

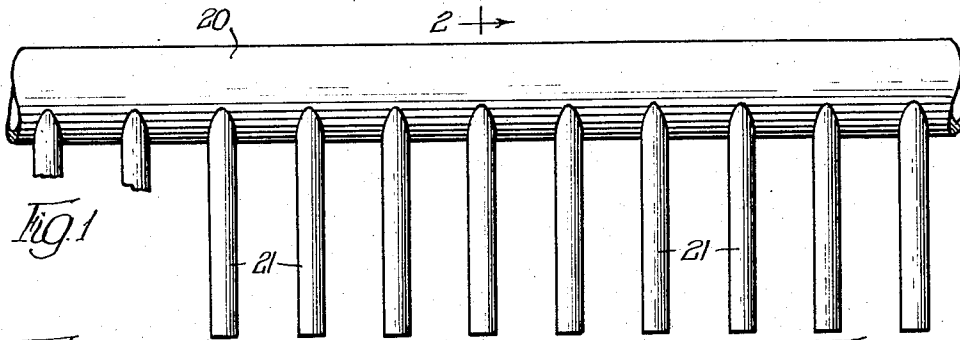
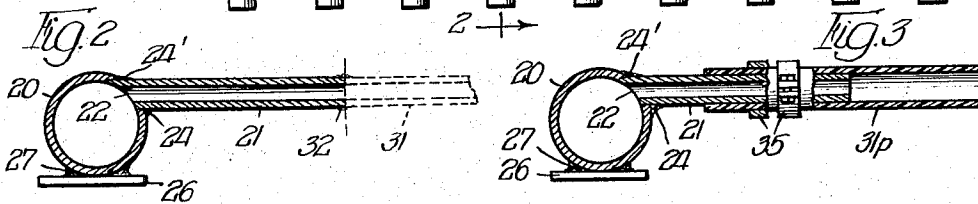
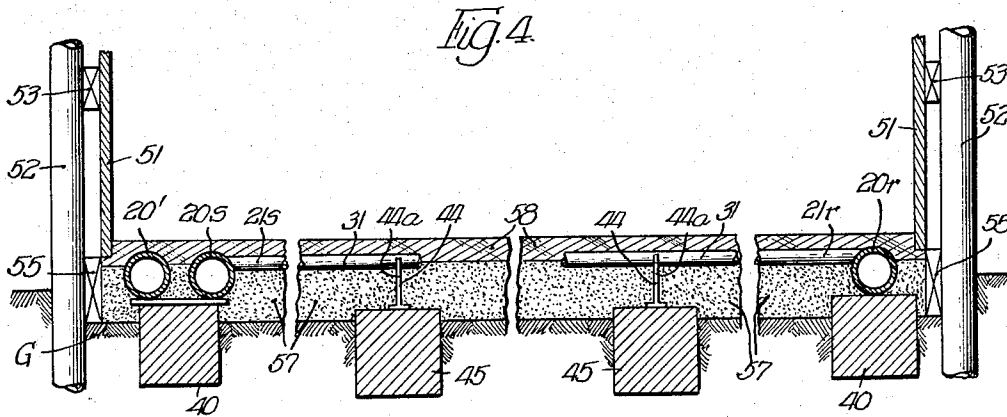
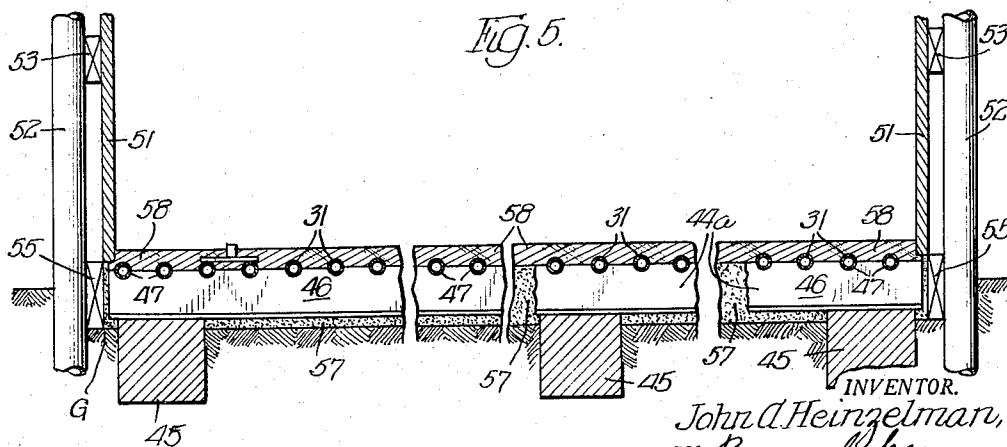
March 24, 1959

