May 22, 1923. 1,455,823

H. E. WILLSIE

ICE MACHINE

Original Filed March 7, 1914 2 Sheets-Sheet 1

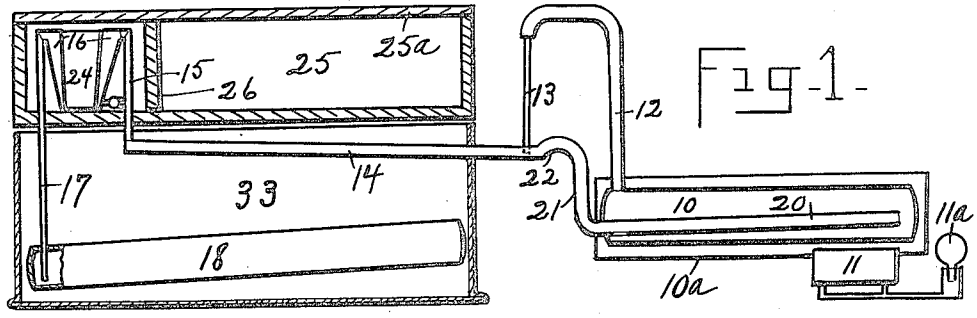

Fig-1-

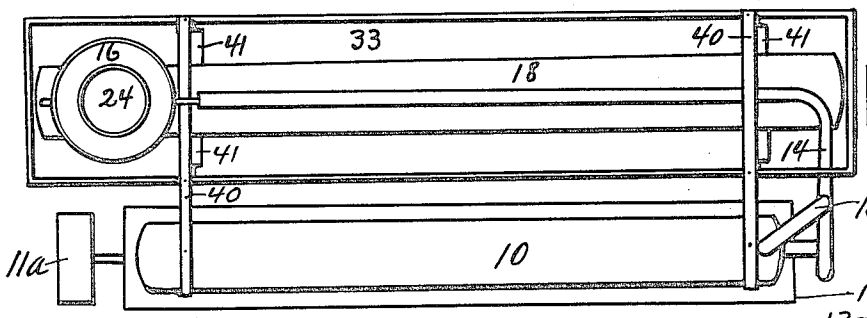

Fig-2-

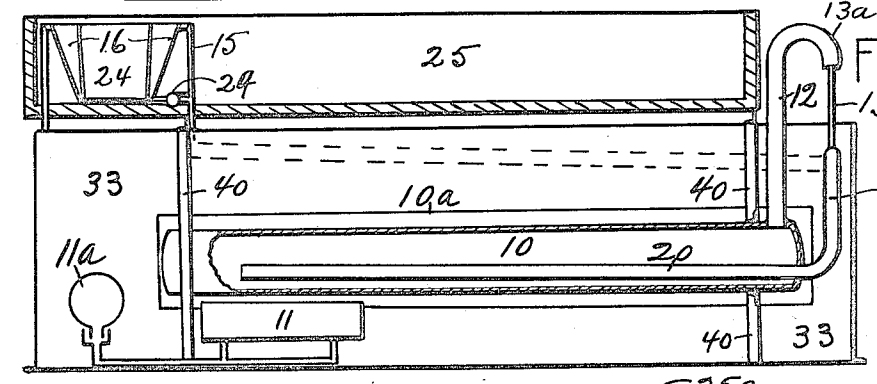

Fig-3-

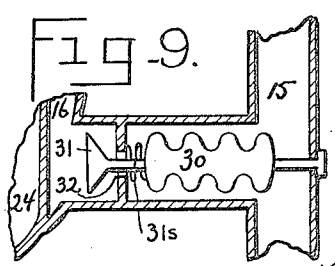

Fig-9.

