Aug. 25, 1925. 1,551,485

R. H. HEMPHILL

ICE MAKING APPARATUS

Filed July 10, 1923 5 Sheets-Sheet 1

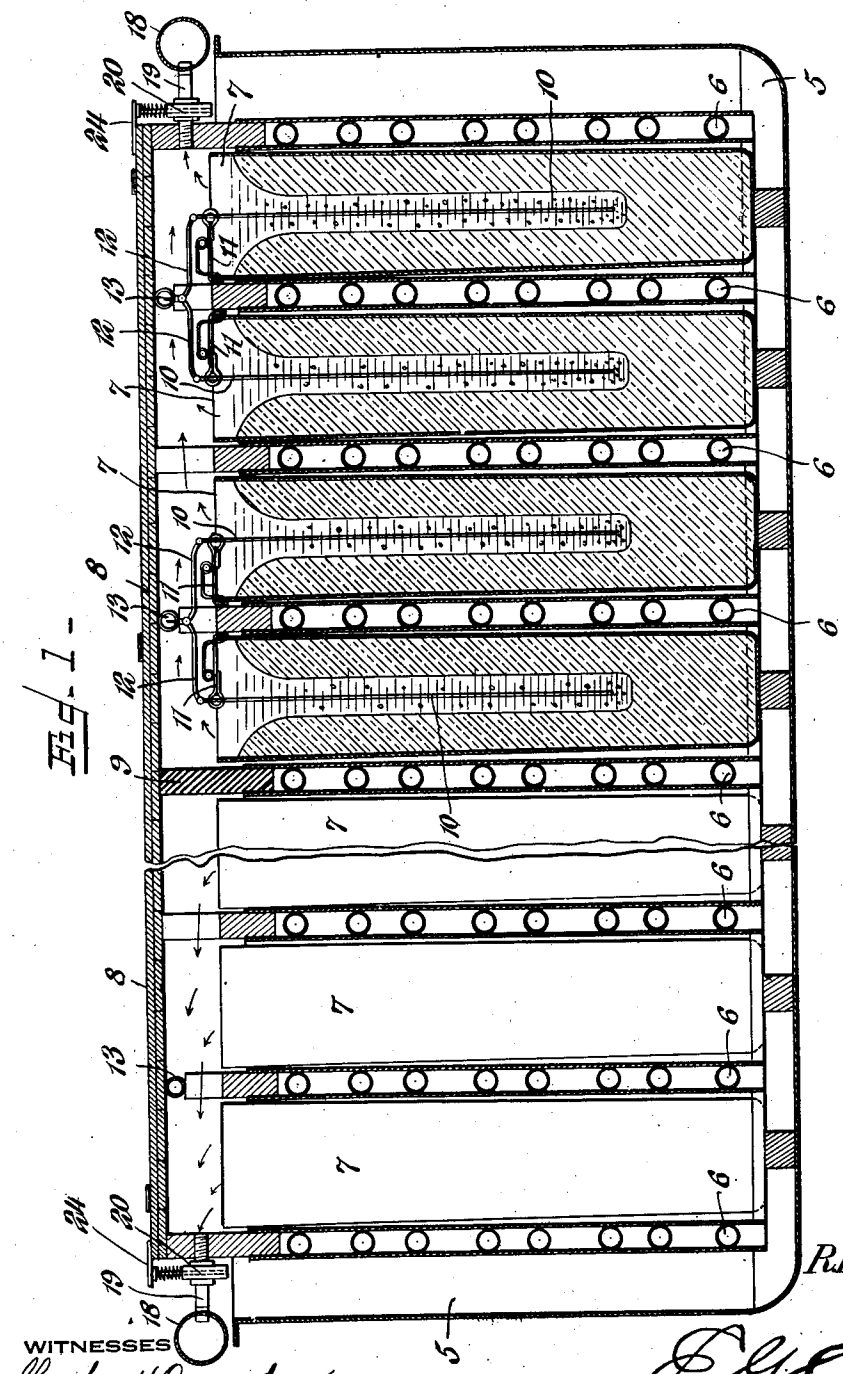


Fig. 1.