J. A. HEINZELMAN
ICE RINK CONSTRUCTION

2,878,651

Filed Dec. 21, 1954

4 Sheets-Sheet 1



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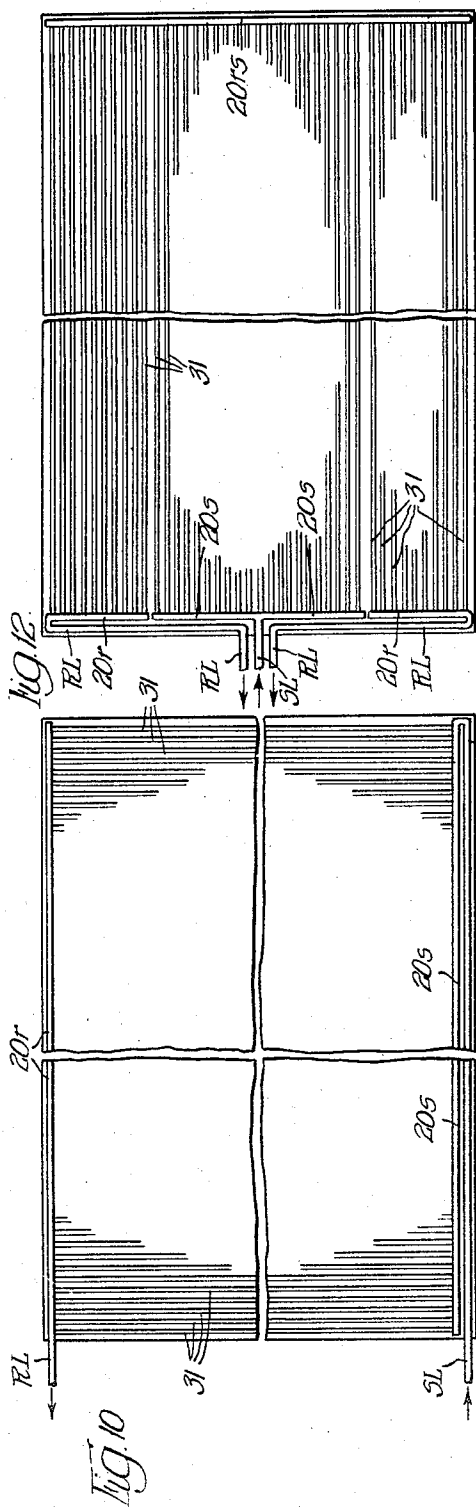
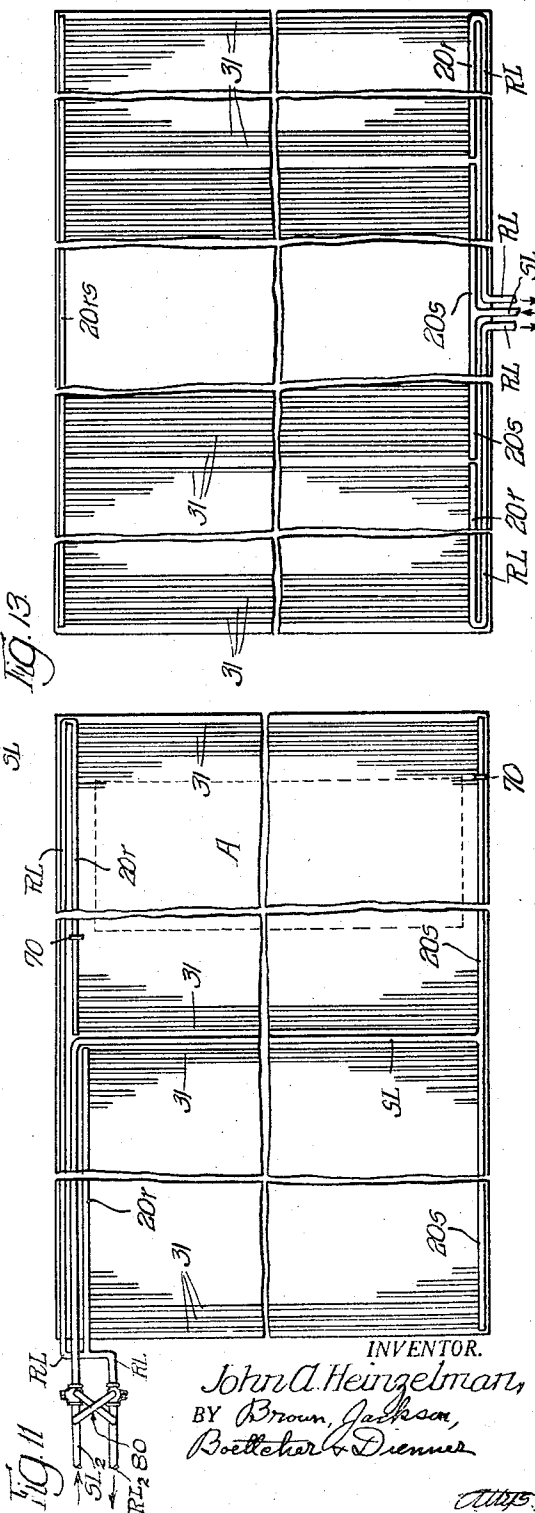
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ICE RINK CONSTRUCTION