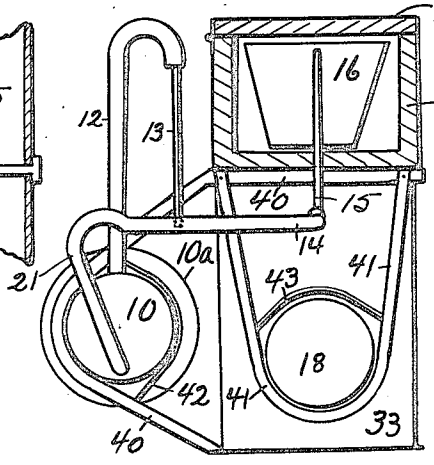

Fig-4-

WITNESSES:

Honore Willsie

INVENTOR

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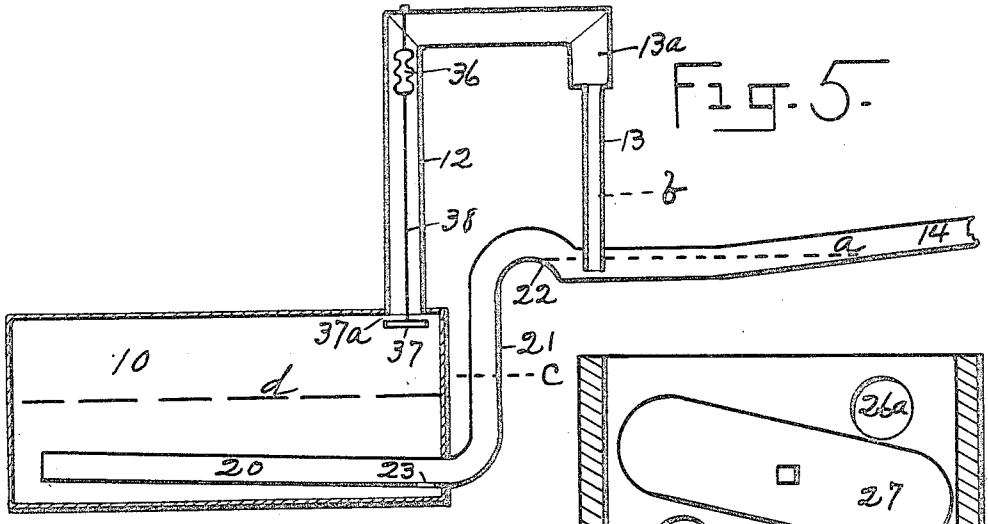

Fig. 5.

Fig. 7.

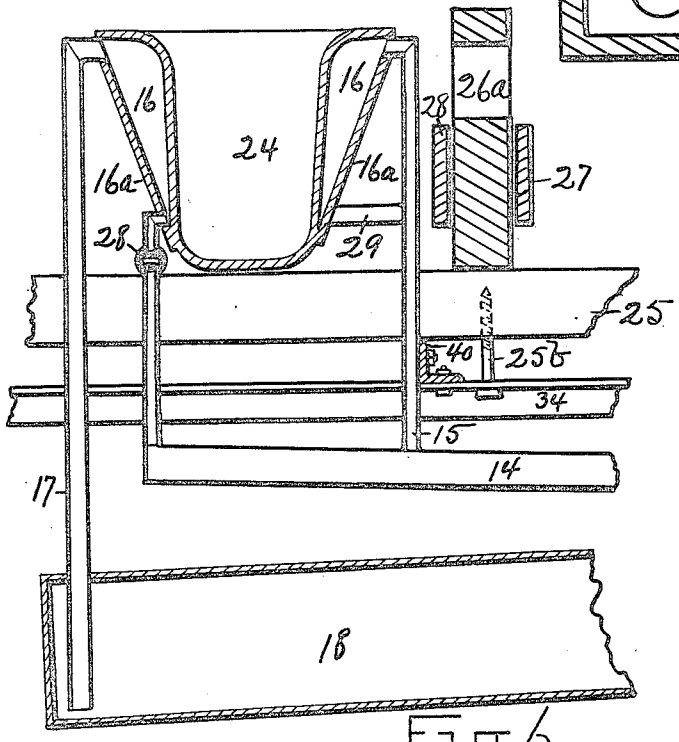

Fig. 6.

