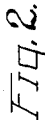


1,186,137.

2 SHEETS—SHEET 1.



WITNESSES
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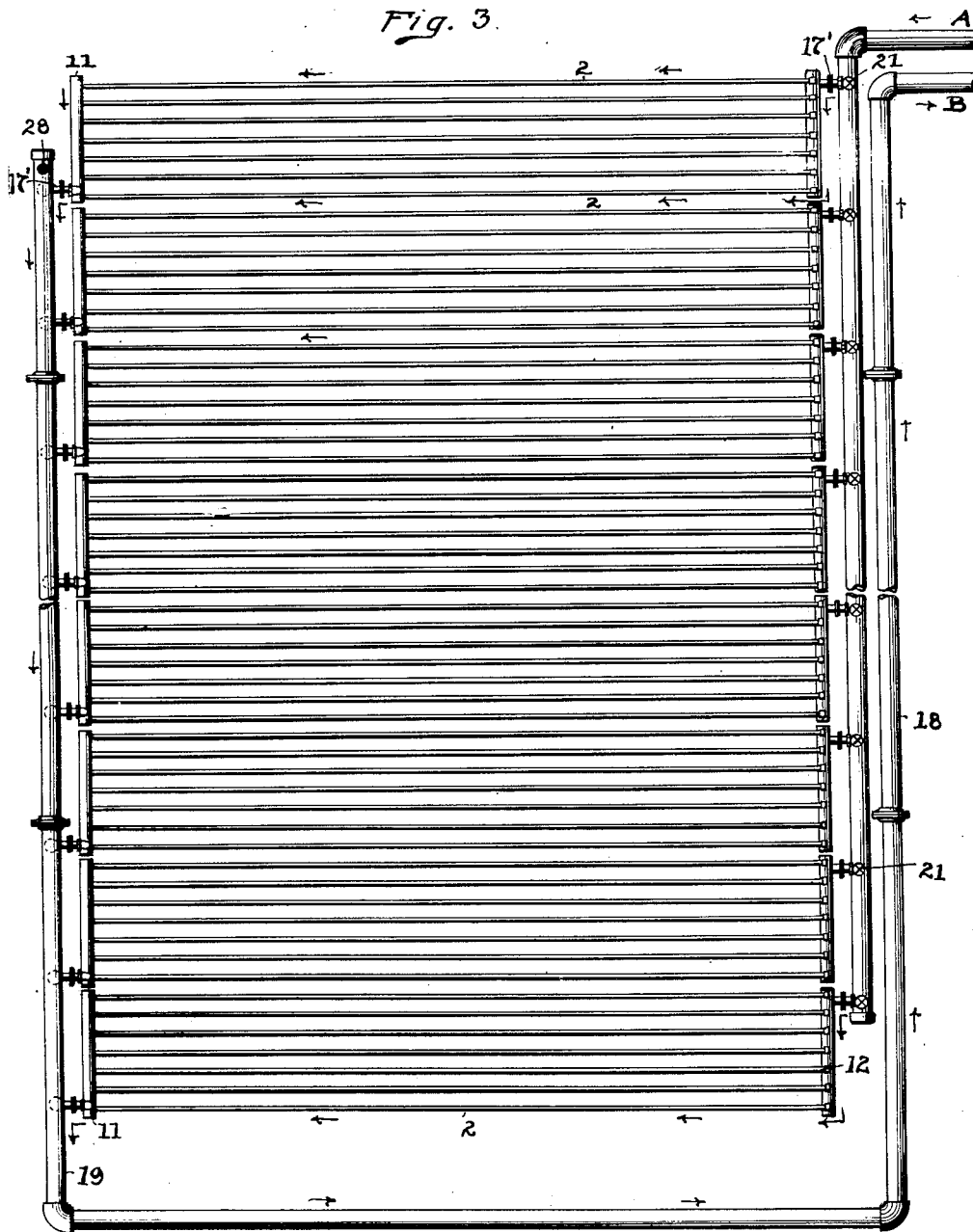
D. H. SCOTT.
REFRIGERATING APPARATUS.
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1,186,137.

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2 SHEETS—SHEET 2.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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REFRIGERATING APPARATUS.

1,186,137.

Specification of Letters Patent.

Patented June 6, 1916.

Application filed March 29, 1915. Serial No. 17,897.