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4 Sheets-Sheet 3



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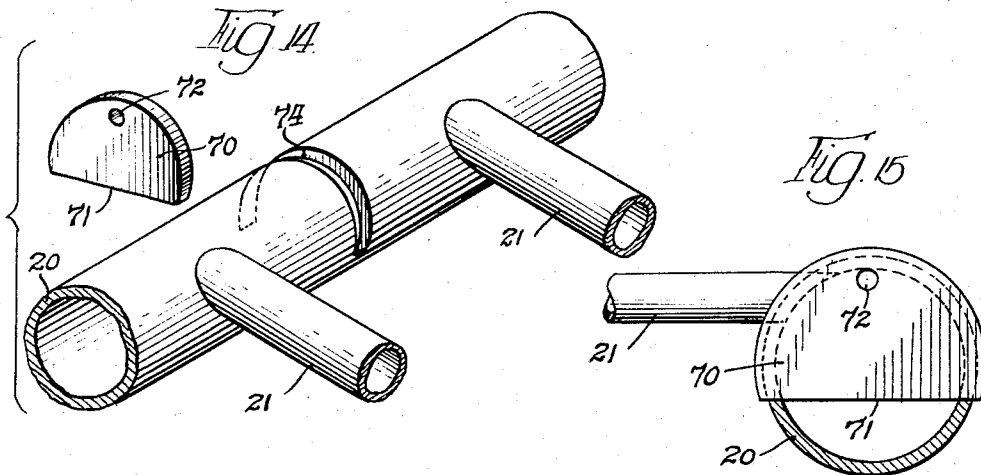
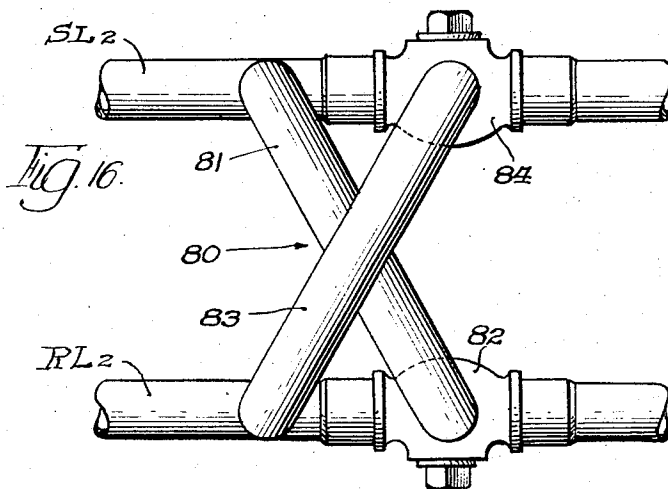
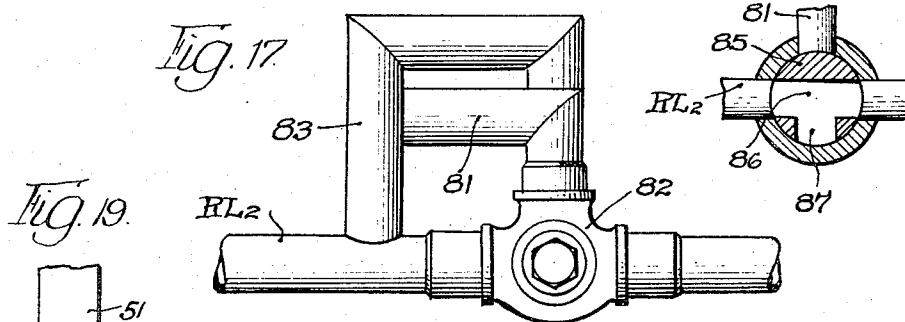
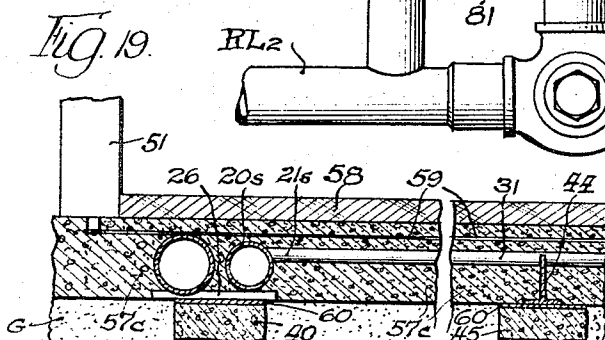
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J. A. HEINZELMAN
ICE RINK CONSTRUCTION

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4 Sheets-Sheet 4



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2,878,651

ICE RINK CONSTRUCTION

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18 Claims. (Cl. 62—235)

The present invention relates to an improved ice rink construction, particularly adapted for ice skating rinks, curling rinks, and the like.

One of the main objects of the invention is to provide an improved construction of ice rink in which all air is automatically purged from the floor. This is accomplished by an improved uniflow circulating system for the brine or other refrigerant, wherein the banks of floor distribution pipes enter the top sections of the supply headers and the top sections of the return headers, so as to obviate air trapping areas in the system. By virtue of this construction, faster freezing is accomplished owing to the even flow of brine, because of complete elimination of air. Also, corrosion on the insides of the floor distribution pipes and headers is eliminated or minimized because, without the presence of air, the corrosion is substantially obviated. No adjustment or regulation of flow is necessary, and no gates or throttling valves are required, because of the elimination of air and because of the operating characteristics of the uniflow design, which will not permit anything but a substantially even flow to each and every pipe.

Another object of the invention is to provide an improved circulating system for ice rinks according to which all header boxes, trenches and purge headers are eliminated, and all valves on the floor proper are dispensed with. Still further, a smaller brine main can be used because of the reduction of pressure drop due to the uniflow design. This all greatly reduces the cost of installation of the system. In this same regard, all maintenance, such as painting, greasing and cleaning of the headers is eliminated, because the headers are frozen directly into the ice, or are embedded in a concrete floor. All flexible connections or expansion loops between the floor piping and the headers are eliminated, because the headers expand and contract with the ice floor proper and the floor piping.

Another object is to provide an improved reversing assembly of supply headers, return headers and floor piping, whereby a substantially even temperature is maintained over the entire sheet of ice. Orifice plates may be embodied in the headers in some installations to assure an even flow of brine over the entire floor.

Another object of the invention is to provide an improved ice rink circulating system composed in part or in whole of plastic piping. When the floor piping is composed of plastic pipe or tubing, and the supply and return headers are composed of metal, the invention contemplates an improved manner of connecting the plastic pipes with the metallic headers.

Other objects, features and advantages of the invention will appear from the following detail description of certain preferred embodiments thereof. In the accompanying drawings illustrating such embodiments:

Figure 1 is a fragmentary plan view of one of the headers, either supply or return, showing the bank of nipples welded or otherwise secured to the upper section of the header;

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Figure 2 is a transverse sectional view, corresponding to a section taken approximately on the plane of the line 2—2 of Figure 1, and showing how each nipple in the bank of nipples is welded or otherwise secured to the upper section of the header, and showing how the metallic type of floor distribution pipe is welded to the end of the nipple;

Figure 3 is a view similar to Figure 2, but showing how the plastic type of floor pipe is clamped over the nipple; Figure 4 is a transverse sectional view through a typical ice rink construction embodying the invention, corresponding to a section taken at a right angle to the plane of the floor pipes extending between the supply and return headers;

Figure 5 is a transverse sectional view through the ice rink construction, taken on a plane at right angles to Figure 4;

Figure 6 is a view somewhat similar to Figure 4, but on a larger scale, showing the construction and arrangement when using plastic floor pipes;

Figure 7 is a transverse sectional view taken at right angles to Figure 6;

Figures 8 to 13 inclusive are schematic diagrams showing various floor plans embodying improved arrangements of the supply headers, the return headers, and the interconnecting floor piping;

Figure 14 is a perspective view showing an orifice plate arrangement;

Figure 15 is a transverse sectional view showing one of the orifice plates in its position in a header;

Figures 16 and 17 show plan and elevational views respectively of a manifold cross-over arrangement for reversing the supply and return connections to headers;

Figure 18 is a diagrammatic cross section of one of the three way valves used in the cross-over arrangement; and

Figure 19 is a fragmentary sectional view of a modified construction showing the headers and floor piping embedded in a concrete slab.