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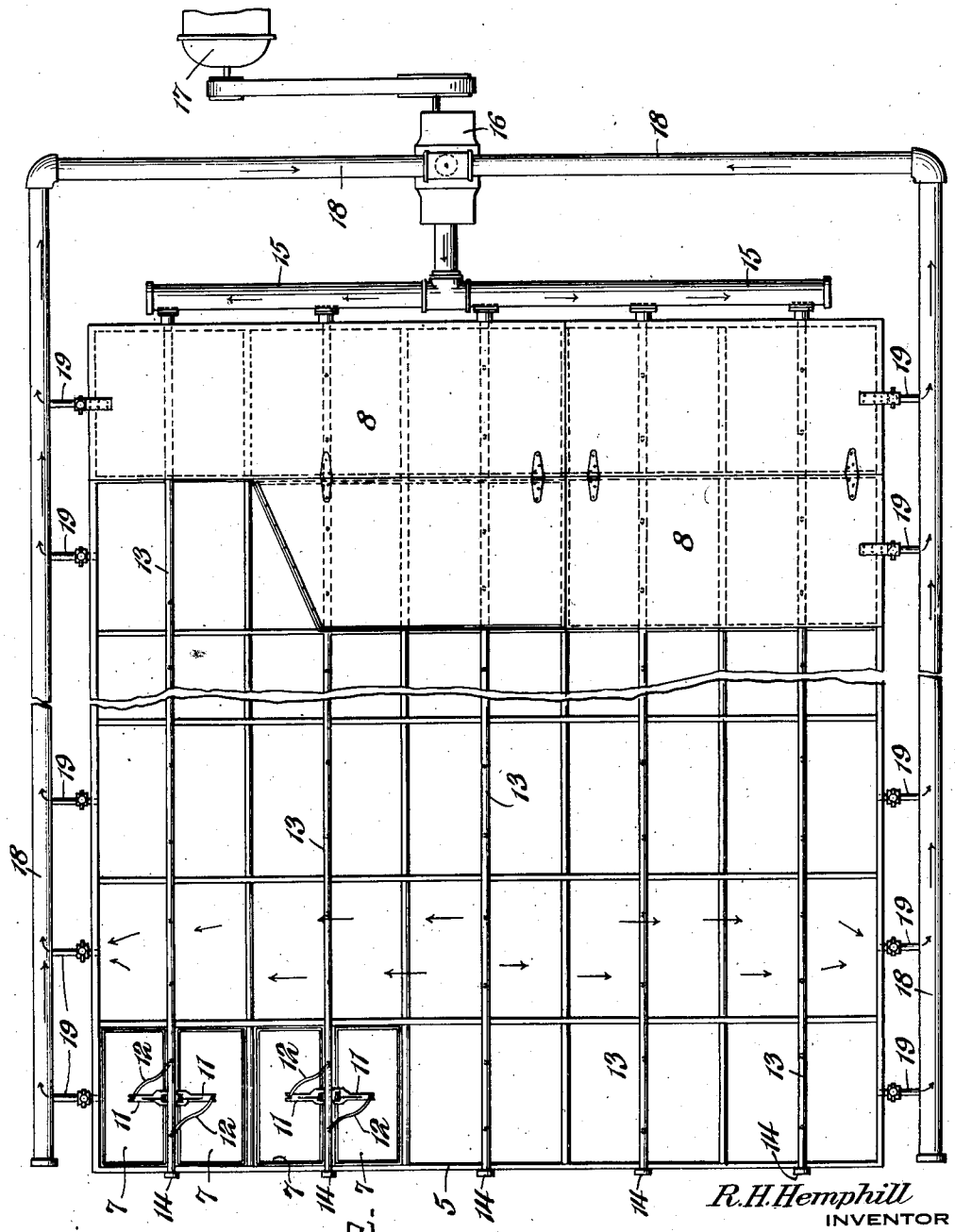


Fig. 2.

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ICE MAKING APPARATUS

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Fig. 3.

