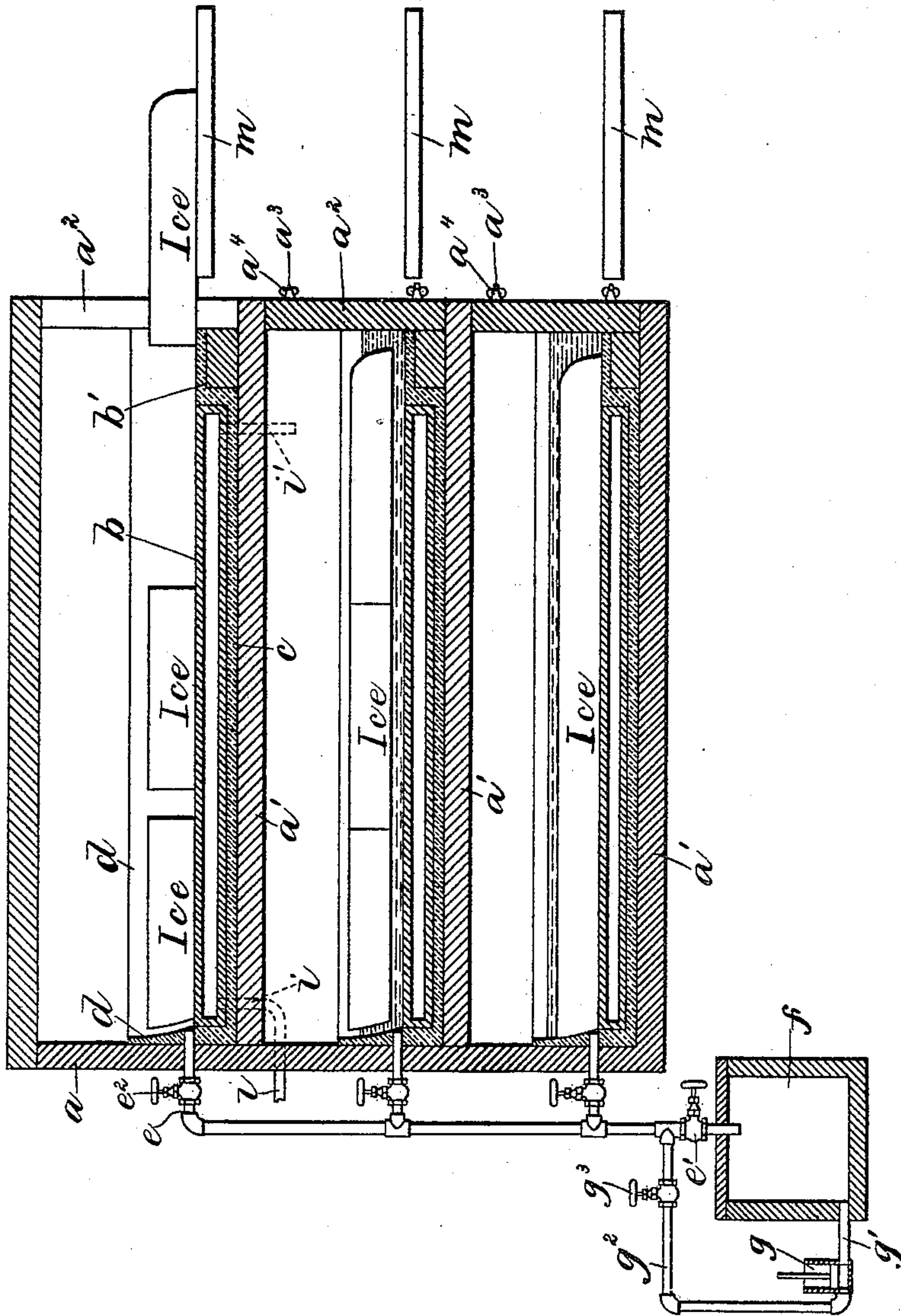


(No Model.)

W. L. CHURCH & S. A. REEVE.
ICE MAKING APPARATUS.

No. 529,343.

Patented Nov. 13, 1894.



WITNESSES:

A. D. Harrison.
W. H. M. Leach

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UNITED STATES PATENT OFFICE.

WILLIAM LEE CHURCH, OF NEWTON, AND SIDNEY A. REEVE, OF BOSTON,
MASSACHUSETTS, ASSIGNORS TO THE WESTINGHOUSE, CHURCH, KERR &
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ICE-MAKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 529,343, dated November 13, 1894.

Application filed January 30, 1894. Serial No. 498,428. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM LEE CHURCH, of Newton, in the county of Middlesex, and SIDNEY A. REEVE, of Boston, in the county of Suffolk, in the State of Massachusetts, have invented certain new and useful Improvements in Ice-Making Apparatus, of which the following is a specification.

This invention relates to the formation of ice in a horizontal tank having at its bottom an ice-forming or generating bed which receives a volatile liquid and in which said liquid is expanded into gas to absorb heat from the water in the tank.

The invention naturally follows another improvement which forms the subject of another application for Letters Patent of the United States, said improvement consisting in freezing a body of water from the bottom only, and partly to the top of the water, leaving a covering of water on the top of the cake and then liberating the cake by the heat of the remaining water, the latter floating or lifting the cake from the generating bed.

The invention has for its object to provide a convenient construction of apparatus whereby after the cake has been floated, as above described, from the bed, the surplus water may be disposed of and the cake conveniently removed from the bed.

