H. D. POWNALL.

ICE MACHINE.

APPLICATION FILED JUNE 22, 1910.

992,589. **Patented May 16, 1911.**

2 SHEETS—SHEET 1.

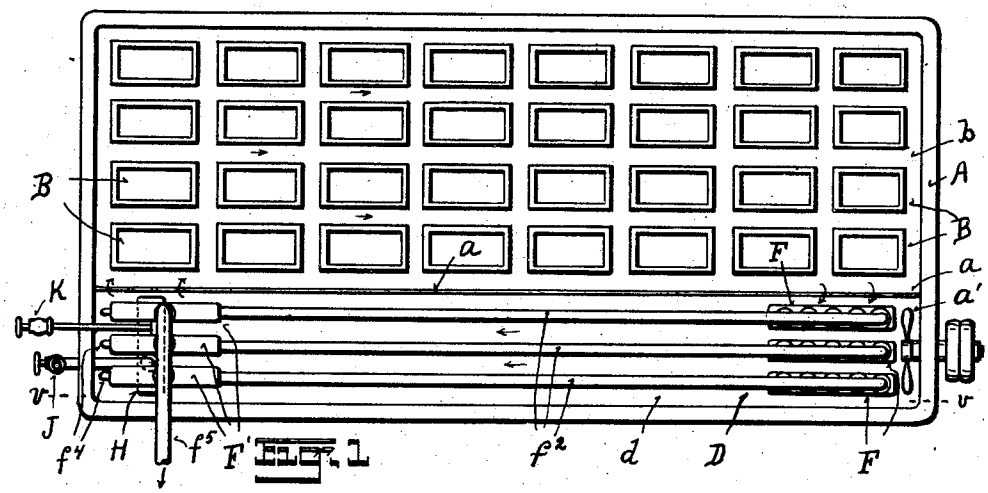

FIG. 1.

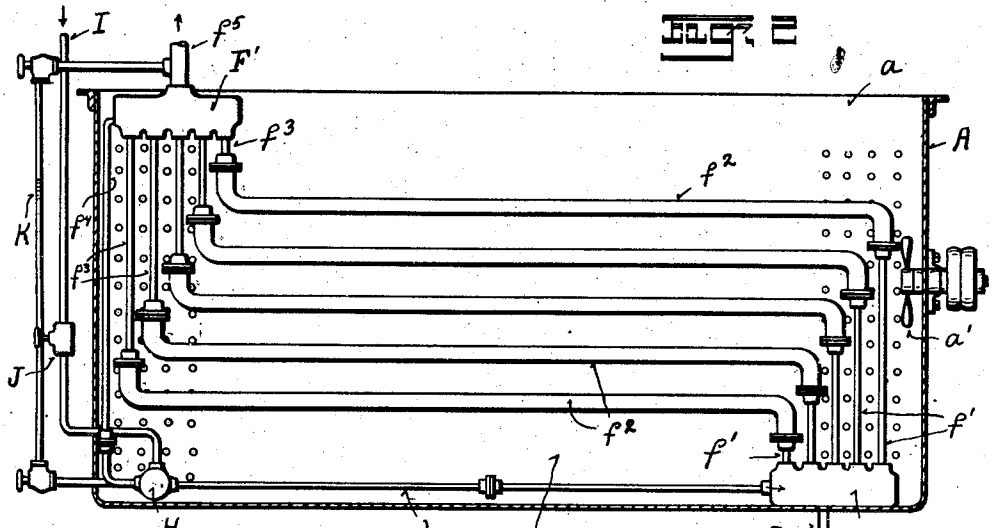

FIG. 2.

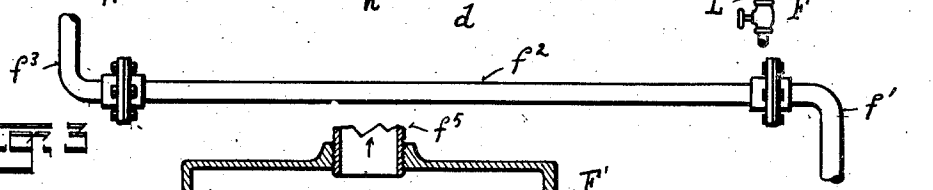

FIG. 3.