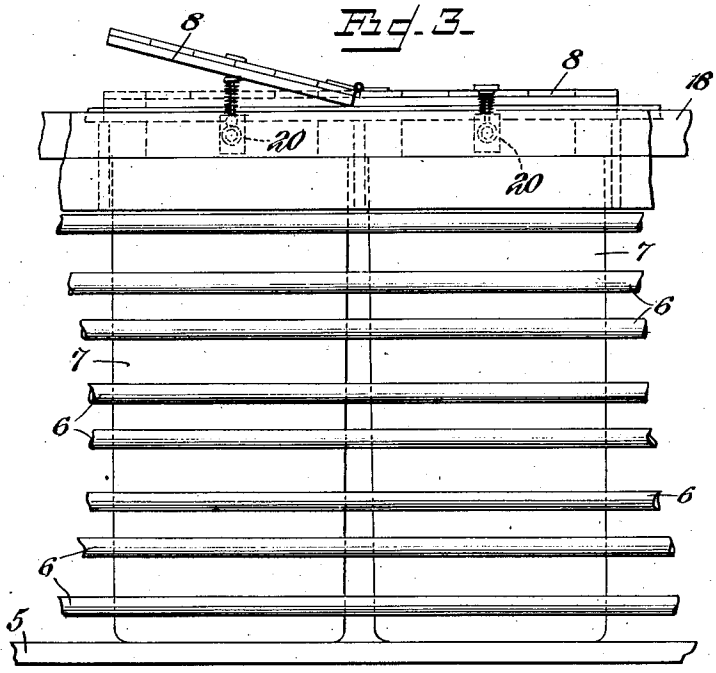


Fig. 4.

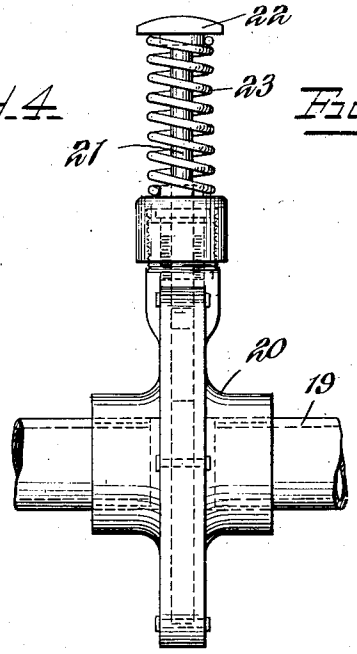
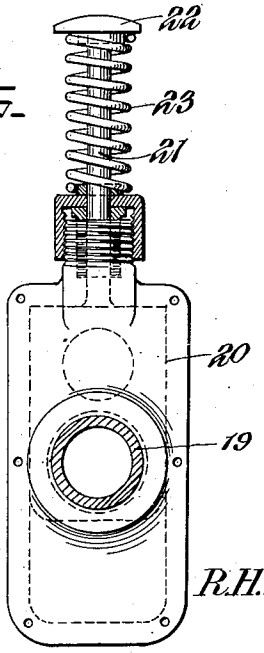


Fig. 5.



