J. F. GESNER.

ICE MACHINE.

No. 177,999. Patented May 30, 1876.

Fig. 1.

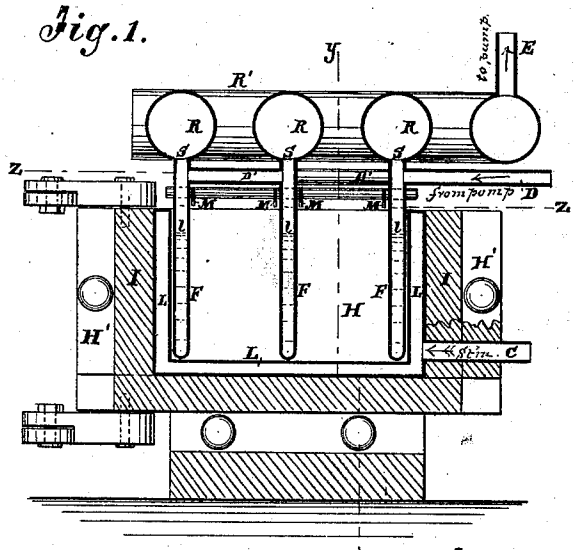


Fig. 2.

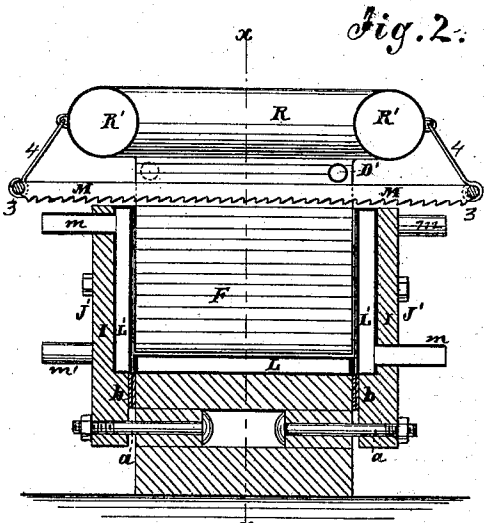


Fig. 3.

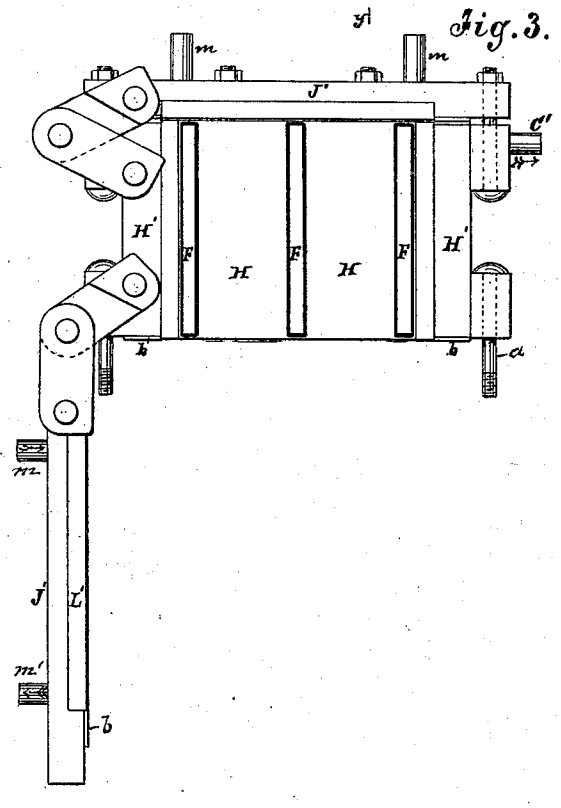
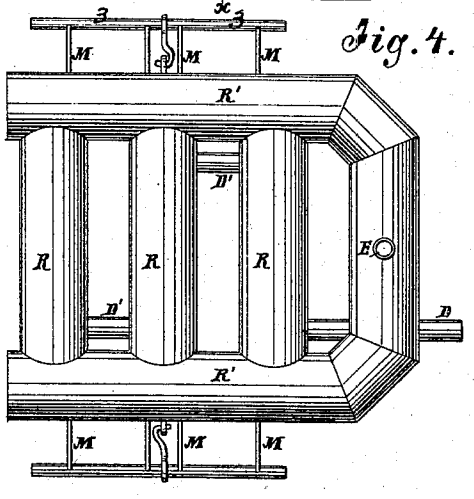


Fig. 4.



WITNESSES:

A Bennecendorf

Alex F. Roberts

INVENTOR:

J. F. Gesner

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN F. GESNER, OF NEW YORK, N. Y.