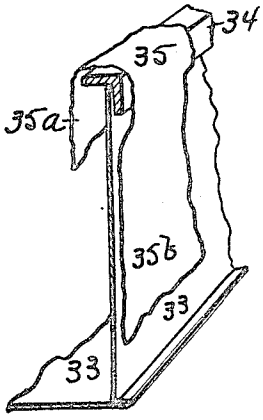

Fig. 8.

WITNESSES:

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M. D. McKeen

INVENTOR

H. E. Willsie

Patented May 22, 1923. 1,455,823

UNITED STATES PATENT OFFICE.

HENRY E. WILLSIE, OF DARIEN, CONNECTICUT.

ICE MACHINE.

Application filed March 7, 1914, Serial No. 823,067. Renewed May 21, 1920. Serial No. 383,286.

To all whom it may concern:

Be it known that I, HENRY E. WILLSIE, a citizen of the United States, and a resident of Darien and State of Connecticut, have invented certain new and useful Improvements in Ice Machines, of which the following is a specification.

This invention relates to ice making and refrigerating apparatus in which a gas is driven off by heat from an absorbing liquid, condensed to liquid form by cooling under pressure, and then by evaporation and reabsorption produces an ice making and refrigerating effect.

The object of my invention is to produce an ice making and refrigerating apparatus suitable for use on farms and at suburban homes especially where running water and motive power are not readily available, and to this end I have made my invention so simple to operate that no especial skill or knowledge of refrigerating apparatus is necessary to use it successfully, and I have eliminated the parts that are apt to get out of order. Besides making it largely automatic in operation another object of my invention is to produce a strong, simple machine that may be sold at a low price. Another object of my invention is to avoid the use of check valves by interposing the avaporator between the still and the condenser.

I attain these objects by the mechanism illustrated in the accompanying drawing in which Figure 1 is a diagrammatic elevation of the machine; Fig. 2, a plan view of the machine; Fig. 3, a side elevation partly sectional, of the same; Fig. 4, an end elevation, partly sectional, of the same; Fig. 5, a vertical section through the still absorber and its connecting pipes; Fig. 6, a vertical section through the evaporator; Fig. 7, a vertical cross-section through the refrigerator showing its shuttered partition; Fig. 8, a perspective sketch showing a means of cooling the water tank; and Fig. 9, a vertical, partly sectional view of the thermostatic drain valve.

Similar figures refer to similar parts.

The operation of my machine, as shown in Fig. 1, is as follows: A still-absorber, 10, partly filled with aqua ammonia, is heated by a blue flame kerosene stove, 11, thus driving ammonia gas through the pipes 12, 13, 14, 15, the evaporator, 16, the pipe 17, into the condenser 18, where the gas is liquified, the condenser being submerged in water contained in tank 33. When the oil in the reservoir, 11^a, burns out, allowing the still-absorber to cool, the liquid ammonia is forced up pipe 17 into the evaporator 16. Gas returns to the still-absorber through pipes 20, 21, because of the device shown in Fig. 5. The still-absorber is charged when sold with aqua ammonia to about the level shown by dotted line *d*, and the pipe 14 is also charged with liquid to the level of the dotted line *a*. The trap, 22, permits an excess of liquid in pipe 14, due to condensation or drain, to flow into the still-absorber. When the still-absorber is being heated the liquid rises in pipe 21 to about the level of dotted line *c*. The lower open end of the pipe 13 is below the level of dotted line *a* so that the pressure of the returning gas forms a liquid column in pipe 13 to about the height of the dotted line *b*, when, the liquid in pipe 21 having been depressed a distance equal to the height of the column of liquid in pipe 13, the gas flows into pipe 20 and mixing with the aqua ammonia flowing up through hole 23 is absorbed. To prevent oscillations of the liquid column in pipe 13 a chamber, 13^a, is provided at the top of pipe 13. The pipe 14 drains toward the still-absorber and has the function of a rectifier. The evaporation of liquid in the evaporator 16 freezes water placed in the ice pocket 24 and also cools the refrigerator, 25. This refrigerator is provided with a partition 26 having two openings, 26^a and 26^b, which may be closed by pivoted shutters, 27, 28. When the stove is lighted these shutters are closed over the openings 26^a, 26^b, and the ice is transferred by hand from the ice pocket 24 to the food compartment of the refrigerator. When evaporation again begins in 16 water is poured in ice pocket 24 and the shutters are moved to uncover the openings 26^a, 26^b. The refrigerator has a door 25^a.