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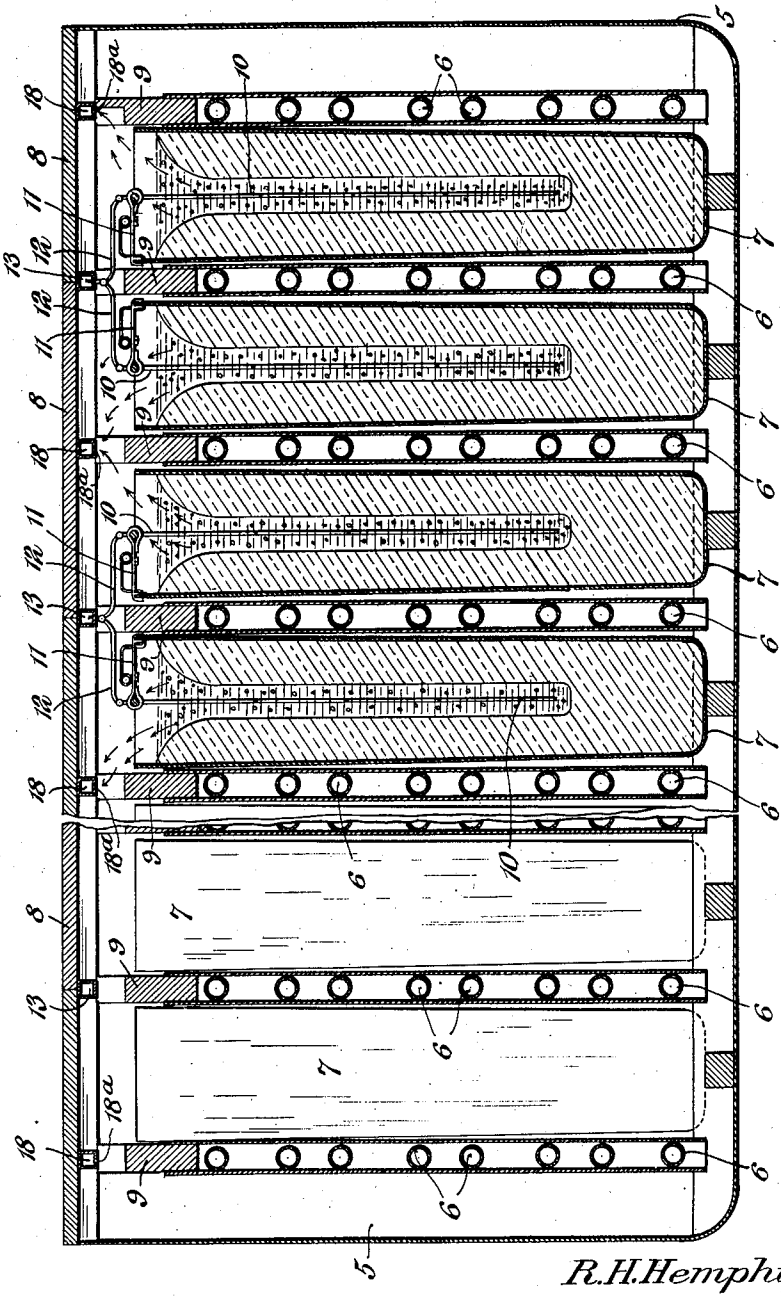
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ICE MAKING APPARATUS

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Fig 4-B.



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ICE MAKING APPARATUS

Filed July 10, 1923

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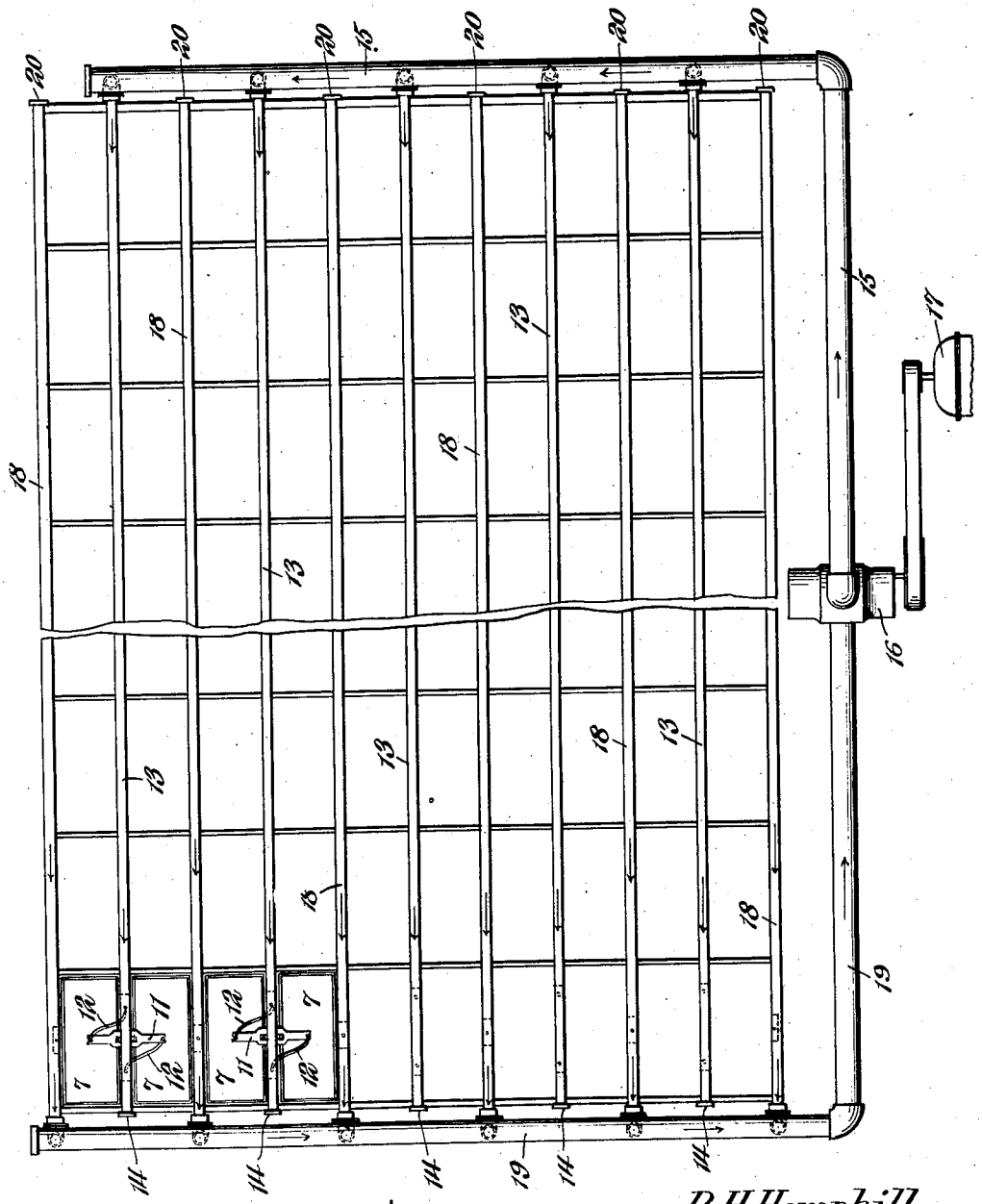