IMPROVEMENT IN ICE-MACHINES.

Specification forming part of Letters Patent No. **177,999**, dated May 30, 1876; application filed September 19, 1874.

To all whom it may concern:

Be it known that I, JOHN F. GESNER, of New York city, in the county and State of New York, have invented a new and useful Improvement in the Refrigeration of Air and Liquids and the Manufacture of Ice, of which the following is a specification:

The herein-described improvements in the artificial refrigeration of air and liquids and the manufacture of ice are dependent upon the principles of, first, the abstraction of heat or production of cold by the evaporation of a volatile liquid *in vacuo;* second, the subsequent condensation of the gas, after such evaporation, by pressure and cold into the liquid state.

The machines hitherto designed, and the volatile liquids used for artificial refrigeration, dependent upon the above principles, are accompanied with certain defects, and attended with certain disadvantages, which I claim are obviated by the use of the improved apparatus for volatile fluids described herein.

In the use of liquefied ammonia, methylic ether, and other fluids of very low boiling-points, it is necessary to make the condenser of stout strong pipes of small diameter, to withstand the great pressure necessary to liquefy these gases.

My improvements in the refrigerator consist in the combination of long, deep, narrow, rectangular chambers or fluid-freezers, exposing a large evaporating-surface in proportion to capacity, and connected throughout its various parts so as to maintain circulation and a uniform level of liquid, with gas-reservoirs, which are connected with the exhausting and compressing apparatus. The freezers are also combined with a water-cistern, which is constructed with hollow sides, having pipe connections, admitting water or steam to detach the ice by warming the linings of the cistern, also having removable sides for opening to discharge the ice. There are also saws combined with the freezers for cutting the ice from them preparatory to the removal of it.

In the accompanying drawing, Figure 1 is a sectional elevation of my improved refrigerator, taken on the line *x x* of Fig. 2. Fig. 2 is a sectional elevation, taken on the line *y y* of Fig. 1. Fig. 3 is a horizontal section, taken on the line *z z* of Fig. 1. Fig. 4 is a plan view of the refrigerator.

Similar letters of reference indicate corresponding parts.

F represents the freezers, with connections D′ D′, and combined with the gas-receivers R. L shows the level of the liquid in the freezer. The receiver R is a cylindrical or other conveniently-shaped vessel, of much larger capacity than the freezer F, to receive the gas from the evaporated fluid. A slot or space, S, Fig. 1, is cut or cast in it, leaving sufficient space at each end for fitting it to transverse gas-receiver R′. The freezer F is a long, deep, narrow vessel, closed at the bottom and sides, but open at the top, which fits into the space or slot S in the receiver. It is firmly secured in the slot S to the bottom of the gas-receiver R, and level with its interior surface, by bolting or riveting, and soldering around its outer edges, or by other approved means.

These vessels F may be of cast or wrought iron, coated with tin, or they may be made of flat sheets of copper or other metal, soldered together, and braced inside and outside to prevent collapsing by the pressure of the atmosphere without, or rupture from the pressure of the gas or fluid within. They are preferably made of from a half inch to two inches in diameter, from one foot to three feet in depth, and of any convenient length, regard being had to strength of material. Where any considerable length may be required they may be cast or made in sections, and secured to the gas-receivers, as already described.

The object of making these freezers of the form shown and described is not only for economy and convenience, but for the purpose of promoting a "priming" or foaming of the fluid in the said freezers when the gas is withdrawn by the exhaust apparatus from the gas-receivers above. This violent ebullition, keeping the particles of fluid in motion, is favorable to the uniform abstraction of heat from the surfaces of the freezers, and prevents evaporation taking place merely from the exposed surface of the fluid.

Any number of these combined freezers and gas-receivers F and R are placed side by side,

and united and combined, as shown in the drawing. The freezers are connected by tubes alternately end to end, either above or below, for the purpose of maintaining circulation and a nearly uniform level of liquid in each. The transverse gas-receivers R′, uniting the ends of the gas-receivers R, communicate, by pipe E, with the exhaust side of the exhausting and compressing apparatus. D is the tube by which the condensed liquid is returned to the freezers. The freezers F are preferably made of thin sheets of copper, which are united and braced together in any convenient manner, so as to prevent collapse or rupture.

Thus it will be seen that one of the essential features of my improvements in the manufacture of ice consists in freezing the water around and in direct contact with the flat parallel surfaces of the above-described freezers for the more easy detaching of the ice. Another important feature, which I will now describe, is the combination of these flat parallel freezers with a water-cistern, having double walls and removable sides; and another feature consists of a platform with guides and inclined plane for the reception and delivery of the ice.

