On no resistance whatever being felt to the motion of the parts of the machine, the air and vapor has been completely exhausted,

and the water in the molds transformed into solid blocks of ice. The drawing of the air and moisture, or compelling it to travel the circuitous course indicated, is thus presented to a very large acid-surface. The acid-chamber being of a U shape, as shown at Fig. 4, a very long travel is thus obtained and absorption complete. A very low temperature is thereby quickly obtained, and ice made in solid blocks, as all the sides and bottoms of the molds wherein it is transformed are exposed to the freezing-chamber.

To remove the ice thus formed, or the liquid cooled, close the valves i and k and open the valve f^2, which admits air to the freezing-chamber, which thus allows the mold-plate to be removed, with the ice within them withdrawn.

Fig. 5 shows the cross-head t, springs u u, and the top of the piston-rod o^2 upon a larger scale. The said springs are disposed between the collar o^3, washer o^4 on the piston-rod o^2, and the bottoms of the sockets u^2, which allows the piston-rod to yield or give on the piston coming against the top and bottom of the air-pump, in virtue of the piston-stroke being greater than the length of the pump-barrel, so that when the piston strikes the top cover of the air-pump the upper spring is compressed and the neck o^5 of the rod made to slightly slide or move longitudinally in the cross-head, and when the piston strikes the bottom of the pump-barrel the lower spring is likewise compressed by the slightly continued movement of the cross-head.

Two or more refrigerator-chambers may be used in connection with a single pump.

Fig. 6 represents in side elevation, partly in section, a machine arranged with a circular cooling or refrigerating chamber. The chamber a is suspended on two pins, v v, into the receiving-brackets v^2, and by a slight turning from left to right the freezing-chamber is elevated or brought against the top cover, v^3. Between the top cover, v^3, and the freezing-chamber a is a flexible joint, v^4, made of india-rubber or other suitable material by which an air-tight joint is made. The bottom of the freezing-chamber has a stratum of strong brine, w, indicated by dotted lines. x is a refrigerating-coil, through which the liquid to be cooled is passed. x^2 is the entrance to the coil, and x^3 the exit, so that any liquid or semi-liquid substance to be reduced in temperature has only to be passed or allowed to flow through the coil, when a low temperature can be thus imparted to the liquid.

The placing of a coil, x, within a freezing or refrigerating chamber is particularly applicable to the cooling of milk and the like.

The action of the machine and its auxiliary parts is precisely the same as hereinbefore described with respect to Fig. 1. The slower the liquid is allowed to pass through the coil, the lower will be its temperature, and by surrounding the freezing-chamber with a lining of salt a few degrees lower temperature is thus obtained.

Fig. 7 is a plan, and Fig. 8 is an end elevation, of the freezing or refrigerating chamber, Fig. 6. When water is to be cooled or frozen (into solid blocks of ice) in pans closed to the atmosphere, the coil x is removed from the freezing-chamber, and I then place within the inside of the said freezing-chamber a (which is circular) square or rectangular molds or pans y y, Fig. 9, with salt at the bottom of the said chamber. The pans are placed diagonally or across each other in tiers, one above another, so as to present or obtain the greatest possible freezing-surface. y^2 y^2 are lugs cast with V notches or recesses on the chamber to receive the corners of the molds, preferably at opposite angles, which allows the greatest possible cooling-surface to act upon and around the molds from top to bottom of the freezing-chamber; or deep molds may be arranged radially, as in Fig. 10, where the molds are filled with water to be cooled or frozen, and placed in the freezing-chamber above the brine. By thus arranging the pans a large cooling or refrigerating surface is thereby obtained.

The thermometer fixed to the top cover indicates the temperature inside the chamber.

To disconnect the chamber a from the cover v^3, the atmospheric relief-valve z, at the summit of the refrigerator, is opened, when an equilibrium pressure is established, so as to allow the covering v^3 to be removed for gaining access to the refrigerating-chamber, in order to remove the pans containing cooled liquid or solid blocks of ice.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a freezing machine or apparatus, the combination, with the freezing-chamber containing acid, the absorbing-chamber, and a suitable exhaust-pump, of the tubular passages or tubes leading from the freezing and absorbing chambers and communicating with the pump, and the valve located between the said chambers and arranged and adapted to alternately close and open the communication between the same, substantially as and for the purpose set forth.

2. In a freezing apparatus, the combination, with the freezing and absorbing chambers and the exhaust-pump communicating therewith, of devices, substantially as described, whereby communication between the two chambers may be alternately closed and opened, so that after mechanical exhaustion of each separately further and complete evaporation may be effected by the acid in the absorbing-chamber.

3. In a freezing apparatus, the twin acid-chambers g g', communicating with each other at one end, and at the other end leading to tubular columns h h^2, which are in communication with the freezing-chamber and with the exhaust-pump, substantially as described.

4. In a freezing apparatus, the combination,

with the acid-chambers g g', containing axially-mounted agitators, of the cap g^4, cup g^5, spindle g^6, and seat g^7, substantially as described.

5. In a freezing apparatus, the air-pump k, having a piston, o, and piston-rod o^2, whose stroke is greater than the length of the barrel, said piston-rod being provided at its upper end with collars o^3 o^4, neck o^5, and springs u u, the latter lying in sockets w w of the cross-head, substantially as described.

Signed this 25th day of September, 1885.

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