Fig. 7.

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UNITED STATES PATENT OFFICE.

ROBERT H. HEMPHILL, OF CHARLESTON, SOUTH CAROLINA, ASSIGNOR TO FRICK COMPANY, OF WAYNESBORO, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ICE-MAKING APPARATUS.

Application filed July 10, 1923. Serial No. 650,707.

To all whom it may concern:

Be it known that I, ROBERT H. HEMPHILL, a citizen of the United States, residing at Charleston, in the county of Charleston and State of South Carolina, have invented a new and useful Ice-Making Apparatus, of which the following is a specification.

My invention relates generally to improved refrigerating methods and apparatus, and aims to provide a novel air conditioning apparatus for air agitating systems such as is employed in raw water ice plants, similar to that disclosed in the patent of R. F. Lindsay and R. H. Hemphill, No. 1,442,410, dated January 16, 1923, though not limited strictly thereto.

The object of the invention is to provide a means and method by which the same air, substantially, is used continuously in circulation, being discharged below the surface of water in the freezing cans or containers, returning through the suction pipes to the forcing means.

In the accompanying drawings wherein I have shown two embodiments of my invention for purposes of illustration,

Figure 1 is a vertical sectional view of apparatus constructed for carrying out my invention;

Figure 2 is a plan view;

Figure 3 is a view in elevation showing the manner in which the covers of the brine tank control the actuation of the air valves;

Figure 4 is an elevation of the preferred type of air valve;

Figure 5 is a side view of the same with parts in section; and

Figures 6 and 7 are views similar to Figures 1 and 2 showing a modified form of the invention.

In the particular embodiment of my invention selected for illustration in Figures 1 to 5 inclusive, the brine tank 5 has the usual ammonia refrigerating coils 6, freezing cans or containers 7 immersed in brine (not shown), and hinged covers 8 completely closing the top of the tank. In Figure 1 a partition 9 is shown which may divide the freezing tank into two separate compartments, but the number of partitions 9 will depend largely upon the size of the ice plant.