The invention also has for its object to provide improved construction of the tank, looking to a rapid cleaving of the ice therefrom.

To these ends, the invention consists in the improvements which we will now proceed to describe and claim.

The accompanying drawing, forming a part of this specification, represents a vertical section of an apparatus embodying our invention.

In the drawing, a represents a casing which comprises a series of shallow tanks, each of which has a bottom a' forming a structural part of the casing, a freezing bed b supported by said bottom and preferably insulated therefrom by a filling c of a non-conducting material such as paraffine, ice-limiting sides or walls d extending around three sides of the bed b , a removable end section a^2 which is detachably secured to the casing by means of

suitable fastening devices such as bolts a^3 and nuts a^4 , said detachable section forming with the walls d an inclosure entirely surrounding the bed b , and an ice-limiting bed b' composed of paraffine or other non-conducting material which is non-adhesive to ice interposed between the bed and the removable section a^2 , said bed b' being substantially flush with the surface of the bed b .

e represents a water outlet pipe extending from the tank outwardly to a water receiver f , said pipe e being adapted to drain off from the tank all the water that remains therein after the completion of the freezing operation.

g represents a pump which is connected by a pipe g' with the receiver f and by a pipe g^2 with the pipe e , said pump being adapted to force water from the receiver b back into the tank, when the valve e' in the pipe e is closed and the valve g^3 in the pipe g^2 is opened and the valve e^2 in the pipe e is opened.

The operation of the apparatus is as follows: The tank being supplied with a charge of sweet water somewhat deeper than the thickness of the ice to be frozen liquid ammonia is introduced into the bed b through a pipe i , and is expanded therein, the gas escaping through a pipe i' . The water on the bed b is frozen by the expansion of the liquid, and the freezing operation is allowed to progress upwardly, but is stopped before the entire body of water is frozen, a sheet of water being left upon the top of the cake. The freezing action is then stopped and the bed is warmed sufficiently to cleave the ice therefrom by any suitable means, such as the introduction of a relatively warm gas into the bed, as described by us in another specification, or by allowing cleavage of the ice being materially assisted by the water remaining at the top of the cake, said water working its way downwardly and tending to float or raise the cake from the bed. When the cake has thus been floated, the remaining water is drawn off into the receiver f by opening the cock e^2 , or it may be drawn directly into the next lower tank by opening the proper valves. The end section a^2 is then removed and the ice, which now rests loosely upon the bed b , is moved horizontally endwise across the limit-

ing bed b' and through the opening caused by the removal of the section a^2 upon the track or way m the receiving end of which is substantially flush with the bed b . If the cake is larger than the commercial size, it may be split up into smaller cakes by any suitable means, either before or after its removal from the tank, and the chips or spawls being returned to the tank serve to further cool the water, and nothing is wasted. The track or way m may conduct the cakes to a storehouse or elsewhere. After the removal of the cake, the section a^2 is replaced and the tank charged with water, the pump g being used if desired, to return the water to the receiver f , with such additional supply as may be required. The section a^2 should be packed in a suitable way, so as to render its connection with the casing water-tight, but only a light packing is required as the head of water is but a few inches.

It will be seen that the described apparatus enables the operation of detaching the cake of ice by floating the same through the agency of a body of water left above the cake and the subsequent operation of removing the cake horizontally from the bed to be conveniently performed, the outlet pipe e conveniently disposing of the surplus water before the end section a^2 is removed to permit the withdrawal of the cake.

We have here shown a series of three tanks arranged in vertical order, each having the described construction and all connected with the water receiver f .

It will be seen that the walls d and ice-limiting bed b' being non-adhesive to ice and of non-conducting material as described materially facilitate the cleaving of the cake. We do not limit ourselves, however, to the particular arrangement of the ice-limiting walls and bed, as the bed and the outlet pipe and the removable end section may be used in connection with any other suitable means for forming the sides of the cake; or if desired, the limiting bed b' may be extended entirely around the generating bed b , in which case the walls

d would not be required, as the extension of the ice would be arrested before it came in contact with the walls of the tank, or the lower end of the cake can be made square by the use of a vertical removable, non-adhesive, limiting wall, such as has been described in another application made by William Lee Church, one of the joint inventors named herein.

We claim—

1. An ice making apparatus comprising a sweet-water tank or receptacle having a removable end section, a freezing bed at the bottom of said section and a non-conducting limiting bed which is non-adhesive to ice interposed between the freezing bed and the removable end section, whereby the extension of the ice to the end section is prevented.

2. An ice making apparatus comprising a tank having a freezing bed at its bottom, approximately vertical walls of non-conducting material, which is nonadhesive to ice extending along three sides of the freezing bed, a removable end section completing an inclosure around the freezing bed, and a substantially horizontal ice limiting bed interposed between said end section and the freezing bed, whereby the extension of the ice to the end section is prevented.

3. An ice making apparatus comprising a sweet water tank having a removable end section, a freezing bed, and a water outlet pipe, a water receiver communicating with the said outlet pipe and located below the tank, and a pump connected with the said receiver and with the tank, whereby water may be returned from the receiver to the tank.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 20th day of January, A. D. 1894.

WM. LEE CHURCH.
SIDNEY A. REEVE.

Witnesses:

W. W. CHURCHILL,
W. M. WHEILDON.