(No Model.)

W. H. APPLETON.

ICE MAKING AND REFRIGERATING MACHINE.

No. 458,440. Patented Aug. 25, 1891.

Fig. 1.

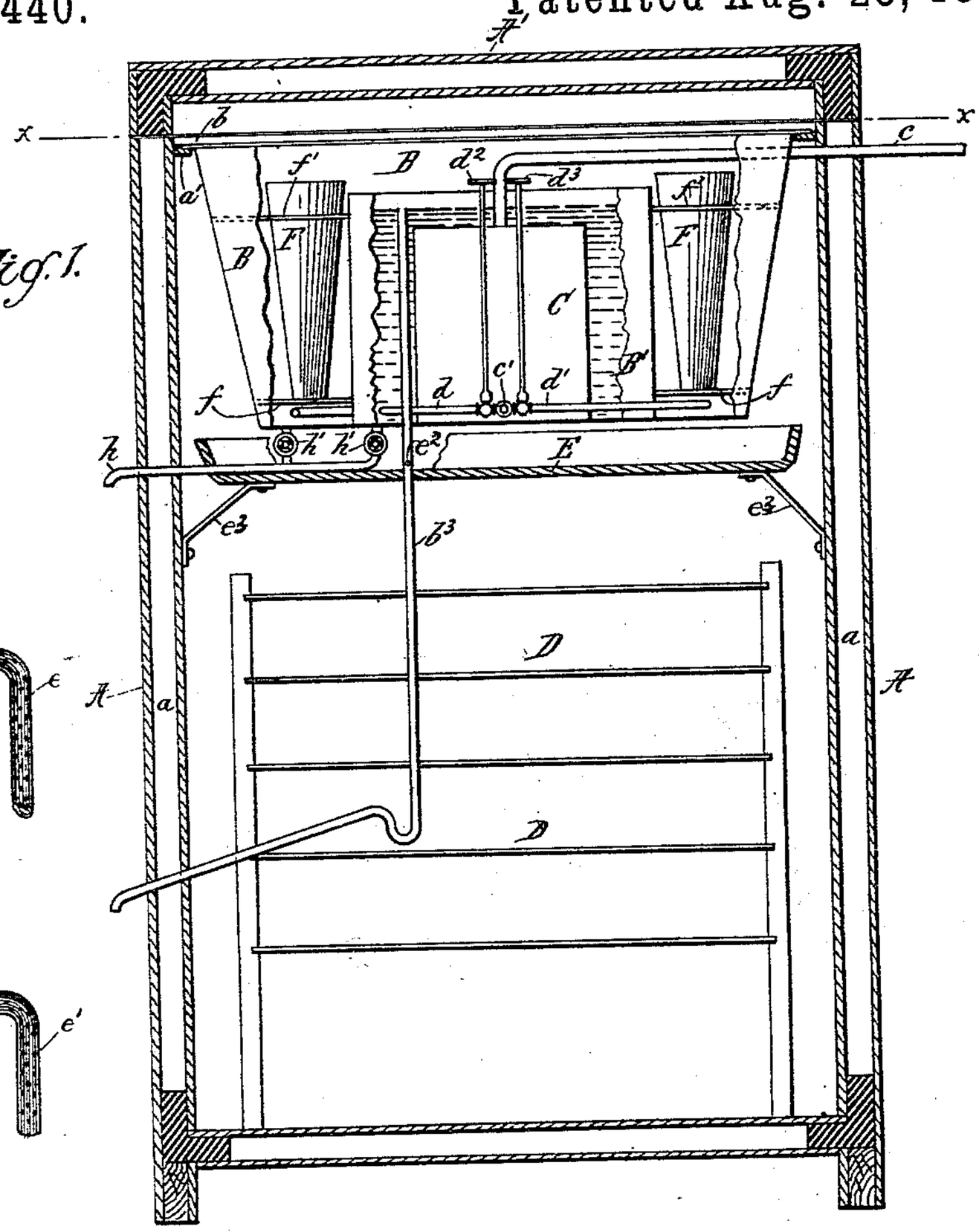


Fig. 3.