Several of the ice cans 7 are shown in Figure 1 as provided with centrally depending air agitating tubes 10, which may be supported in any suitable way, for example by an attachment 11, such as is shown and described in the aforesaid patent of R. F. Lindsay and R. H. Hemphill. The upper ends of the agitating tubes 10 may be supplied with compressed air through a hose 12, and as best shown in Figure 2, the hose 12 from the agitating tubes in adjacent cans are connected to compressed air supply pipes 13, which preferably extend above and throughout the entire length of the freezing tank and are closed at their ends 14. At their opposite ends, the air supply pipes 13 are connected with a header 15, into which a blower or pump, or other air forcing means 16, continuously delivers a supply of air. The blower 16 may be driven in any preferred manner, as for example by electric motor 17 (Figure 2).

In an ordinary air agitating system, whether employing high or low pressure, the blower has its suction pipe open to the atmosphere, and atmospheric air is drawn through the blower and discharged into the pressure pipes forming the distributing system, and from the pressure pipes to the freezing water in the cans, whence it escapes to the atmosphere. Because of the relatively high temperature of and the impurities in atmospheric air, and because of the variance in its moisture content from day to day, and even from hour to hour, it is necessary to introduce a cooling, cleaning and dehydrating apparatus in the discharge system of the blower so that the atmospheric air may be properly conditioned for use in agitating tubes. The principal objections to the ordinary air agitating system are, first, that there are refrigerating losses caused by the reduction of the temperature of the air to the freezing point of water; second, that the air must be washed to be free from dust and deleterious gases; and third, there must necessarily be constant supervision and regulation of such an apparatus to obtain uniformly conditioned air. By the present invention all of these and other objectionable features are entirely eliminated, because substantially the same air is used over and over again without material dilution or contamination with atmospheric air.

In the embodiment of the invention shown in Figures 1 and 2 the blower 16 is substantially closed to the atmosphere, but has a plurality of intakes into which pipes 18 discharge air. There may be two pipes 18 as

shown, each of which provides a suction header arranged on opposite sides of the brine tank, from which header smaller pipes or laterals 19 extend to the interior of the freezing tank, as best shown in Figure 1. In order to prevent material rise in temperature of the air circulating through pipes 13, 15, 18 and 19, all these pipes may be insulated where exposed to the atmosphere, or preferably the entire installation, including the blower, will be maintained at or below 32° F.

The flow of air through each of the pipes 19 is controlled by a valve 20 of any well known construction, for example, as shown in Figures 4 and 5. Preferably the valves employed are reciprocating gate valves having valve stems 21 provided with heads 22, and springs 23 which normally hold the valves in closed position. The covers of the freezing tank adjacent pipes 19 preferably swing outwardly and have projecting arms 24 engaging the tops of the valve stem heads 22, but not materially depressing said valve stem heads 22 until the covers are closed, as shown in Figure 3, at which time the valves 20 will be moved downwardly and opened thereby allowing passage of air through pipes 19, thus setting up the circulation of the agitating air through the system.

In the operation of the system, the blower forces air through pipes 15 and 13 and through hose 12 and the agitator tube 10 into the freezing cans. From the surface of the water in the freezing cans the air emerges and is drawn off by means of suction from the pipes 19, and so passes through the headers 18 back to the blower again. After the freezing of the cakes of ice, it is necessary to lift the ice cans or containers out of the freezing tank, and in order to do this, one or more of the covers 8 must be lifted (Figure 3). At such a time it is desirable to check the flow of air through that portion of the system which is open to atmospheric air. The automatic closing of the valves 20 by the opening of the covers 8 prevents any material contamination or dilution of the agitating air supply and any material rise in its temperature.

In the particular embodiment of my invention shown in Figures 6 and 7, the air conditioning apparatus is disclosed as applied to plants already in use. The brine tank 5, the coils 6, freezing cans 7, and removable covers 8, which completely close the top of the tank and are preferably supported on the beams 9 which separate the rows of freezing cans, are of the well known construction.

The cans or containers are provided with centrally depending air agitating tubes 10, supported by the attachment 11, such as is described and claimed in the aforesaid patent of Lindsay and Hemphill. The upper ends of the agitating tubes 10 may be supplied with compressed air through lengths of hose 12, which are connected to compressed air supply pipes 13. The pipes 13 are preferably square in cross section, as shown in Figure 6, and hence may be readily secured to the top edges of beams 9, and provide convenient supports for the removable covers 8.