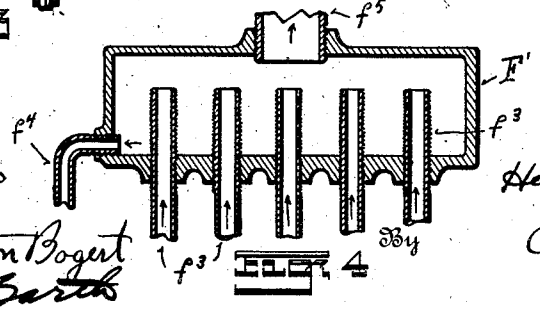

FIG. 4.

Witnesses

W. Thornton Bogert

Chas. Barth

Inventor

Henry D. Pownall

By C. W. Miles.

Attorney

H. D. POWNALL.

ICE MACHINE.

APPLICATION FILED JUNE 22, 1910.

992,589.

Patented May 16, 1911.

2 SHEETS—SHEET 2.

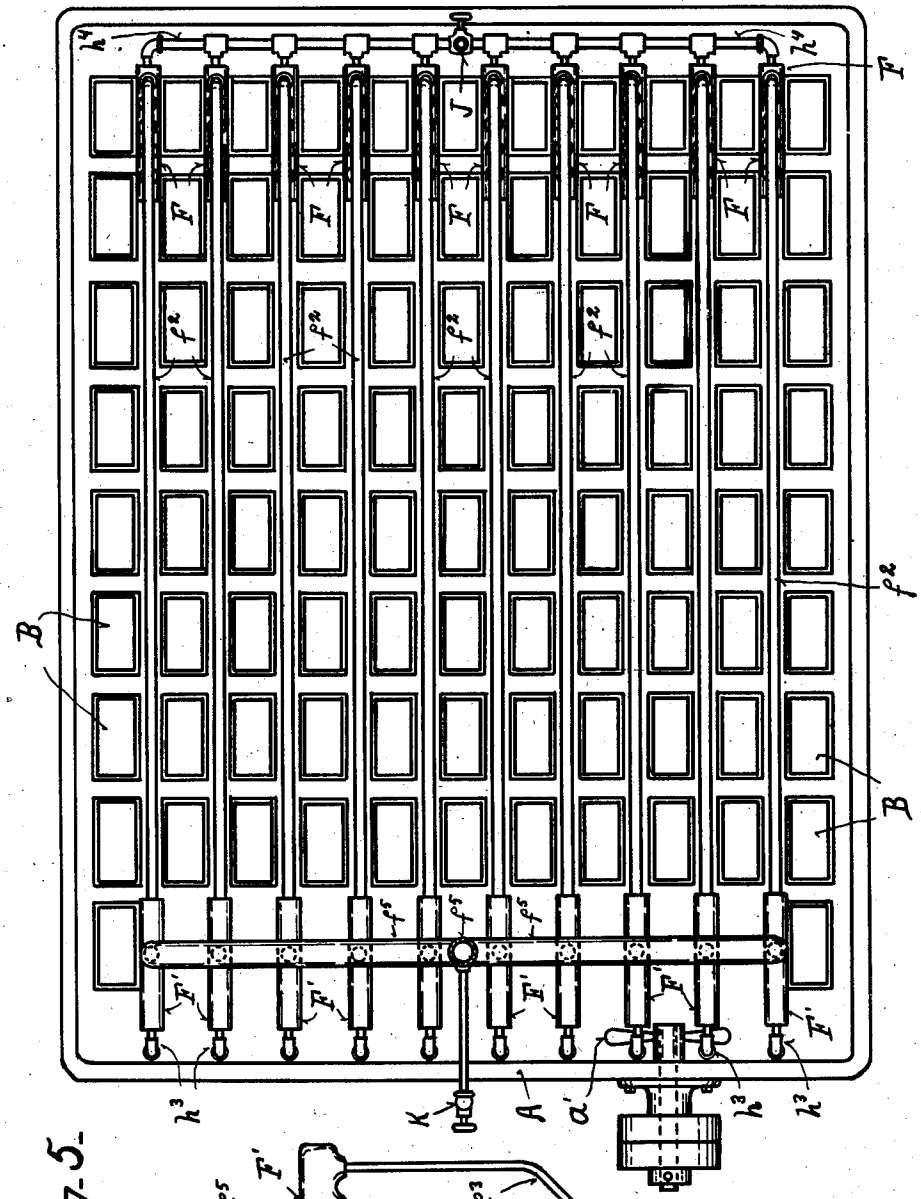

Fig. 5.