Referring first to Figures 1 and 2, 20 designates a metallic header, which may be either a supply header or a return header in the system. Extending from one side of this header is a bank or row of closely spaced nipples 21, etc. As shown in Figure 2, each of these nipples is secured to the header 20 to communicate with an opening 22 formed in the top or upper section of the header. By thus having all of the nipples 21 communicate with the top or upper section of each supply header and each return header, air trapping areas in the headers and in the floor distribution piping are avoided, and the system automatically purges itself of air. Preferably, the nipples 21 are secured to the openings 22 in the header by welding them in place, the bottom fillet of the weld being indicated at 24 and the top fillet at 24'; although it will be understood that the header 20 and its bank of nipples 21 might be formed as an integral casting, if desired. For some installations, it may be desirable to provide mounting base plates 26 at spaced intervals along the under side of the header 20, these base plates being welded to the bottom section of the header at 27; or being cast integral with the header in the case of an integrally cast header and nipple section.

The header and nipple sections 20, 21 are welded together at the manufacturing plant, and are shipped as a unit to the point of use. Where the floor piping extending across the floor of the rink is of the metallic type, the end of each floor pipe is welded at one end to one of the nipples 21 of the supply header and is welded at the other end to one of the nipples 21 of the return header. In Figure 2, one of these floor distribution pipes is indicated at 31, the weld which serves to join this floor pipe to the associated nipple 21 being indicated at 32. By performing the welding operation in situ at the end

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of the nipple 21, rather than at the header, more space is available for the welding tools, and the welding operation is not hampered or encumbered by the walls of the header, adjoining headers, or header supports.

Where the floor piping is of the plastic type, each plastic pipe or tube is secured over the end of the nipple 21 by clamps. In Figure 3 I have shown a plastic pipe 31p fitting over one of the nipples 21 and fixedly secured thereto by a plurality of clamps 35.

In Figures 4 and 5 I have illustrated a typical ice rink construction of my invention, utilizing metallic floor piping. Extending along one margin of the floor area is a main supply header 20s, and extending along the opposite margin is a main return header 20r. These two headers have nipples 21s and 21r which are interconnected by lengths of floor pipe 31 welded to the ends of the nipples 21s and 21r. As will be later described, in some floor plans having a reversed assembly of headers, there may be two or three headers along one or more margins of the floor area, one of these additional or supplemental headers 20' being indicated at the left in Figure 4. The headers 20s, 20r and 20' are supported on concrete blocks 40 located at spaced points along the margins of the floor area, these concrete blocks having their lower portions set into the supporting ground. The lengths of floor pipe 31 may extend over quite a span from header to header, and are supported at one or more points across their spans by support members 44 which extend parallel to the marginal headers 20s and 20r. Each of these support members 44 is set on a row of spaced concrete blocks 45 extending parallel to the rows of concrete blocks supporting the headers 20s and 20r. In the embodiment shown in Figures 4 and 5, I have illustrated these support members 44 as being in the form of inverted T irons 44a having their cross bar flanges secured to the spaced concrete blocks 45 and having their web portions 46 extending upwardly to form supporting edges for the floor pipes 31. Semi-circular recesses 47 are formed in the top edge of each web portion 46 for receiving the floor pipes 31 and holding them at their predetermined spacing between centers.

In hockey rinks, skating rinks and the like, the side margins of the ice area are usually defined by vertically extending bumper boards 51 or the like which extend up to a convenient height and which are supported by stanchion pipes 52 or like supporting structures, horizontal stringers 53 being interposed between the bumper boards 51 and the stanchion pipes 52. The lower ends of the bumper boards 51 terminate substantially at the upper edge of a wood retaining wall 55 which is also held in place by the pipe stanchions 52. A sand fill 57 covers the ground G up to approximately the center lines of the floor pipes 31, from which it will be seen that this sand fill covers all but the top portions of the headers 20s, 20r, and all but the top portions of the T iron supports 44a. The ice sheet 58 is frozen above this sand fill 57, this ice sheet extending from bumper board to bumper board at each side and end of the rink, and covering the exposed upper halves of the floor pipes 31 and covering the exposed upper portions of the headers 20s, 20r and 20'. These headers 20s, 20r and 20' are free to slide on the top surfaces of their supporting concrete blocks 40, and, likewise, the floor pipes 31 are free to slide longitudinally in the recesses 47 formed in the upper edges of the T irons 44a. Because of this ability of the headers and floor pipes to slide horizontally, the expansion and contraction which occurs in the freezing and melting of the ice sheet 58 is readily accommodated without the necessity of any expansion joints or expansion loops in the floor pipes 31.

As an alternative construction, shown in Figure 19, the sand fill 57 may be substituted by a poured slab of concrete 57c, which will fill the space from the ground level G up to and covering the floor pipes 31 and just covering the tops of the main headers 20s and 20r and the

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supplemental header 20'. This concrete slab may be reinforced by a layer of wire mesh 59, typically represented by a 4" x 4", #13 wire mesh which is wired to the upper surfaces of the floor pipes 31 and upper surfaces of the headers 20s, 20r and 20'. To insure that this concrete slab is capable of sliding movement on the concrete posts 40 (and/or 45), to accommodate expansion and contraction, films of material 60, such as aluminum foil are interposed between the top surfaces of the posts 40 and 45 and the under surface of the poured concrete slab. The ice sheet 58 is frozen directly above this poured slab of concrete 57c.