I prefer to form the evaporator by drawing the ice pocket part into the shape shown in Fig. 6 and welding to it a surrounding metal cone, 16^a, into which are welded the connecting pipes. That any water collecting in the evaporator may be drained into the still-absorber a hand operated drain cock, 28, may be used, but I prefer to use the thermostatic drain valve 29 shown in Fig. 9. This consists of an expansible cartridge 30 filled with a fluid, operating a plug 31 to close the opening 32. Warm gases from the still passing up pipe 15 expand the cartridge

30 causing the plug 31 to move from the opening 32, thus permitting any liquid in 16 to drain out. The spring 31^s tends to close the plug 31 into the opening 32. When the absorption period begins the first of the liquid to reach the evaporator evaporates near the cartridge causing it to contract and close the opening.

While the amount of water in tank 33 is sufficient to condense the ammonia gas without undue pressure under most conditions of weather yet in tropical climates it is desirable to cool the water in tank 33 by means of the burlap evaporation device shown in Fig. 8. The top of the tank 33 is strengthened by angle irons, 34, and over the top of the tank is draped burlap, 35, or other cloth, so that one end 35^a dips into the water and the other end 35^b is in contact with the tank on its outside. Dry desert winds, even if hot, blowing on this wet burlap have a cooling effect.

As a safety precaution I use a device shown in Fig. 5, consisting of an expansible cartridge 36 controlling a damper 37. This cartridge is not primarily a thermostatic device as its shape is changed first and most by pressure. I fill the cartridge with air compressed, say, to 200 pounds and at the temperature at which the cartridge is to act. When the ammonia pressure in the machine exceeds 200 pounds the cartridge is compressed and through the rod 38 raises the damper 37, thus closing the opening 37^a. The effect of closing the opening 37^a is to force a large part of the aqua ammonia from the still 10 into the condenser 18 which then becomes an absorber, greatly reducing the gas pressure in the machine. The further operation of the machine under normal conditions will return the liquid to the still-absorber 10.

In constructing the machine the still-absorber, 10, and the condenser, 18, are secured to bent angle irons, 40, 41 by bolts, 42, 43 and this angle iron frame is bolted to the water tank 33. Pipes connecting into the evaporator are also bolted to the angle iron frame. Bolts, as 25^b, secure the refrigerator 25 to the water tank. The pipe 17 drains the bottom of condenser 18 which is inclined so as to drain to the end of the pipe 17. The still-absorber 10 is surrounded by a casing 10^a. The numerals 14, 15, 20, 21, 22, indicate different parts of a single pipe and the different functions of these parts are obtained by suitable bends in the pipe length. The wall of the tank 33 may be of some porous substance.

What I claim and desire to secure by Letters Patent is:

1. In an ice making machine, the combination of a still-absorber, a tank adapted to contain cooling water, a condenser within said tank, an evaporator, a pipe connecting the bottom of the condenser with the top of the evaporator, a rectifier adapted to drain into a trap and connected to the top of the evaporator, a trap connected to and adapted to partly drain into the still-absorber at a low level, a pipe connected to the bottom of the trap and connected to the still-absorber at a high level and adapted to oppose a column of liquid to gas returning to the still-absorber, and means for heating the still-absorber.

2. In an ice machine, an evaporator, a pipe through which gas may flow into and out of said evaporator, and a thermostatic valve adapted to drain said evaporator into said pipe.

3. In an ice machine, an evaporator, a pipe communicating with said evaporator above the bottom thereof, a passage through which a communication is established between the lower portion of said evaporator and said pipe, and an automatically operating valve for controlling the flow through said passage.

