D. L. HOLDEN.

Method and Apparatus for Producing Ice.

No. 205,643. Patented July 2, 1878.

Fig. 1.

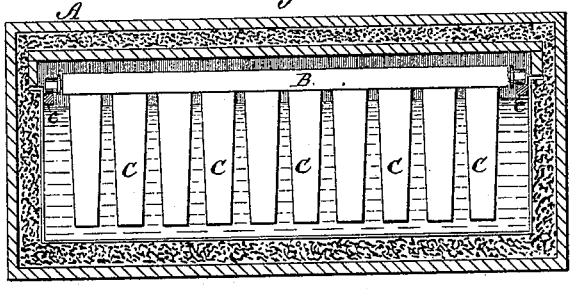


Fig. 2.

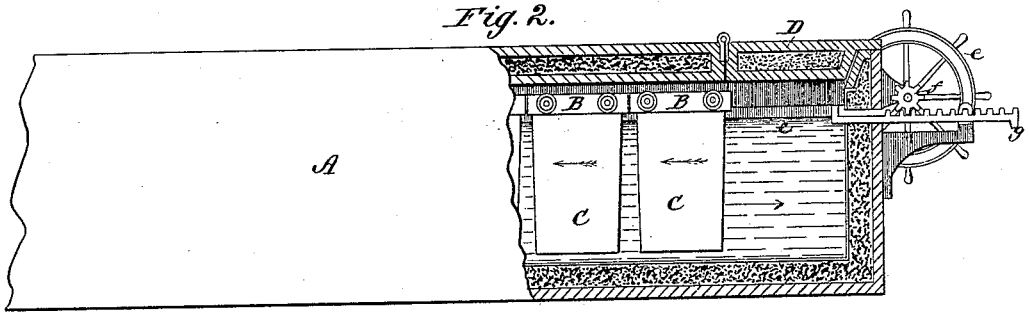
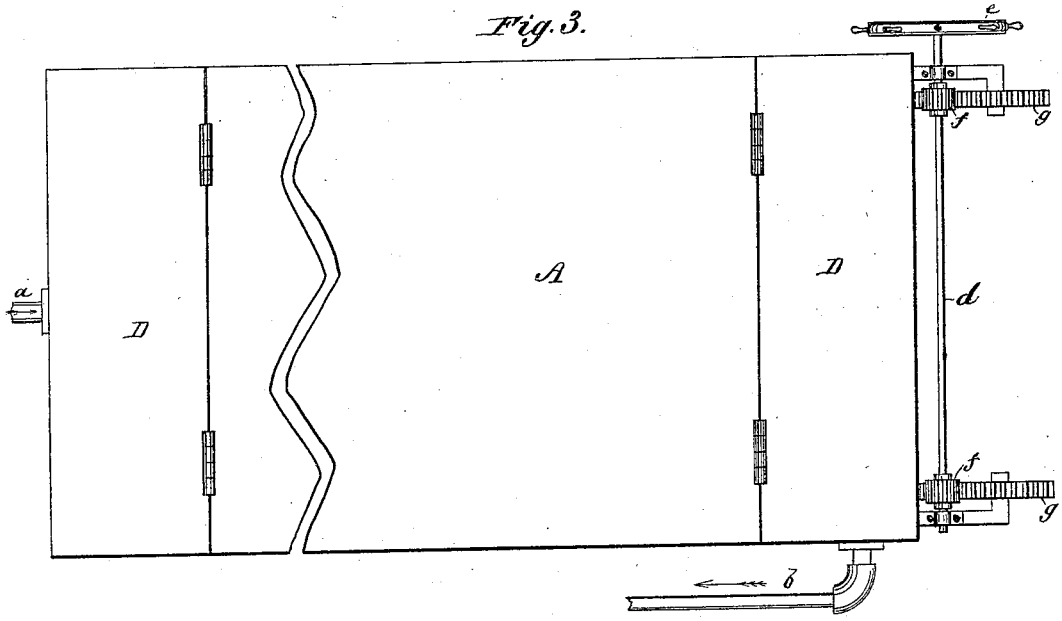


Fig. 3.



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IMPROVEMENT IN METHODS AND APPARATUS FOR PRODUCING ICE.

Specification forming part of Letters Patent No. **205,643**, dated July 2, 1878; application filed May 10, 1878.

To all whom it may concern:

Be it known that I, DANIEL L. HOLDEN, of the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Ice-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a vertical transverse section. Fig. 2 is a side view of a part of the tank, with one end in vertical longitudinal section. Fig. 3 is a plan view, showing both ends of tank, with a part of the middle broken away for want of space.

This invention is an improvement upon that feature of an ice-machine known as the congealer, or compartment in which the freezing of the water is effected by immersing the cans in a non-congealable fluid whose temperature is reduced below the freezing-point.

The improvement consists in the particular construction and arrangement of a longitudinal tank for the non-congealable fluid, having rails upon the side, which support wheeled carriers containing pendent cans, which cans are filled with water and immersed in a refrigerated non-congealable fluid, and which carriers, with the cans, abut against each other on traversing the rails within the tank placed above the level of the fluid, and are separately lifted out the end doors.

