J. GAMGEE.

Apparatus for Forming Sheets of Ice.

No. 204,210. Patented May 28, 1878.

Fig. 2.

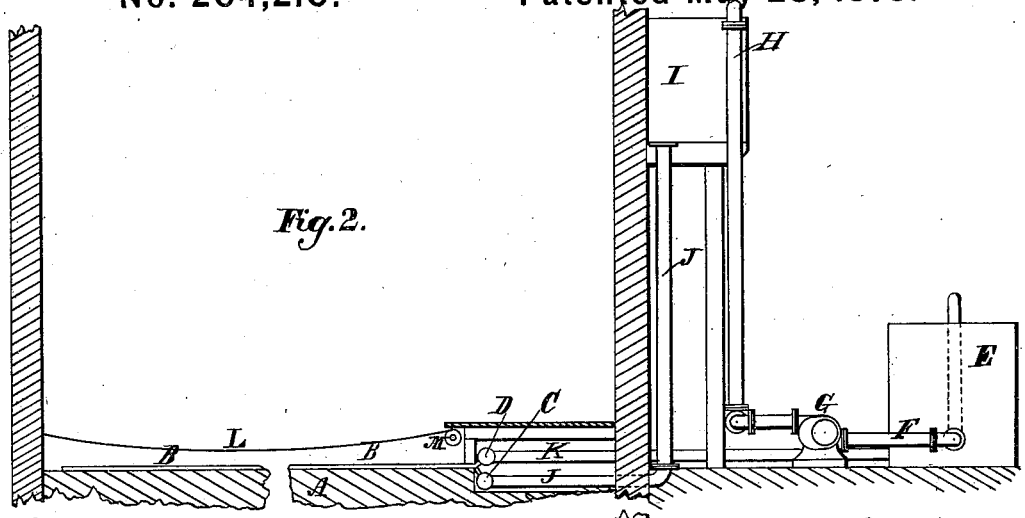


Fig. 1.

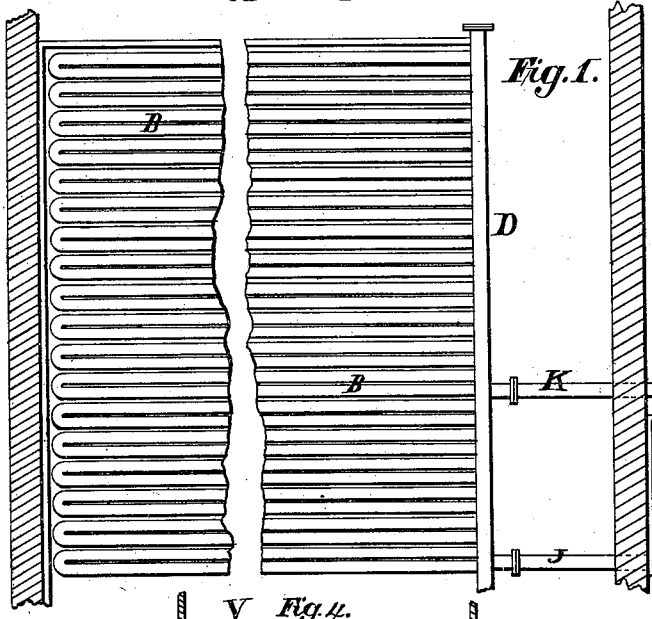


Fig. 3.

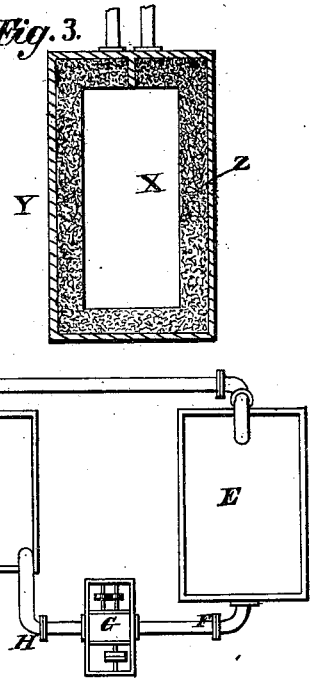
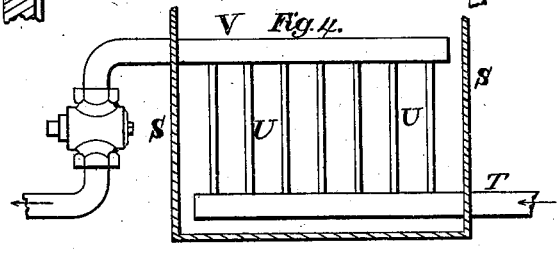


Fig. 4.



Witnesses:

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JOHN GAMGEE, OF CHELSEA, GREAT BRITAIN.

IMPROVEMENT IN APPARATUS FOR FORMING SHEETS OF ICE.

Specification forming part of Letters Patent No. **204,210**, dated May 28, 1878; application filed October 16, 1877.

To all whom it may concern:

Be it known that I, JOHN GAMGEE, of 379 Kings Road, Chelsea, in the county of Middlesex and Kingdom of Great Britain, at present residing at Metropolitan Hotel, Washington, District of Columbia, in the United States of America, have invented certain Improvements Applicable to the Formation and Maintenance of Skating-Rinks, of which the following is a specification:

The object of my invention is to produce a solid sheet of ice capable of supporting numerous skaters, and to enable it to resist the surrounding heat.