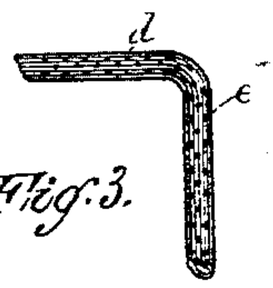


Fig. 4.

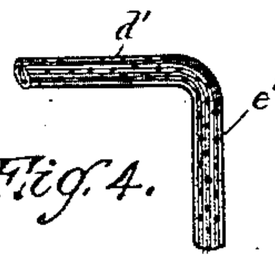


Fig. 5.

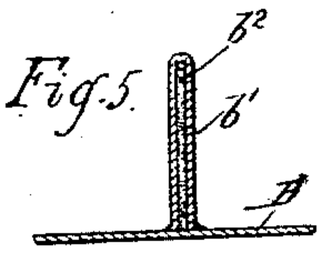
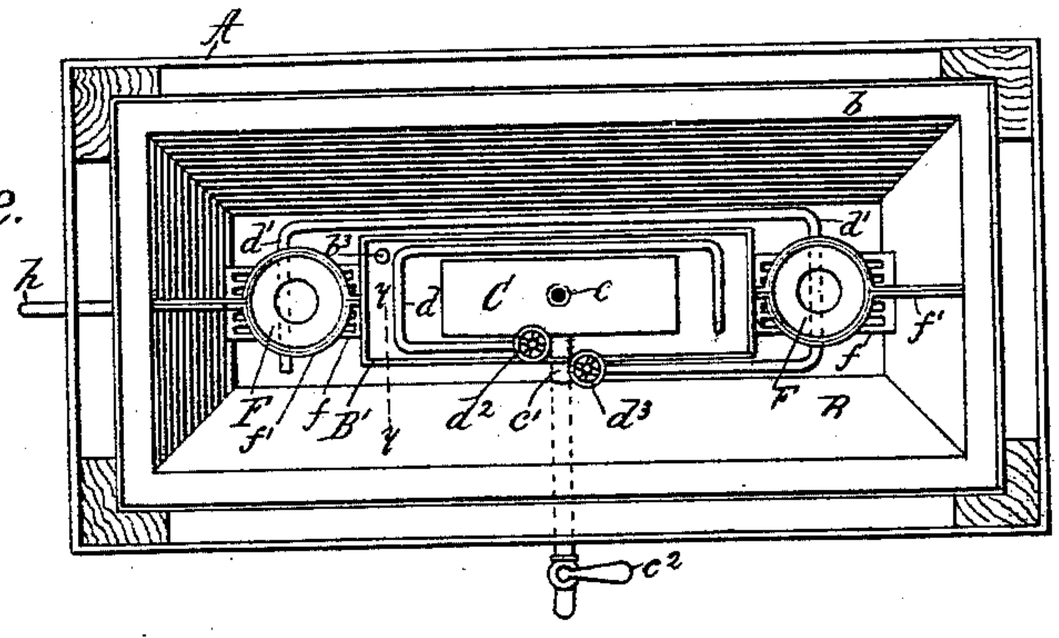


Fig. 2.



WITNESSES:

C. W. Benjamin,
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UNITED STATES PATENT OFFICE.

WILLIAM H. APPLETON, OF NEW YORK, N. Y.

ICE-MAKING AND REFRIGERATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 458,440, dated August 25, 1891.

Application filed January 29, 1891. Serial No. 379,547. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. APPLETON, a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Ice-Making and Refrigerating Machines, of which the following is a specification.