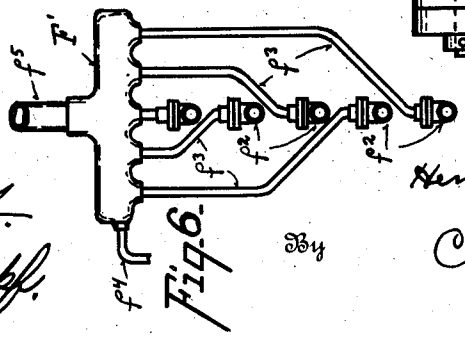

Fig. 6.

Witnesses

Inventor

Henry D. Pownall

By C. W. Miles.

Attorney

UNITED STATES PATENT OFFICE.

HENRY D. POWNALL, OF CINCINNATI, OHIO.

ICE-MACHINE.

992,589 Specification of Letters Patent. Patented May 16, 1911.

Application filed June 22, 1910. Serial No. 568,251.

To all whom it may concern:

Be it known that I, HENRY D. POWNALL, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Ice-Machines, of which the following is a specification.

My invention relates to improvements in ice machines.

One of its objects is to provide improved brine cooling mechanism in which a liquefiable gas in the liquid state is employed.

Another object is to provide improved mechanism, the components of which are capable of being conveniently assembled into units, of the desired dimensions, and as many units as desired united into a cooling system, whereby duplicate parts may be employed for installations of different sizes.

Another object is to provide for a large cooling surface and an elasticity in construction of the respective units.

It further consists in certain details of form, combination, and arrangement, all of which will be more fully set forth in the description of the accompanying drawings, in which:

Figure 1 is a top plan view of an ice machine brine tank employing my improved brine cooler. Fig. 2 is a vertical section through the same on line *v v* of Fig. 1. Fig. 3 is a detail of one of the cooler pipes illustrating a modification. Fig. 4 is a central vertical section through the exit header. Fig. 5 is a view similar to Fig. 1 showing a modification. Fig. 6 is a sectional detail of a modification of the cooler.

As illustrated in Fig. 1, A represents the brine tank of an ice or refrigerating machine, which is divided by one or more partitions *a* so that the brine may be circulated in a loop shaped path in said tank by means of a propeller *a'* or other circulating member. The ice cans B are located in one compartment *b* of the brine tank, and the brine cooler D is located in another compartment of said tank *d*, opposite ends of the partition *a* being perforated to permit the brine to circulate from compartment *b* to compartment *d* and return.

The brine cooler is composed of as many units as may be necessary to provide the requisite amount of cooling surface necessary to secure the desired result. The respective units each comprise an inlet or supply manifold or header F and an exit header F′ which are united by a series of pipes each preferably composed of three sections f' f^2 f^3. The sections f' are attached to the supply header and the sections f^3 to the exit header, and may be conveniently assembled in quantity at the shop. The sections f^2 are preferably of pipe of larger diameter than the sections f' f^3 and are varied in length to suit the dimensions of the brine tank to which they are to be applied. The sections f^2 are preferably united at opposite ends to the sections f' f^3 by means of flanged unions, provided with packing rings to secure tight joints. In the preferred form as shown in Fig. 2 the bends occur in the sections f^2, but may, if desired, be formed in the ends of sections f' f^3 as illustrated in Fig. 3. The sections f' f^3 are of different length to bring the sections f^2 one above the other. The sections f^3 are projected up on the inside of the header F′ as indicated in Fig. 4 so that any liquid which may be forced up with the rising columns of gas will overflow the upper ends of sections f^3 and settle in the bottom of the header F′, which forms a catch basin, from which the liquid is conducted by pipe f^4 to the lower part of the cooler. A pipe f^5 serves to conduct the gas from the header F′. Where the several units are arranged close together in a separate brine cooling compartment the several pipes f^4 from the respective headers F′ are connected to a header H at the bottom of the brine cooling compartment, which header is in turn connected by pipes *h* with the respective headers F. A pipe I leading from a condenser or liquefied gas receiver is provided with an expansion valve J and serves to supply liquefied gas to the headers H F and pipe sections f' f^2 of the respective units so that the level of the liquefied gas stands above the top of the upper section f^2. In practice this body of liquefied gas slowly boils or simmers, converting the liquid to a gas or vapor which rises through the pipe sections f^3 to the headers F′ and thence by the pipes f^5, and is conducted to a compressor or absorber to be again liquefied. A liquid gage K enables the operator to maintain the desired liquid level in the several pipes and headers.