Figures 6 and 7 illustrate one embodiment of my improved ice rink construction employing floor pipes of plastic construction. The supply header 20s and the return header 20r may be mounted on concrete blocks, as above described, but, as illustrative of another type of installation I have shown these headers as being supported on a base 61 composed of concrete, earth, or other supporting material. Each header has preferably welded to its under side at spaced points along its length the supporting plates shown at 26, which give a broad base of support for the header. This broad base of support for each header is particularly desirable when using plastic floor pipes, because it prevents the flexibility of the floor pipes from causing them to sag and tilt the header nipples 21 in a downward direction. The plastic floor pipes, designated 31p, have their ends engaging over the nipples 21 of the supply and return headers, being secured over these nipples by one or more U-shaped clamps 35. These plastic floor pipes are supported at one or more points in their transverse span by a support or supports 62, shown as consisting of creosoted timber. These creosoted timbers 62 extend the full dimension of the rink parallel to the supply and return headers, and may be anchored to the concrete floor or to supporting posts by bolts 63. The plastic floor pipes 31p rest on the top surfaces of these supporting timbers 62, and are confined against sidewise displacement thereon by hook-shaped clamps 65 which are secured to the supporting timber 62 by screws 67. The side and end margins of the rink are defined by vertical bumper boards or timbers 68, 68. A sand fill 57 covers the concrete base or ground level 61 up to approximately the center lines of the plastic floor pipes 31p. The ice sheet 58 formed above this sand fill 57 covers the exposed upper surfaces of the headers 20s and 20r and their nipples 21s and 21r. Owing to the flexibility of the plastic floor pipes 31p, installations employing plastic floor piping do not present as much of a problem in expansion and contraction as installations employing metallic floor pipes. However, the ability of the supporting base plates 26 of the supply and return headers to slide horizontally on the supporting base 61 accommodates such expansion and contraction as may tend to cause shifting of the headers 20s and 20r.

I shall now describe the improved floor layouts for headers and floor piping schematically illustrated in Figures 8 to 13 inclusive. Referring first to Figure 8, the brine from the refrigeration equipment room enters one end of the rink floor through a supply line SL which extends substantially centrally of the rink to the far end thereof, where it divides into right and left hand supply headers 20s, 20s. The floor pipes 31 or 31p extend from these supply headers 20s toward the other end of the rink floor, where they join right and left hand return headers 20r, 20r. These two return headers connect with return lines RL which convey the brine back to the refrigeration equipment room.

In Figure 9, the supply line SL enters one end of the rink floor area centrally thereof, as before, but immediately divides into right and left hand supply headers 20s, 20s which extend across this end of the rink. The floor pipes 31 or 31p conduct the brine toward the other end of the rink where they join a return header 20r which ex-

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tends across this entire end of the rink. Each end of the return header 20r connects with a separate return line RL, which return lines extend along the opposite side margins of the rink and then converge together at the supply admitting end for passing back to the refrigeration equipment room along with supply line SL.

In Figure 10, the supply line SL enters one end of the rink area adjacent one side margin thereof and extends the entire length of the rink along this side margin, connecting at the far end to the supply header 20s which doubles back the entire length of the rink along this side margin. The floor pipes 31 or 31p extend from this longitudinal supply header 20s in a direction transversely of the length of the rink. At the far side, these floor pipes connect to return header 20r which extends the entire length of the ring along this far side. The return header 20r connects through return line RL leading from the supply admitting end of the rink. By extending the supply line SL to the far end of the rink and then doubling back through the supply header 20s, the transverse floor pipes at the far end of the rink are not short circuited, but receive their share of the cooler brine.

In Figure 11, the supply line SL enters the rink area along one side margin and proceeds to the center, from whence it extends transversely across the width of the rink, and divides into two supply headers 20s which extend along this opposite side margin of the rink. At the left hand end of the rink the floor pipes extend transversely from the supply header 20s and communicate with a return header 20r which is confined to the left hand end of the rink. At the right hand end of the rink the floor pipes 31 or 31p extend transversely across the width of the rink and connect with a separate right hand return header 20r. The left hand return header 20r has its left hand end opening directly into a return line RL, whereas the right hand return header 20r has its right hand end doubled back and connecting with a second return line RL. The doubling back of the right hand return header 20r into the upper return line RL insures an even distribution of brine through the floor pipes adjacent to the right hand end of the rink.

In Figure 12 the supply line SL enters one end of the rink substantially centrally thereof, and divides into two supply headers 20s, 20s, each of which extend only half way across the width of the rink at this end. Longitudinally extending floor pipes 31 or 31p extend from these two half-way supply headers 20s to the opposite end of the rink. This latter header is a composite header, designated 20rs in that it functions as a return header for the floor pipes leading from the supply headers 20s, but also functions as a supply header for additional floor pipes leading back to return headers 20r, 20r, which lie substantially in continuation of the supply headers 20s, 20s. The outer ends of the return headers 20r, 20r double back and connect with the two return lines RL, RL which extend into the central portion of the rink for passing to the refrigeration equipment room along with supply line SL.

Figure 13 illustrates an arrangement quite similar to Figure 12, except that the floor piping is extended transversely of the length of the rink. The supply line SL enters one side margin of the rink intermediate the ends thereof, and branches into right and left supply headers 20s, 20s. Extending from the supply headers are the floor pipes 31 or 31p which pass transversely across the length of the rink and enter a composite header 20rs which extends the entire length of the rink along this opposite side. The brine which enters the composite header 20rs from the floor pipes extending from supply headers 20s, 20s leaves the composite header 20rs through end banks of floor pipes which extend transversely across the rink to the first mentioned side for connection with right and left return headers 20r, 20r. The outer ends of these right and left return headers 20r, 20r double back and have connection with return lines RL, RL, which extend

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substantially to the center of the rink for passing to the refrigeration equipment room along with supply line SL.

In Figures 14-15, I have shown an orifice plate arrangement adapted to be interposed in one or more headers for insuring an even flow of brine through a certain section or sections of the floor piping. One of these orifice plates is illustrated at 70, comprising a semi-circular or quadrant plate having a flat lower edge 71 and an air venting aperture 72 in its circular upper portion. This orifice plate is adapted to be interposed at right angles to the flow at a particular point in one of the supply or return headers or both. A slot 74 is cut in the top half of the header, preferably with an oxy-acetylene torch, the slot being of the requisite depth to accommodate the depth of the orifice plate 70. This plate is then inserted in the slot in the position illustrated in Figure 15, with the aperture 72 uppermost where it can pass air from one side to the other of the orifice plate. The sides of the slot 74 are then joined to the plate 70 by welding so that there is no possibility of leakage of brine. The brine metering action occurs principally below the lower edge 71 of the plate, which lower edge can be made higher or lower in different plates, or which can be set higher or lower in the slot 74, to subtend different areas of the header.