To all whom it may concern:

Be it known that I, DUDLEY H. SCOTT, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

My invention relates to improvements in refrigerating apparatus for ice rinks, and the improvement comprises a new and useful arrangement and construction of circulating pipes and devices for the refrigerating medium whereby an ice floor may be produced and maintained for skating purposes at a low cost and in the most effective manner.

Stating the objects of the invention more specifically, my improved apparatus is particularly designed to produce initial freezing of a large sheet of water into a solid body of ice without cracks or imperfections at much lower temperatures and more quickly than heretofore; also, to circulate the refrigerating medium at equable temperatures uniform distances over different lines of pipe within and without the sheet of ice, and in reverse directions alternately; also, to drain, vent and effect cleaning of the circulating lines of pipe and main connections rapidly and conveniently; also, to facilitate repairs, disconnections and replacements in the most direct way without impairing the ice body or draining the entire system of the refrigerating medium; also, to insulate the valves and pipe connections outside of the ice body in a cheap and effective way which will permit quick and convenient access to and observation of said parts in case of leakage; also, to accommodate expansion and contraction and flexing of the circulating pipes and their connections; and, to reduce the labor and cost of erection of an installation of this kind as well as in the maintenance thereof.

In the accompanying drawings, Figure 1 is a transverse section of an ice rink installation comprising the mains and headers and a single transverse floor pipe connected therewith, and showing the compartments for the headers and mains at opposite sides of the rink or building. Fig. 2 is a detail view of one header and its floor pipe connections, including the vent end of the upper main pipe. Fig. 3 is a reduced plan view of the floor pipes, headers and mains, the headers and mains being arbitrarily ar-

ranged in parallel offset relations to better disclose their respective connections.

In producing and maintaining an ice body for skating purposes, the practice is to force a refrigerating medium, such as calcium chlorid through a multiplicity of parallel pipes placed relatively close to each other on a flat foundation. These pipes and the foundation are covered by water at intervals and frozen until an ice body of several inches in thickness is produced, and the area covered is relatively large, necessarily, where a large number of skaters must be accommodated. In fact, the actual requirements for a public ice rink call for a very extensive sheet of ice which must be relatively thin and of uniform thickness for economical maintenance by forced refrigeration from within and which should possess a smooth and good skating surface and be free from cracks and imperfections for the entire period of its use and maintenance from day to day for six or more successive months in the year. The initial production of such a large field or sheet of ice takes several days or longer dependent on the methods employed, but when the ice body is formed the floor pipes are permanently inaccessible unless the ice body is destroyed. These conditions, and others, have a vital bearing on my invention and must be understood and recognized to make my invention clear. Furthermore, the initial cost and the life of a floor installation must be taken into account and as to this my object has been to greatly lessen the cost and to lengthen the life of such an installation as well as to further other objects.

Now detailing, the invention, the floor pipes 2 are of relatively small diameter, preferably three-quarters of an inch internal diameter, and have a length more or less in excess of the width of the ice floor 3 so that the ends of each pipe 2 will extend beyond the side borders or boundaries 4 thereof and project a short distance into the compartments 5 and 6 on opposite sides of the rink or building beneath the two platforms 7 and 8 therein. All the pipes 2 are of equal length laid on a sand or concrete foundation 9 in parallel lines approximately four inches apart center to center and the total number of floor pipes used is dependent upon the area of ice body desired. The length of the ice body may be two hundred feet, more or less, and the pipes 2 are con-

nected at their opposite ends to short distributing headers 10 and 11 respectively, to provide independent groups or sub-divisions of uniform numbers of the pipes and independently controllable sections of ice body. That is to say, in a practical installation, a series of pipes 2, fifteen or eighteen in number, are connected to two cast iron headers five to six feet long and approximately four inches in diameter and this arrangement is duplicated and multiplied as may be needed to extend the area to be covered. The headers of the adjacent groups or sub-divisions of pipes are laid in a straight line with their ends contiguous or in such near relations as will bring the two adjacent pipes 2 of each group into the same uniform spaced relations as all the other pipes. All pipes 2 are located on the same horizontal plane, but the respective headers 10 and 11 are placed on lower and higher planes relatively to pipes 2 and each other to prevent trapping of air and to effect draining of the pipes and system. Furthermore, the header connections comprise T fittings 12 at the ends of each pipe 2 which have removable screw plugs 13 or their equivalent axially in line with the bore of the pipe to permit cleansing of each individual pipe when matter accumulates therein. This is a decided advantage as the placing of a single floor pipe out of working commission produces a corresponding deleterious effect on the ice body and makes the floor as a whole useless for skating purposes. In the event of leakage in any given pipe after long usage it is also possible to re-line the pipe with a copper bushing or tube inserted through the fitting thereby avoiding the removal of the pipe and destruction of the ice floor. The header connections also comprise short vertical pipes or branches 16 having nipple and union members 17, whereby the initial erection of the installation is simplified and cheapened and each and every pipe 2 easily disconnected and replaced when repairs are required. The short pipes or branches 16 are sufficiently flexible to adjust and overcome slight irregularities in length or placement of the pipes, and also to accommodate any expansion or contraction of the pipes, and by extending pipes 2 beyond the side edges of foundation 9, a certain degree of flexibility is also afforded thereat.