My invention relates to that class of ice-making and refrigerating machines in which a frigorific or freezing mixture composed of the usual salts—such, for instance, as nitrate of ammonia or nitrate of ammonia and carbonate of soda combined with water—are employed, and has for its object to produce a machine of this class which shall be simple, cheap, and compact in construction, shall obviate as far as possible the freezing of the pipes which conduct the water through the machine, and which shall be more effective and reliable than those heretofore in use.

To these ends my invention consists, first, in the combination, with the vessels for holding the frigorific or freezing mixture, of a tank or cooler for holding drinking-water, arranged within the inner end thereof, and a system of pipes for conducting the water from the tank or cooler and delivering it to one or the other or both of said vessels, as may be desired, and, second, in various other combinations and arrangements of parts, all as will hereinafter more fully appear.

Referring to the accompanying drawings, in which my invention is shown applied in connection with an ordinary domestic refrigerator, Figure 1 is a sectional elevation of the same, some of the parts being broken away to more clearly illustrate parts beyond; Fig. 2, a sectional plan thereof, taken on the line *x x* of Fig. 1; Figs. 3 and 4, details showing the perforations in the pipes which conduct the water from the tank or cooler to the outer and inner vessels containing the frigorific or freezing mixture, respectively; and Fig. 5 a section of the walls of the inner vessel, taken on the line *y y* of Fig. 2.

In all the figures like letters are employed to designate corresponding parts.

A indicates a refrigerator, which is or may be of any ordinary or preferred construction and is provided with a suitably-hinged cover A′ and dead-air spaces *a a*, or otherwise, as may be desired.

B B′ indicate the vessels for containing the freezing-mixture, the same being constructed of such material as will resist the corroding action of the mixture thereon. The vessel B, which for the purposes of this specification I shall call the "outer vessel," is preferably made in rectangular form, with its sides inclining outward from bottom to top, as shown, and is of a size at its upper edge to substantially fit the interior of the refrigerator, in the upper portion of which it is supported by means of an outwardly-projecting flange *b*, resting upon cleats *a′*, secured to the inner side thereof. The vessel B′, which for convenience of description will be called herein the "inner vessel," is also preferably made in rectangular form and is arranged within the outer vessel B, the same being constructed either as an independent device or formed by securing its walls to the bottom of the latter. This last-mentioned construction is the one I prefer in practice, however, and in order to prevent the conduction of the heat from the freezing-mixture contained in the outer vessel to the freezing-mixture contained in the inner vessel, and vice versa, I find it convenient to construct the walls of this inner vessel double, with some heat-non-conducting material interposed between them, as shown in Fig. 5, in which the walls are illustrated as formed from a strip of sheet metal *b′*, bent into U form and soldered or otherwise secured at its edges to the bottom of the outer vessel B, with a strip b^2 of heat-non-conducting material—such, for instance, as card or other similar board—arranged between the two portions thereof; but however constructed the walls of this vessel should be somewhat lower than the walls of the outer vessel, to permit of the freezing-mixture contained in the latter vessel, when such freezing-mixture rises to a certain point, flowing over these walls and into the former vessel, which is provided with an ordinary overflow-pipe b^3 to prevent the mixture from rising therein beyond a certain limit.

Within the inner vessel B′, I arrange a tank or cooler C, which, like the vessel B′, may either be made as a separate structure or