Various efforts have previously been made to produce artificially ice-surfaces for skating upon; but none of them have been successful. According to some, saline solutions have been caused to flow beneath a metal surface, which has been intended as the support for water to be frozen into ice; but these solutions freeze at a temperature of 18° Fahrenheit when stagnant and at 8° or 10° when in active circulation, so that, if a freezing-machine is suddenly stopped and the moving brine or saline solution brought to a stand-still, it will solidify and destroy the metal tubes or surfaces. Now, instead of a saline solution, I employ a liquid which will not congeal above 0° Fahrenheit, such as glycerine and water mixed in equal proportions by measurement, or alcohols, and I cause it to flow beneath a metal surface upon which the water to be frozen into ice rests.

As it is essential to keep the metal space beneath the ice always full of the above-mentioned liquid, the ordinary method of direct circulation by pumps is not efficacious, and as, also, it may be necessary to concentrate the cooling powers of several machines at special points, I employ elevated reservoirs of a refrigerant, in which the liquid is first cooled and maintained at a very low temperature, and from which it is permitted to flow evenly under the metal surface.

Sometimes I supplement the power of a freezing-machine by immersing the vessel containing the above-mentioned freezing-liquid in or causing the freezing-liquid to flow through a vessel or tank containing ice and salt, ice and chloride of calcium, or other refrigerating-salt or ice through which strong brine or a solution of some refrigerating-salt is made to circulate. Thus as fast as the ice on the surface of the rink becomes cut up it may be thrown into the ice tank, and thereby economized.

Where freezing machinery cannot be erected, or when a sufficient supply of ice can be obtained without the use of machinery, I sometimes employ ice with refrigerating-salts to cool the freezing-liquid used to make and maintain the ice on the rink—that is to say, I put ice and salts in a vessel, through which the freezing-liquid is caused to circulate, so that the freezing-liquid may be reduced to a low temperature, and I cause it to circulate below the metal floor of the rink, so as to freeze the water thereon. I thus form and maintain an ice-rink without the employment of ice machinery at the spot.

Finally, I cause currents of cold dry air to pass over the surface of the ice at intervals, or continuously, especially in warm weather, and for the purpose of confining such currents of cold air to the surface, or of conforming the cold air to the surface when artificially-produced currents are not passed over it, I sometimes stretch a non-conducting cover temporarily over the ice at a distance therefrom of, say, six or eight inches, or thereabout; and, in order that the manner of carrying my invention into effect may be fully understood, I annex a sheet of drawings, showing how I prefer to arrange the rink and the apparatus connected therewith.

In these drawings, Figure 1 is a plan of a rink, and Fig. 2 a vertical section through the the rink and machine-room.

A is the floor of the rink, on which the freezing-pipes B are laid. These pipes are of U shape, one branch opening into the general supply-pipe C and the other into the general outlet-pipe D. E is the refrigerator for cooling the freezing-liquid. F is the pipe conducting the freezing-liquid from the refrigerator to the pump G, by which it is elevated through the pipe H to the reservoir I. The pipe J conducts the freezing-liquid from the reservoir or accumulator I into the general supply-pipe C. K is the return-pipe from the general outlet-pipe to the refrigerator. The pipes B are covered with water to a depth of about two inches, (more or less.)

The action is as follows: The freezing-liquid

flows from the reservoir I, by the pipe J, into the supply-pipe C, whence it passes into one branch of each U-shaped freezing-pipe B, traversing which it passes at the farther end into the second branch of the freezing-pipe, and after traversing this branch it enters the general outlet-pipe D. It next passes, by the pipe K, to the refrigerator E, where, being cooled, it passes by the pipe F to the pump G, which forces it through the pipe H into the reservoir or accumulator I, to be again sent into the rink, and so on. Sometimes I place the refrigerator or an additional refrigerator in the reservoir I.

Fig. 3 shows how the power of a freezing-machine may be supplemented, either by immersing the freezing-machine itself or the elevated reservoir in a vessel containing ice and salt, ice and chloride of calcium, or other refrigerating salt or ice through which strong brine or a solution of some refrigerating-salt is made to circulate. X is the refrigerator or reservoir, as the case may be, placed in and surrounded by a vessel, Y, containing the ice and salt or other ingredients, Z, above-named. The solution of brine or other refrigerating-salt may be made to circulate through the said ingredients Z, as shown by the arrows; or, instead of immersing the refrigerator or the reservoir in a vessel, as shown in Fig. 3, I cause the freezing-liquid to pass through a vessel containing ice and salt, ice and chloride of calcium, or other refrigerating-salt, as represented in vertical section in Fig. 4, in which S is the vessel; T, the return-pipe from the rink; U, a set of smaller pipes, by which the liquid from the pipe T passes to an upper pipe, V, leading to the refrigerator.

In Fig. 2, L represents the non-conducting cover stretched over the ice-surface. Between it and the surface of the ice the cold air is retained. This cover may be rolled on a roller, M, when not in use, and, if large, must be supported at intervals, in the manner usual in awnings or tent-covers, to prevent it sagging or resting on the surface of the ice.

Having now fully described my invention and the means or method I prefer of carrying it into effect, I would remark that in the specification filed by me this day, along with an application for a patent for improvements in refrigerating or freezing liquids, claim is made to the employment of an aqueous solution of glycerine in lieu of brine or saline solutions in the manufacture of ice, and that therefore I do not claim broadly as part of the present invention the use of glycerine as a substitute for brine in ice-making.

What I do claim under the present Letters Patent is—

1. In an apparatus for the production and maintenance of ice in skating-rinks, the elevated reservoir I, which supplies the refrigerating-pipes B on the floor of the rink, in combination with the refrigerator E, which receives and cools the refrigerating medium from the pipes B, and with the pump G for supplying the reservoir from the refrigerator, substantially as hereinbefore described and set forth.

2. A flexible sheet or cover to be extended a short distance above the ice in skating-rinks as a non-conductor when the ice is not in use.

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Witnesses:
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