Each header has a single vertical pipe connection 17' with the main distributing pipes 18 and 19, which are alined directly above or below the headers; and an offset connection is made by employing nipples and elbows 20, and angle valves 21 having flanged, screw-threaded, or union ends.

In this way, each header can be easily connected and disconnected to the main distributing pipes and each valve is easily attached and detached and conveniently

placed for control and observation, and the said parts are also compactly related which is of advantage in insulating them. One of the most effective insulating mediums consists of ground cork, and this material is loosely or tightly packed around the pipes and valves within the compartments 5 and 6 which have inclined bottoms 22 to drain off leakage. One side wall of the separate compartments is also of a knockdown construction comprising uprights 23 and doors or hatches 24 resting on stepped bases 25, and the upper ends of the said compartments are left open preferably above the doors or hatches to give convenient access to the handles 26 of the angle valves 21.

A further important feature of the invention consists in the way the headers and main pipes are connected to distribute the refrigerating fluid uniformly throughout any given sub-division or all of the floor pipes, including the main pipes. To obtain uniform freezing results throughout the ice body it is obvious that the refrigerating medium should possess uniform temperature at all corresponding points of travel in each given subdivision and also in all the groups of floor pipes and their respective headers. To effect this desired result it is necessary that the distance of travel over each individual pipe 2 and the main pipes shall be the same, and therefore, I place the pipe connections 17' for each header 10 at one extreme end of the header and locate the corresponding pipe connection 17' for each header 11 at the opposite end thereof, or diagonally opposite viewing the two headers and the floor pipes of any given group in plan, see Fig. 3. All the headers are connected alike, and the result is that the refrigerating fluid is compelled to travel the same distance and at uniform temperatures through each and every header and each and every floor pipe 2. For example, note that the flow of fluid through the main pipes and the first pipe 2 in the first group is exactly the same distance as the flow of fluid over the last pipe 2, in the same group as indicated by the arrows, Fig. 3 and beginning at A and ending at B, also that the same distance of flow of fluid takes place in each and every group of pipes, as indicated by the arrows in the last group, bottom of Fig. 3. A reverse flow of the fluid gives the same result, and such reversal is often resorted to at intervals to obtain uniform refrigerating effects at opposite sides of the ice floor. Main pipe 18 is located at a lower level than any of the other pipes, and main pipe 19 is highest and above all other pipes and connections, and a vertical air vent or relief pipe 28 extends from the capped end of pipe 19 to positively prevent the trapping of air in the system during starting operations and thereafter.

A uniform distribution of the refrigerating medium through separate sub-divisions of floor pipes is of material benefit in producing the ice body initially as a much lower
 5 temperature of the refrigerating medium can be maintained constantly for portion of the refrigerating area than for the maximum area covered by the pipes. In practice, separate sections or subdivisions of the ice
 10 body are produced successively at very low temperatures, and in this way the entire sheet of ice is produced more quickly and the ice is materially lower in temperature at that time than during maintenance thereof
 15 in the future thereby absolutely preventing contractions of the ice to the point of cracking during maintenance.

What I claim is:

1. In refrigerating apparatus for producing and maintaining an ice floor for skating
 20 purposes, separate groups of parallel floor pipes, separate headers at opposite ends of each group of pipes, and the opposite ends of said pipes being connected with the upper
 25 and lower portions of their respective headers to effect complete and rapid venting and draining thereof.

2. In refrigerating apparatus for producing and maintaining an ice floor for skating
 30 purposes, parallel floor pipes, separate headers connected with the opposite ends of said pipes, main circulating pipes for said headers, pipe connections between the upper side
 35 of the main circulating pipe and the bottom side of the headers at one end of said floor pipes, and pipe connections between the upper side of the headers and the bottom side of the main circulating pipe at the other
 40 end of said floor pipes.