In Figure 11, I have shown two orifice plates 70, 70 welded into the supply header 20s and into the return header 20r adjacent to the right hand end of the rink. Let us assume in this floor plan that there is an area "A" of the floor piping in the right hand portion of the rink that is not getting its proportionate share of the colder brine. This can be corrected by inserting an orifice plate 70 in the right hand supply header 20s just beyond or posterior to the section of floor piping which has not been getting its share of brine, and also by possibly supplementing the action by inserting an orifice plate 70 in the right hand return header at a point beyond or anterior to said section of floor piping. The restriction 70 in the supply header 20s reduces the amount of brine which can pass the restriction, with the result that a larger proportion of the brine takes the anterior path through the pipes which heretofore have not received their proportionate share of brine. The restriction 70 in the return header 20r reduces the amount of brine which can enter the left hand portion of the right hand return header 20r, thereby confining the augmented flow of brine to the area "A."

In Figures 16, 17 and 18 I have illustrated an improved reversing manifold arrangement 80 for readily reversing the relation of supply and return headers, and reversing the flow of brine through the floor pipes. For example, let us say that a reversing manifold arrangement is desired for the floor plan of Figure 11. The two return lines RL, RL are combined into a single return line RL₂ which is juxtaposed to the single supply line SL₂. The reversing cross-over 80 comprises a pipe 81 which extends from a supply line SL₂ to a three-way valve 82 interposed in return line RL₂, and also comprises a pipe 83 which extends from the return line RL₂ to a three-way valve 84 in the supply line SL₂. In Figure 18 I have illustrated the conventional valve plug element 85 of each of the above three-way valves 82 and 84, this rotatable plug element having a T shaped passageway there-through. By rotating each valve to place the diametrical through-passageway 86 in communication with the aligned ends of its respective refrigerant line, and with the right angle passageway 87 pointing downwardly out of communication with the cross-over manifold, the refrigerant flow is straight through the respective supply and return lines SL₂ and RL₂, and no reversing occurs in the cross-over. However, by rotating each valve element 85 counterclockwise through 90° to place the through-passageway 86 in communication with its respective cross-over manifold, and to place its right angle passageway 87 in communication with that portion of its

refrigerant line that leads to the ice rink, the flow of refrigerant through the floor pipes 31 or 31p can be reversed. That is to say, the supply of refrigerant is transferred through the reversing cross-over 80 to what was previously the return header, and the return of refrigerant then occurs from what was previously the supply header through the cross-over to the return line. This reversing of flow can be readily accomplished by merely rotating the two valves 82 and 84, and is frequently desirable to provide for a more equalized freezing over the surface of the rink.

In lieu of straight line floor pipes 31 or 31p, the invention also contemplates making these floor pipes in the form of grids or serpentine type coils, either connected snugly between the supply and return headers, or connected in a series of serpentine type coils with the ends of each series connected to the supply and return headers, this grid or serpentine type coil arrangement being sometimes preferable for smaller units. These grids or serpentine types of coils may be made either of metallic construction, like the floor pipes 31, or of plastic construction, like the floor pipes 31p.

While I have illustrated and described what I regard to be the preferred embodiments of my invention, nevertheless it will be understood that such are merely exemplary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

I claim:

1. In an ice rink construction, the combination of a main supply header of circular cross section extending along one margin of the rink, a main return header of circular cross section extending along another margin of the rink, a supplemental header of circular cross section disposed outside of and lying in substantially the same horizontal plane with one of said main headers, said supplemental header being connected with one of said main headers, a row of horizontally projecting nipples welded in apertures entering substantially the uppermost horizontal plane of each main header, said nipples extending toward the opposite main header, a bank of horizontal floor pipes each welded at one end to a nipple of said supply header and welded at the other end to a nipple of said return header, base plates projecting horizontally from the base portions of said main headers for preliminarily holding said main headers during the welding operation with their respective nipples extending horizontally therefrom to facilitate the welding of the floor pipes thereto, inverted T irons extending transversely beneath said floor pipes and having recesses in the upper edges of their webs for supporting the floor pipes, a reinforcing wire mesh extending across the tops of said main and supplemental headers, said nipples, floor pipes and T irons and wired thereto, marginal curbs defining the margins of the ice rink located outside of said main and supplemental headers, a bed slab of concrete poured over and encasing said main and supplemental headers, said nipples, floor pipes, T irons and reinforcing mesh and extending to said marginal curbs, the location of said nipples entering substantially the uppermost planes of said main supply and return headers minimizing the thickness of the concrete required to cover said headers, and supporting means on which said concrete bed slab, said headers and said floor pipes can expand and contract as a unit with sliding motion relatively thereto.

2. In an ice rink construction, the combination of a main supply header of circular cross section extending along one margin of the rink, a main return header of circular cross section extending along another margin of the rink, a supplemental header of circular cross section disposed outside of and lying in substantially the same horizontal plane with one of said main headers, said supplemental header being connected with one of said main headers, a row of horizontally projecting nipples welded in apertures entering the upper section of

each main header and extending horizontally toward the opposite main header, a bank of horizontal floor pipes each welded at one end to a nipple of said supply header and welded at the other end to a nipple of said return header, inverted T irons extending transversely beneath said floor pipes and having recesses in the upper edges of their webs for supporting the floor pipes, a reinforcing wire mesh extending across the tops of said main and supplemental headers and across said nipples, floor pipes and T irons and wired thereto, marginal curbs defining the margins of the ice rink located outside of said main and supplemental headers, a bed slab of concrete poured over and encasing said main and supplemental headers, said nipples, floor pipes, T irons and reinforcing mesh and extending to said marginal curbs, the location of the nipples entering the upper portions of said main supply and return headers minimizing the thickness of the concrete required to cover said headers, and supporting means on which said concrete bed slab, said headers and said floor pipes can expand and contract as a unit.