from a coil of pipe, or be constructed with its walls secured to the bottom of the vessel B. This tank or cooler is preferably made of sheet metal or other similar material, with a closed top to render it thoroughly water-tight, and is provided with a suitable induction-pipe *c* for connection with the usual main or other water-supply and with a discharge-pipe *c'*, extending out through the walls of the inner and outer vessels and through the wall of the refrigerator, where it is supplied with a valve or faucet c^2, by means of which the flow of the water through it may be controlled. Connected with this discharge-pipe *c'* and extending around within the inner and outer vessels B B' are the pipes *d d'*, respectively, for conducting the water from the pipe *c'* and discharging it into their appropriate vessels. These pipes are each provided with a suitable valve d^2 d^3 for controlling the flow of the water through them, and instead of having their ends open, so as to permit of the water passing freely therethrough, such ends are closed and the under sides of said pipes are provided with small perforations *e e'*, as shown in Figs. 3 and 4, for the purpose of causing the agitation of the salts in bottom of the vessels by the action of the water as it flows through them and of permitting of the mixture contained in the vessels entering their respective pipes when the valves d^2 d^3 are closed to prevent freezing. As thus constructed, water introduced through the induction-pipe *c* will pass into the tank or cooler C, thence into the discharge-pipe *c'*, and, if the valves d^2 d^3 be opened, thence through the pipes *d d'*, and be discharged into their respective vessels B B'. The continued flow of water to these vessels will cause them to gradually fill, the water in the outer vessel rising until the upper edge of the walls of the inner vessel is reached, when it will flow over such walls and be discharged into that vessel, and the water in the inner vessel rising until the top of the overflow-pipe b^3 is reached, when it will be discharged through that pipe, and the further rise in the two vessels will thereby be prevented.

In order to permit of the ready withdrawal of the freezing-mixture from the inner and outer vessels B B' when it may be desired to clean them or otherwise, I sometimes find it convenient to employ the pipe *h*, which, extending through the walls of the refrigerator, is connected at its inner end to the bottoms of each of said vessels, and is provided with suitable valves *h'*, whereby the passage through said pipe may be opened and closed, as desired.

Beneath the cooling devices thus described I arrange a series of shelves D for the reception of such articles as may be placed upon them, and with a view to preventing the mixture contained in the inner and outer vessels B B', due to leakage or otherwise or to the condensed moisture occasioned by the warmer air in the refrigerator coming into contact with the cooled outer surface of such vessels, dropping into or upon the articles placed upon such shelf, I arrange beneath the cooling devices a drip-pan E, which communicates with the overflow-pipe b^3 by means of an orifice e^2 and is supported in place by suitable brackets e^3, secured to the side of the refrigerator, as shown.

Nitrate of ammonia or other suitable salts being placed in the inner and outer vessels B B', the valve d^2 being opened and the water admitted through the induction-pipe *c*, the operation of my machine is as follows: The water will first enter the tank or cooler C, which it will soon fill, thence pass out into the discharge-pipe *c'*, thence through the pipe *d*, and thence be discharged into the vessel B', where it will mix with the nitrate ammonia or other salts, making a solution therewith and rising in such vessel until it reaches the top of the overflow-pipe. The valve d^2 is then closed, and after some minutes the valve d^3 is opened and the water allowed to flow into the outer vessel B, where, as in the vessel B', it meets with the freezing-salts and forms a solution, filling such vessel until the solution flows over the upper edge of the walls of the inner vessel and into such vessel, and this continues as long as the valve d^3 remains open. As a result of this the solution in the inner vessel absorbs the heat from the water contained in the tank or cooler, reducing its temperature and causing it to be discharged into the outer vessel in a greatly cooled condition, where, meeting with the freezing-slats, its temperature is still further reduced and the desired degree of refrigeration is reached. If now it be desired to avail of the refrigerating effects of this mixture to cool or freeze any article or substance, such article or substance is immersed in the mixture, and in order to provide means for conveniently holding it therein I provide the receptacles F F, which are preferably made of sheet metal and rest upon grated bottoms *f f*, their upper ends being held in place through the instrumentality of the supports or stays *f' f'*, through which they pass. After the freezing-mixture has performed its function of cooling the articles or substances contained in the receptacles F F it flows over into the vessel B', where it is still further availed of to cool the incoming water in the tank or cooler C, following which it is discharged from the inner vessel B, and thus the operation of the machine is made practically continuous. At the same time that the cooling of the water in the tank or cooler C and the articles or substances in the receptacles F F are being effected the air in the refrigerator beneath the vessels B B', by coming in contact with their cooled surfaces, is gradually being refrigerated. The cooled air being heavier than the warmer air below descends and gradually displaces it, causing the latter in turn to come in contact with the vessels and be cooled, and thus the temperature of the entire air contained in the

refrigerator is equalized and reduced to a point approximating the temperature of the mixture in the freezing-vessels.