3. In refrigerating apparatus for producing and maintaining an ice floor for skating
 45 purposes, parallel floor pipes, separate headers, and vertical pipe connections for the opposite ends of said floor pipes and said headers.

4. In refrigerating apparatus for producing and maintaining an ice floor for skating
 50 purposes, parallel floor pipes, separate headers, and vertical pipe connections for said headers in detachable coupling relations with the opposite ends of said floor pipes.

5. In refrigerating apparatus for producing and maintaining an ice floor for skating
 55 purposes, parallel floor pipes, separate headers at opposite ends of said pipes, vertical pipe connections between said headers and floor pipes, and removable closure means for the opposite ends of said floor pipes.

6. In refrigerating apparatus for producing and maintaining an ice floor for skating
 60 purposes, parallel floor pipes, fittings for said pipes having removable closure means opposite the ends of said pipes, headers, and vertical pipes having union couplings to detachably connect the headers to said fittings.

7. In refrigerating apparatus for producing and maintaining an ice floor for skating
 70 purposes, parallel floor pipes, headers for said pipes, a main feed pipe and a main return pipe, and offset pipe connections for said main pipes and headers having angle valves detachably connected therewith.

8. In refrigerating apparatus for producing and maintaining an ice floor for skating
 75 purposes, parallel floor pipes, headers having vertical branches detachably connected to the ends of said floor pipes, main circulating pipes, and angle valves and pipe connections between said headers and main
 80 pipes.

9. In refrigerating apparatus for producing and maintaining an ice floor for skating
 85 purposes, separate groups of parallel floor pipes, headers on lower and higher horizontal planes than said floor pipes having pipe connections with the opposite ends of each group of pipes, main circulating pipes on
 90 higher and lower horizontal planes than said headers and having pipe connections therewith, and a vent pipe for the upper main pipe.

10. In refrigerating apparatus for producing and maintaining an ice floor for skating
 95 purposes, a floor with terminating walls at opposite sides thereof, in combination with parallel floor pipes on said floor extending at opposite ends beyond said walls, headers above and below the opposite ends of said
 100 pipes and main circulating pipes having branch pipes connected with said headers.

11. In refrigerating apparatus for producing and maintaining an ice floor for skating
 105 purposes, a floor and compartments on opposite sides thereof, in combination with parallel pipes on said floor extending into said compartments, headers and main pipes having pipe connections with each other and
 110 with said floor pipe extensions located in said compartment, insulating material, and means to confine said material within said compartment about said headers and pipes.

12. In refrigerating apparatus for producing and maintaining an ice floor for skating
 115 purposes, a floor and compartments at each side thereof, in combination with parallel floor pipes on said floor extending into said compartments, headers and main pipes and connecting pipes for said floor pipe extensions located in said compartments, insulating
 120 material packed within said compartments about said headers and pipes, and a removable side wall for said compartments.

13. In refrigerating apparatus for producing and maintaining an ice floor for skating
 125 purposes, a floor and compartments at each side thereof having inclined bottoms, in combination with groups of parallel pipes on said floor having separate headers connected with the ends of said pipes and located within said compartments, main pipes
 130

and pipe connections with said headers having valves, insulating material within said compartment about said headers and valves, and a removable side wall for each compartment above its inclined bottom opposite said headers.

14. In refrigerating apparatus for producing and maintaining an ice floor for skating purposes, a floor and compartments at each side thereof, in combination with parallel pipes on said floor extending into said compartments, headers and main pipes in superposed relations within said compartments having vertical pipe connections with each other and with said floor pipe extensions, and valves for each header connection.

15. In refrigerating apparatus for producing and maintaining an ice floor for skating purposes, groups of parallel floor pipes, separate headers connected with the opposite ends of the floor pipes of each group, main circulating pipes parallel with all the head-

ers, and the opposite ends of the respective headers of each group of floor pipes having a pipe connection with said main circulating pipes.

16. In refrigerating apparatus for producing and maintaining an ice floor for skating purposes, groups of parallel floor pipes, separate headers connected with the opposite ends of said floor pipes on different horizontal planes above and below the same, main circulating pipes at higher and lower elevations than said headers, a vent connection for the higher main pipe, and the opposite ends of the respective headers of each group of floor pipes having a pipe connection with said main circulating pipes.

In testimony whereof I affix my signature in presence of a witness.

DUDLEY H. SCOTT.

Witness:

GEO. E. KRICKER.