3. In an ice rink construction, the combination of a main supply header of circular cross section extending along one margin of the rink, a main return header of circular cross section extending along another margin of the rink, a row of horizontally projecting nipples welded in apertures entering in the upper section of each main header and extending toward the opposite main header, a bank of horizontal floor pipes each welded at one end to a nipple of said supply header and welded at the other end to a nipple of said return header, transverse supporting irons extending transversely beneath said floor pipes for supporting the latter, reinforcement extending across the tops of said main headers, nipples, floor pipes and transverse supporting irons, marginal curbs defining the margins of the ice rink located outside of said main headers, a bed slab of concrete poured over and encasing said main headers, nipples, floor pipes, transverse supporting irons and reinforcement and extending to said marginal curbs, whereby said concrete floor slab, headers and floor pipes can expand and contract as a unit, the location of the nipples entering the upper portions of said main headers minimizing the thickness of the concrete required to cover said headers and also automatically purging the headers and floor pipes of air.

4. In an ice rink construction, the combination of a main supply header of circular cross section extending along one margin of the rink, a main return header of circular cross section extending along another margin of the rink, a supplemental header of circular cross section disposed outside of and lying in substantially the same horizontal plane with one of said main headers, said supplemental header being connected with one of said main headers, a row of horizontally projecting nipples welded in apertures entering in substantially the uppermost plane of each main header and extending toward the opposite main header, a bank of horizontal floor pipes each welded at one end to a nipple of said supply header and welded at the other end to a nipple of said return header, base plates projecting horizontally from the base portions of said main headers for preliminarily holding said main headers during the welding operation with their respective nipples extending horizontally therefrom to facilitate the welding of the floor pipes thereto, inverted T irons extending transversely beneath said floor pipes and having recesses in the upper edges of their webs for supporting the floor pipes, marginal curbs defining the margins of the ice rink located outside of said main and supplemental headers, and a fill encasing the lower portions of said main and supplemental headers, said nipples, floor pipes and T irons and extending to said marginal curbs, the location of the nipples entering the upper portions of said main supply and return headers minimizing the thickness of the ice sheet required to cover said headers.

5. In an ice rink construction, the combination of a

main supply header of circular cross section extending along one margin of the rink, a main return header of circular cross section extending along another margin of the rink, a row of horizontally projecting nipples welded in apertures entering in the upper section of each main header and extending horizontally toward the opposite main header, a bank of horizontal floor pipes each secured at one end to a nipple of said supply header and secured at the other end to a nipple of said return header, base plates projecting horizontally from the base portions of said main headers for preliminarily holding said main headers with their respective nipples extending horizontally therefrom to facilitate the securing of the floor pipes thereto, transverse supporting means extending transversely beneath intermediate portions of said floor pipes for supporting the latter, marginal curbs defining the margins of the ice rink located outside of said main headers, and a fill for said main headers, nipples, floor pipes and transverse supporting means, said fill extending to said marginal curbs and supporting an ice sheet extending across the tops of said main headers.

6. In an ice rink refrigerating system, the combination of a refrigerant supply line entering one margin of the rink, right and left supply headers branching from said supply line at the latter margin of the rink and each extending part way across said latter margin, a first set of floor pipes connecting with said right and left hand supply headers and extending to the opposite margin of the rink, a composite header extending across the entire opposite margin of the rink, said first set of floor pipes connecting with the intermediate portion of said composite header, second and third sets of floor pipes connecting with the opposite end portions of said composite header and extending back to the first mentioned margin of said rink, a pair of return headers at the first mentioned margin of the rink with which said second and third sets of floor pipes connect, and refrigerant return lines connecting with the outer ends of said return headers and doubling back along the first mentioned margin of the rink, the intermediate portion of said composite header functioning as a return header portion with respect to said first set of floor pipes and the two outwardly projecting end portions of said composite header functioning as supply header portions with respect to said second and third sets of floor pipes.

7. In an ice rink construction, the combination of a refrigerant supply line entering one end of the rink and extending along one side thereof to an intermediate point and then extending transversely across the rink to the opposite side thereof, right and left supply headers at said opposite side of the rink branching outwardly from said supply line, floor pipes connected with said right and left supply headers and extending across the rink to the first-mentioned side thereof, right and left return headers along said first-mentioned side and with which said floor pipes connect, said supply and return headers being disposed with their axes below the axes of said floor pipes and a refrigerant return line connecting with one of said return headers and doubling back along the first-mentioned side of the rink for egress from the same end of the rink that said refrigerant supply line enters.

8. In an ice rink refrigerating system, the combination of a refrigerant supply line entering one end of the rink, right and left hand supply headers branching from said supply line at the latter end of the rink and each extending part way across said latter end, a first set of floor pipes extending from said right and left hand supply headers and extending to the opposite end of the rink, a composite header extending across the entire opposite end of the rink, said first set of floor pipes entering the intermediate portion of said composite header, second and third sets of floor pipes extending from the end portions of said composite header and back to the first-mentioned end

of said rink, a pair of return headers at the first mentioned end of said rink with which said second and third sets of floor pipes connect, the intermediate portion of said composite header functioning as a return header portion with respect to said first set of floor pipes, and the two outwardly projecting end portions of said composite header functioning as supply header portions with respect to said second and third sets of floor pipes and refrigerant return lines connecting to the outer ends of said return headers and doubling back along the first mentioned end of the rink, said supply and return headers being disposed with their axes below the axes of said floor pipes, and with said floor pipes opening into the top portions of said headers for automatically purging the headers and floor pipes of air.