Where it is desired to locate the several units of the cooler between the respective rows of ice cans as indicated in Fig. 5, the header H is dispensed with, and separate pipes h^3 corresponding to the pipes f^4, *h*

serve to conduct any liquid which may be forced up to headers F′ back to the corresponding headers F, and a pipe h^4 connected to the successive headers F serves to supply each of said headers F with liquid and to maintain said liquid at a uniform level in the respective units. A pipe L connected to the bottom of the respective headers F enables the operator to periodically draw off a portion of the liquid and to separate therefrom any accumulated impurities. In Fig. 6 is illustrated a connection of the cooler parts with the headers at right angles.

I am thus enabled to provide a cooler adapted to operate successfully when flooded with liquefied gas, which is composed of parts adapted to be assembled at the shop, and which with slight change are adapted to tanks of different dimensions, and to be combined to form any desired number of units, which are strong and flexible and have a minimum number of joints, and readily repaired by replacing defective parts.

The apparatus herein illustrated and described is capable of considerable modification without departing from the principle of my invention.

Having described my invention what I claim is:

1. In an ice machine a brine cooler comprising a lower inlet header, an upper exit header, a series of pipes connecting said headers and comprising substantially vertical end sections and substantially straight and horizontal central sections, said vertical and horizontal sections being arranged in a substantially vertical plane, a valve controlled liquid supply pipe, and an overflow pipe connecting said headers, and adapted to drain a liquid from said exit header to said inlet header.

2. In an ice machine a brine cooler adapted to be submerged in the brine to be cooled and to normally contain a body of liquefied gas, said cooler comprising a lower header, an upper header, a series of independent conduits arranged one above another in a substantially vertical plane and each connected at opposite ends respectively with said lower header and said upper header, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, a gas exit pipe from said upper header and a valve controlled liquefied gas supply pipe.

3. In an ice machine, a brine cooler adapted to be submerged in the brine to be cooled, and to normally contain a body of liquefied gas, said cooler comprising a lower header, an upper header, a series of independent conduits arranged parallel with each other in a substantially vertical plane and each connected at opposite ends respectively with said lower header and said upper header and composed of a plurality of sections united together, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, a gas exit pipe from said upper header and a valve controlled liquefied gas supply pipe.

4. In an ice machine, a brine cooler adapted to be submerged in the brine to be cooled and to normally contain a body of liquefied gas, said cooler comprising a lower header, an upper header, a series of independent conduits arranged parallel to each other in a substantially vertical plane and each connected respectively at opposite ends with said lower header and said upper header and composed of end sections attached to said respective headers, and intermediate detachable sections, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, a gas exit pipe, from said upper header, and a valve controlled liquefied gas supply pipe.

5. In an ice machine, a brine cooler adapted to be submerged in the brine to be cooled, and to normally contain a body of liquefied gas, said cooler comprising a lower header, an upper header, a series of independent conduits arranged parallel to each other in a substantially vertical plane and each connected respectively at opposite ends with said lower header and said upper header and composed of a plurality of sections united together, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, a gas exit pipe from said upper header and a valve controlled liquefied gas supply pipe, and means to determine the liquid level within said cooler.

6. In an ice machine, a brine cooler adapted to be submerged in the brine to be cooled, and to normally contain a body of liquefied gas, said cooler comprising a series of independent conduits arranged parallel to each other in a substantially vertical plane, a lower header connected to said respective conduits at one end, an upper header connected to said respective conduits at the opposite end, said conduits being composed of a plurality of sections united together, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, a gas exit pipe from said upper header, and a valve controlled pipe from said lower header through which impurities may be withdrawn.

7. In an ice machine, a brine cooler adapted to be submerged in the brine to be cooled, and to normally contain a body of liquefied gas, said cooler consisting of a series of units, each unit comprising a series of independent conduits arranged parallel to each other in a substantially vertical plane,

a lower header connected to said respective conduits at one end, an upper header connected to said respective conduits at the opposite end, a catch basin formed in said upper header, an overflow conduit from said catch basin to the lower portion of said cooler, valve controlled means to supply liquefied gas to the several units of said cooler, and means to conduct the gaseous refrigerant from the upper headers of said respective units.

In testimony whereof I have affixed my signature in presence of two witnesses.

HENRY D. POWNALL.

Witnesses:
C. H. BARTH,
C. W. MILES.