In the operation of the machine as thus far described the freezing-salts have been employed in both the inner and outer vessels; but, if desired—as, for instance, when it is the wish to cool only the water in the tank or cooler for drinking purposes—the salts will only be deposited in the inner vessel and the water will be supplied to that vessel alone, the other vessel remaining empty during the time the machine is so employed.

In using my machine I prefer to employ nitrate of ammonia and water, the best results being attained when the proportions of those constituents are about equal; but, if desired, carbonate of soda may be combined with them and good results attained. When it is desired to draw off the solution contained in the vessels B B′, it is only necessary to open the valve h' h', when it will flow through the pipe h and be discharged into any convenient receptacle. The solution thus discharged, with that carried off through the overflow-pipe b^3, may then be evaporated by any suitable means and the ammonia or other salts recovered and used again.

From the foregoing it will be seen that I produce a machine which is exceedingly simple in construction, effective in operation, and admirably suited for many purposes where a comparatively small amount of ice or cooling is required.

While I have shown the best means contemplated by me for carrying my invention into practice, I wish it distinctly understood that I do not limit myself strictly thereto, as it is obvious that the same may be modified in various ways without departing from the spirit thereof.

Having thus described my invention and one way in which it is or may be carried into effect, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with an outer freezing-mixture-holding vessel of an ice-making machine and a second freezing-mixture-holding vessel arranged within the same and constructed with its walls of less height than the walls of the outer vessel, of a receptacle or cooler for water arranged within the inner vessel, and connections whereby water delivered to such receptacle or cooler may be discharged into either one or both of said vessels, substantially as described.

2. The combination, with an outer freezing-mixture-holding vessel of an ice-making machine and a second freezing-mixture-holding vessel arranged within the same and constructed with heat-non-conducting walls which are of less height than the walls of the outer vessel, of a receptacle or cooler for water, arranged within the inner vessel, and connections whereby water delivered to such receptacle or cooler may be discharged into either one or both of said vessels, substantially as described.

3. The combination, with the outer vessel B and inner vessel B′, arranged within the former and constructed with the walls thereof of less height than the walls of the former vessel, of the tank or cooler C, arranged within the inner vessel and provided with the eduction-pipe c', extending outwardly through the walls of the refrigerator, the pipes d d', connected with the eduction-pipe and extending around within the inner and outer vessels, respectively, for conveying the water thereto, and the valves d^2 d^3 for regulating the flow of water through such last-mentioned pipes, substantially as described.

4. The combination, with the outer vessel B and inner vessel B′, arranged within the same and constructed with the walls thereof of less height than the walls of the former vessel, of the tank or cooler C, provided with the discharge-pipe c', the pipes d d', extending around within the inner and outer vessels, respectively, with their ends closed and provided with perforations in their under sides, and the valves d^2 d^3 for regulating the flow of water through the last-mentioned pipes, respectively, substantially as described.

In testimony whereof I have hereunto set my hand this 22d day of December, 1890.

WILLIAM H. APPLETON.

Witnesses:

GEORGE P. APPLETON,

ROBT. W. WATERBURY.

Letters Patent No. 458,440.

Correction in

It is hereby certified that in Letters Patent No. 458,440, granted August 25, 189
upon the application of William H. Appleton, of New York, N. Y., for an improv
ment in "Ice Making and Refrigeratiug Machines," an error appears in the print
specification requiring correction, as follows: In line 26, page 1, the word "en
should read *one;* and that the said Letters Patent should be read with this co ion
therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 29th day of September, A. D. 1891.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

W. E. SIMONDS,
Commissioner of Patents.