9. In an ice rink refrigerating system, the combination of a refrigerant supply line entering one side of the rink substantially intermediate its ends, right and left hand supply headers branching from said supply line at the latter side of the rink and each extending part way along the latter side outwardly from said supply line, a first set of floor pipes extending from said right and left hand supply headers and extending to the opposite side of the rink, a composite header extending along the entire opposite side of the rink, said first set of floor pipes entering the intermediate portion of said composite header, second and third sets of floor pipes extending from the end portions of said composite header back to the first mentioned side of the rink, a pair of return headers at the first mentioned side of said rink with which said second and third sets of floor pipes connect, and refrigerant return lines connecting with the outer ends of said return headers and doubling back along the first mentioned side of the rink, the intermediate portion of said composite header functioning as a return header portion with respect to said first set of floor pipes and the two outwardly projecting end portions of said composite header functioning as supply header portions with respect to said second and third sets of floor pipes.

10. In an ice rink construction, the combination of a supply header extending along one margin of the rink, a return header extending along another margin of a rink, floor pipes extending between said headers, and a flow regulating plate set into one of said headers for reducing the flow of refrigerant to one side of said plate, said plate having an air venting orifice through its upper portion for purging the system of air.

11. In an ice rink construction of the class described, the combination of a supply header extending along one margin of the rink, a return header extending along another margin of the rink, floor pipes extending between said headers, and a flow regulating orifice plate set into a notch cut in one of said headers for reducing the flow of refrigerant to one side of said plate, said plate having a lower edge which defines the area of the header open to flow, and said plate having an air venting orifice in its upper portion.

12. In an ice rink construction, the combination of a refrigerant supply line, a supply header normally receiving refrigerant therefrom and extending along one margin of the rink, a refrigerant return line, a return header normally returning refrigerant to said refrigerant return line and extending along another margin of the rink, floor pipes extending between said headers, and a reversing cross-over arrangement enabling the refrigerant supply line to be connected to said return header and enabling the refrigerant return line to be connected to said supply header, whereby the flow of the refrigerant through said floor pipes can be reversed, said reversing cross-over arrangement comprising a first three-way valve between said supply line and said supply header, a second three-way valve between said return line and said return header, a cross-over pipe extending from said supply line to the third port of said second valve, and a cross-

over pipe extending from said return line to the third port of said first valve.

13. In an ice rink refrigeration system, the combination of a supply header extending along one portion of the rink, a return header extending along another portion of said rink, floor pipes extending from said supply header to said return header, a slab of concrete in which said headers and floor pipes are cast, a plurality of supporting posts for supporting said concrete slab, and films of material between the tops of said supporting posts and said concrete slab for permitting expansion and contraction of said slab relatively to said posts.

14. In an ice rink refrigeration system, the combination of a supply header extending along one portion of the rink, a return header extending along another portion of said rink, floor pipes extending from said supply header to said return header, a T iron supporting said floor pipes intermediate said headers, said T iron having notches formed in its upstanding web portion in which said floor pipes engage, a slab of concrete in which said headers, floor pipes and T iron are cast, a plurality of spaced concrete supporting posts for supporting said concrete slab, and sheets of aluminum foil interposed between the tops of said concrete posts and said concrete slab for permitting expansion and contraction of said slab relatively to said posts.

15. In an ice rink refrigeration system, the combination of a supply header and a return header extending along spaced margins of the rink, each of said headers having a row of apertures in the upper side wall thereof opening into the upper space of the header and having a row of nipples extending horizontally from said row of apertures, floor pipes joined to said nipples and interconnecting said supply header with said return header, said supply and return headers being delivered to the rink site with the nipples extending therefrom, and said floor pipes being connected to said nipples in situ, means supporting said headers permitting horizontal sliding movement thereof to accommodate expansion and contraction of the system, a flow regulating plate set into one of said headers for reducing the flow to one side of said plate, said plate having an air venting orifice through its upper portion, a refrigerant supply line normally connected to said supply header, a refrigerant return line normally connected to said return header, and a reversing cross-over arrangement enabling the refrigerant supply line to be connected to said return header and for enabling the refrigerant return line to be connected to said supply header, whereby the flow of refrigerant through said floor pipes can be reversed.

16. In an ice rink construction, the combination of a supply header pipe of circular cross section extending along one margin of the rink, a return header pipe of circular cross section extending along another margin of the rink, rows of horizontally projecting nipples welded in apertures entering the upper sections of said header pipes and extending horizontally toward the opposite header pipe, a bank of horizontal floor pipes of plastic composition, clamps for clamping each of said plastic floor pipes at one end to a nipple of said supply header and at the other end to a nipple of said return header, and marginal curbs defining the margins of the ice rink

located outside of said supply and return header pipes, whereby the sheet of ice frozen on the rink covers said supply and return header pipes and also covers said clamps.

17. In an ice rink construction, the combination of a supply header extending across the one end of the rink, a refrigerant supply line extending the length of the rink substantially centrally thereof and connecting with an intermediate point of said supply header to divide the latter into right and left halves, right and left hand return headers at the opposite end of the rink, a right hand bank of floor pipes extending between the right half of said supply header and said right hand return header, a left hand bank of floor pipes extending between the left half of said supply header and said left hand return header, both banks of floor pipes extending in straight line parallel relation for conducting the refrigerant in unidirectional straight line flow from said supply header directly to said return headers, said floor pipes opening into the top portions of said supply and return headers for automatically purging the headers and floor pipes of air, and two return lines connected with the inner ends of said right and left hand return headers respectively.

18. In an ice rink construction, the combination of a supply header extending across one end of the rink, a refrigerant supply line connected with an intermediate point of said supply header at the latter end of the rink and dividing said supply header into right and left hand halves, a return header at the opposite end of said rink, a bank of floor pipes extending in straight line parallel relation from the right and left hand halves of said supply header to said return header, said straight line parallel relation of said floor pipes serving to conduct the refrigerant in unidirectional straight line flow from said right and left hand halves of said supply header to said return header, said supply and return headers being disposed below the upper surface of the ice in said rink, and right and left hand refrigerant return lines connected with the right and left hand ends of said return header and extending back along the right and left hand sides of the rink to the first mentioned end of the rink.

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