In the manufacture of ice but one series of freezers is used, and these freezers are arranged in a water-cistern. This water-cistern H is made with double walls and bottoms, with a space, L, between the walls, the outer wall being covered with a non-conducting heat material, I. It is fitted with removable ends or sides J′; also, constructed with double walls, with space L′ between them, and covered with a non-conducting heat material, I. These removable ends or sides are fitted accurately to the sides of the water-cistern, and are made capable of being securely fastened to the same by bolts *a*, screws, or otherwise. Washers *b*, of india-rubber or other elastic packing material, are fastened to the faces of the walls of the removable sides J′, and also to the faces of the sides H′ corresponding to the same, so as to make and maintain a water-tight joint when secured together. These removable sides J′ may be hinged to the water-cistern and made capable of swinging free, or they may be made capable of being withdrawn to either side, or up or down.

The spaces between the walls of the water-cistern are connected by a pipe, C, with a reservoir of steam, hot air, or hot liquid, which may be turned on or off at will by a stop-cock. C′ is the exit-tube, also provided with a stop-cock for the escape of the steam, hot air, or fluid. The space between the walls of the removable sides is also connected, by flexible tubes or equivalent means, with a reservoir of steam, &c., the tubes of entrance and exit being seen at *m* and *m′*.

In the manufacture of ice the removable sides J′ are first made fast by bolts, screws, or springs, to the open ends of the water-cistern. The water-cistern is then filled with water by any suitable means, and the exhausting and compressing apparatus put and kept in action until the water is frozen.

To remove the ice when the contents of the water-cistern are frozen solid, steam is first admitted to the space between the walls of the two sides by the flexible tubes *m m′* until they can be easily detached and withdrawn from the ice formed. This leaves the water-cistern with its contents of ice open at its two extremities. Fine saws M, moving on guides 3 3, (see Figs. 2 and 4,) as near the vertical surface of each freezer as possible, are now worked down the sides of each freezer, freeing the ice from it. These saws are attached to the guides 3 3, which move with the saws as they descend in the process of sawing, and hold the saws snugly up to their work. When not in use the saws are attached to the gas-reservoir by means of the hook-bars 4 4, as shown in Fig. 2. The ice now remains attached only to the bottom of the water-cistern, whence it is detached by admitting steam, &c., to the space between the walls of the water-cistern, and removed by sliding it out upon a platform.

The freezers F are placed close down upon the bottom of the water-cistern, and the ice is sawed as closely as possible to the bottom, in order to avoid the accession of any more heat than is absolutely necessary in detaching the ice. The space between the walls of the water-cistern and the removable sides serves not only for the admission of steam, hot air, or hot liquid, to facilitate the removal of the ice, but when not so used serves to confine a non-conducting space of air, which, together with the non-conducting heat-covering of the water-cistern and removable sides, prevent the ready admission of heat from without to the freezing contents within the water-cistern.

The freezers may be placed at any convenient distance apart, consistent with economy, according to the thickness of ice deemed desirable.

In order to economize as far as possible in the continuous production of ice while the water in the cistern H is freezing, the water intended for the next freezing may undergo a preliminary cooling by exposing it to the refrigerating action of the cold gas evaporated from the fluid in freezers F. For this purpose the gas-reservoirs R, extended and multiplied to any desirable extent, may be surrounded by water in a water-cooler. This water-cooler will consist of a reservoir like the water-cistern H, with double metallic walls, with the air-space L covered externally with a non-conducting heat material—preferably wood—all for the better prevention of accession of heat from without, and fitted with a stop-cock for drawing off the water, when necessary, into the water-cistern below. Spaces will be cut through the bottom of the water-cooler of the width and length of the freezers F, which are to be let down through them into the water-cistern below, and cemented or soldered water-tight in their places. The wa-

ter-cooler may be supported above the water-cistern H in any convenient manner and at any convenient height.

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

1. The combination of gas-reservoirs R and R′ with fluid evaporators or freezers F, substantially as described.

2. The combination, with a water-cistern having double walls, of a removable side or sides, J, provided with double walls and an inlet and an outlet, and elastic washers *b*, substantially as and for the purpose specified.

3. In combination with the gas-reservoir R and R′ and freezer F, the saws M working on the guides 3 3, and provided with a means of being suspended when not in use, substantially as and for the purpose set forth.

JOHN F. GESNER.

Witnesses:
C. SEDGWICK,
ALEX. F. ROBERTS.