4. In an ice machine, an evaporator, a pipe communicating with said evaporator above the bottom thereof, a passage through which a communication is established between the lower portion of said evaporator and said pipe, and a thermally controlled valve for controlling the flow through said passage.

5. In an ice making machine, the combination of a tank adapted to contain cooling water, a condenser within said tank, an evaporator connected to the condenser, a still-absorber connected to the evaporator, and means for evaporating water from the side walls of said tank.

6. In an ice making machine, the combination of a condenser, an evaporator, a connection between the condenser and the evaporator, a still-absorber, a pipe connecting the still-absorber to the evaporator and adapted to have the functions of a drain, a trap and a rectifier in different parts thereof, and a connection between the top of the still-absorber and said pipe.

7. In an ice making machine, the combination of a condenser, an evaporator, a connection between the condenser and the evaporator, a still-absorber, a pipe extending into the still-absorber and connecting it to the evaporator and adapted to have the functions of a circulator, a drain, a trap and a rectifier in its different parts, and a connection between the top of said still absorber and said pipe.

8. In a refrigerating machine, a still absorber, an evaporator connected thereto, a condenser connected to said evaporator, and a thermostatic valve operated by the hot gas from the still and adapted to drain the evaporator.

9. In a refrigerating apparatus, a still ab-

sorber, an evaporator, a rectifier connected to said still absorber and to said evaporator, a thermostatically controlled valve operated by the hot gas from the still for draining said evaporator into said rectifier, and a condenser connected to said evaporator.

10. In a refrigerating apparatus, a still absorber, a rectifier and trap connected to the upper part of said still absorber and to the lower part of said still absorber, an evaporator and a thermostatically controlled valve operated by the hot gas from the still for draining the evaporator, a condenser, and a conduit connecting the upper part of the evaporator with the lower part of the condenser.

11. In a refrigerating machine, a still absorber, an evaporator connected to the upper part of the still absorber to receive gas therefrom and connected to the lower part of the still absorber to return gas thereto, a thermostatically controlled valve operated by the hot gas from the still for draining the evaporator, and a condenser having its lower part connected to the upper part of the evaporator.

12. In a refrigerating apparatus, a still absorber, an evaporator, a conduit connecting the upper part of the still absorber with the upper part of the evaporator, a connection between said conduit and the lower part of said still absorber, a connection from the lower part of the evaporator and said conduit, and an automatically operated valve controlling drainage through said connection.

13. In a refrigerating apparatus, a still-absorber, an evaporator, a condenser, a conduit connecting the still absorber to the top of the evaporator, a pipe connecting the top of the evaporator to the bottom of the condenser to form the operative connections between the still absorber and the condenser, and valved means for automatically draining water from the bottom of the evaporator.

14. In an ice making machine, the combination of a still-absorber, relief means therefor, an evaporator, a condenser, a pipe connecting the bottom of the condenser with the top of the evaporator, and a pipe connecting the top of the evaporator with the still-absorber, the said pipe connections being adapted to conduct gas from the still-absorber through the evaporator to the condenser, and from the condenser through the evaporator and back to the still-absorber, and an automatic drain valve for said evaporator.

15. In an ice making machine, the combination of a still-absorber, an evaporator, a drain therefor and a condenser connected together in an operative cycle by pipes in such a way that fluid passing from the still-absorber to the condenser and from the condenser to the still-absorber passes through the evaporator and liquid automatically drains from said evaporator, and a relief device for said still absorber.

16. In refrigerating apparatus of the absorption type, the combination of a still absorber, a refrigerating member, a condensing member below said refrigerating member, communicating means between said still absorber and said refrigerating member, communicating means between said condenser and refrigerating member, and thermostatic means for draining said refrigerating member automatically.

Signed at Cranford, in the county of Union and State of New Jersey, this 25th day of February A. D. 1914.

HENRY E. WILLSIE.

Witnesses:
HONORÉ WILLSIE,
G. M. HENDRICKS.