The invention also consists in the method of introducing the cans containing the water into the end of the tank whence the non-congealable fluid is discharged, and then feeding them gradually toward the end of the tank at which the non-congealable fluid enters, where the cold is most intense, by which means the air is expelled from the water, the freezing of the same more gradually effected, and the ice is made clear and solid, instead of white and snowy, as when it is suddenly crystallized with more or less air in the same.

This method also apportions the degree of cold of the non-congealable fluid to the work to be performed in freezing the water—that is to say, the least degree of cold is utilized for freezing the first film of ice, and the greatest degree of cold utilized for freezing the water in the central portion of the can, where it has to operate through a thickness of ice already formed.

In the drawing, A represents the tank, made of any suitable size and length, and well insulated or incased with a packing of some poor conductor of heat. Said case is provided at one end with an inlet, *a*, Fig. 3, and at the opposite end with an outlet, *b*. These connections are arranged in communication with the refrigerator of an ice-machine, and through them a non-congealable fluid, refrigerated by the ice-machine, is made to traverse the tank.

Upon the inner sides of the tank, near the top, are fixed rails *c c*, upon which travel wheeled carriers B. These carriers consist of frames equaling in length the tranverse dimensions of the tank, which frames are provided with fixed or removable cans C, depending from the frame so as to be immersed in the non-congealable fluid. These cans are designed to contain the water that is to be frozen, and a series of them may be arranged together in one frame, or one continuous receptacle may be employed instead. To facilitate the removal of the blocks of ice, these cans are made a little tapering, the largest end being at the top.

At each end of the upper surface of the tank is hinged a door, D, through one of which the carriers are inserted, and through the other of which they are removed. Now, the cans of the carriers being filled with water, and the carriers placed in the tank with their rollers resting upon the rails, the method of manipulation and action of freezing will be as follows:

The non-congealable fluid enters at *a* at its lowest temperature—at zero, for instance—and in passing to the other end absorbs a part of the heat of the water in the cans to freeze it, thus losing a part of its cold and rising to a temperature of 32°, for instance. Now, as the water in the cans of the carrier first introduced becomes frozen, the said carrier is taken out at the end *a* where the cold fluid enters, and is transferred to the opposite end of the tank, to be relieved of its burden and refilled with water. This transfer is effected by a traveling crane running upon suspended rails, or by any other suitable means.

To relieve the cans of their blocks of ice, they are lowered for a few seconds into a warm bath to loosen the blocks, and the latter then withdrawn. The cans in the tank are then moved up along the rails toward the colder end of the tank, in order to fill up the vacancy made by the removal of the first and to give place for the set of cans just emptied.

This movement of the carriers up along the rails may be effected by any mechanical means; but I prefer to use the device shown, which consists of a shaft, *d*, having hand-wheels *e e* and pinions *f f*, which pinions engage with racks *g g*, which, from the revolution of the shaft, press against the nearest carrier and urge the whole along the rails.

By introducing the freshly-filled cans at the outlet end of the tank for the non-congealable liquid important advantages are secured. In the first place, the freezing is effected gradually, so that the ice formed is clear, transparent, and free from air-bubbles, instead of being white and snowy in appearance, as is the case when frozen rapidly. Furthermore, when introduced at the point of least cold and gradually fed to the point of greatest cold, the small degree of cold is utilized at a time when it can readily operate upon the water through the sides of the can, while the greatest cold is utilized at a time and place where great cold is required to operate through the film of ice already formed to freeze the interior of the can.

The economy of this method of manipulation is obvious. The newly-filled cans enter liquid of a temperature of 32°, for instance, where a film of ice at once forms, and, as they gradually move forward they are subjected to a greater degree of cold as the ice-film thickens, until, finally, they reach the coldest point, where the warmth of the remaining uncongealed water has to be extracted through the greatest thickness of ice.

With respect to the construction of my tank, I am aware that receptacles for containing a cold non-congealable fluid have been immersed in a tank containing the water to be frozen, and that such receptacles have been supported upon side rails in the tank by means of rollers so as to permit a degree of movement; but as these receptacles for non-congealable fluid must have pipe-connections for the entrance and discharge of the non-congealable fluid, the movement of such receptacles on the rails is limited, and the idea of traversing the rail is not only not contemplated, but is not capable of being carried out by reason of the pipe-connections. In view of this arrangement, however, I limit my invention to the tank having doors on its upper surface at each end, and rails, as described, combined with disconnected and removable carriers for the cans, adapted to abut against each other in traversing the rail, and be separately inserted and lifted out at the end doors.

Having thus described my invention, what I claim as new is—

1. The tank having side rails near the top and doors upon its upper surface at each end, in combination with a set of disconnected carriers provided with cans and means for advancing the same, whereby the carriers are made to abut against each other in traversing the tank and be separately inserted and removed at the ends, substantially as and for the purpose described.

2. The method of freezing water in cans, which consists in immersing the cans containing the water in a current of non-congealable fluid reduced below the freezing-point, and feeding them gradually from the discharge end, or point of least cold, to the inlet end, or point of greatest cold, substantially as and for the purpose described.

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Witnesses:

EDWD. W. BYRN,

CHAS. A. PETTIT.