At one end, the pipes 13 are closed as indicated at 14, (Fig. 7), while their other ends are joined with a header 15 extending preferably along one side or end of the brine tank and connected to the discharge side of a blower 16 driven by a motor 17 or the like. The blower is preferably closed to the atmosphere. As shown, the pipes 13 are supported upon each alternate beam 9 and extend in the same direction in parallel lines, while other similar suction pipes 18 are supported upon the other beams and extend in the opposite direction from a suction header 19 connected with the intake side of the blower 16. Opposite and adjacent to each freezing can, the suction pipes 18 are perforated at 18ª, so that air arising from the surface of the water in the freezing cans may be drawn off and re-circulated through the system. The pipes 18 are closed at ends 20. It is obvious that it is immaterial whether the suction and discharge pipes are parallel, the important point being that each freezing can be served by both a suction and discharge pipe.

In the operation of this form of the invention the blower forces air through pipes 15 and 13 and through hose 12 and tubes 10 into the freezing cans, from which the air rises in bubbles to the surface of the water, and is drawn off by the suction through the perforations in pipes 18 and so passes back to the blower again. In order to prevent material rise in temperature of the supply of agitating air, headers 15 and 19 and the blower itself should be insulated where exposed to the atmosphere, or preferably the entire installation is maintained at or below 32° F. When one or more of the covers are lifted for the removal of a can of completely frozen ice, the circulation of agitating air is not interfered with, because of the greater density of air at 32°, and substantially no dilution of or contamination by the atmosphere takes place. Moreover, as in actual practice, only a small portion of the freezing tank is uncovered at any one time, the dilution by atmospheric air is negligible.

It is obvious that the present system is wholly automatic, since the air as it issues from the surface of the freezing water in the cans is in an ideal condition for re-use for agitation, and that after the system is once installed no superintendence is neces-

sary to effect the proper conditioning of the air. Notable economies in the operation of an ice plant may be effected by my invention, which eliminates all air conditioning apparatus and the necessarily expensive maintenance thereof.

My invention obviously is not restricted to the particular embodiments thereof herein illustrated and described, nor is it restricted to ice manufacturing.

By the words "direct" and "directly" in the claims, I intend to exclude a construction wherein the air is conditioned outside the refrigerator by being passed through a brine chamber.

What is claimed is:—

1. In an ice-making plant, the combination of a brine tank having a hinged cover, a freezing can in said tank, a conduit for conducting agitating air into the interior of the can, a blower forcing air to said conduit, a suction pipe connecting the blower with the interior of the tank, and a valve in the suction pipe actuated by movement of the cover so as to be open when the cover is shut and closed when the cover is partly or wholly open.

2. In an ice-making plant, the combination of a brine tank having a partition therein dividing the tank above the surface of the brine into a plurality of non-communicating compartments, a cover closing the top of each compartment, a freezing can in each compartment, a conduit conducting agitating air into the interior of each can, a blower forcing air to said conduits, a suction pipe connecting each compartment with the suction side of the blower, and a valve provided in each suction pipe and closed by raising of the cover.

3. In an ice-making plant, the combination of a freezing tank, containers in said tank, partitions between and extending above the tops of said containers and separating the upper part of said tank into compartments through which the said containers or the contents thereof may be introduced and withdrawn from said freezing tank, an air circulating system consisting of an air pumping device and a series of suction and discharge pipes suitably connected with the suction and discharge sides respectively of said air pumping device, said pipes being arranged alternately above the partitions between successive pairs of containers, and depending tubes connected at each side of the discharge pipes said tubes extending into said containers and providing with said pipes direct communication from the pumping device to the containers.

4. In an ice-making plant, a container for water, a refrigerating tank for holding the container said tank having an opening adjacent the container, an air passage leading into said container, means to force air through said passage, a passage from the interior of said tank to said means thereby providing a circulation of air, a cover for said opening in the tank, and interconnected means for interrupting such circulation when the cover is opened, substantially as set forth.

5. In an ice-making plant, a refrigerating tank having means to divide the air-space therein into a plurality of separate compartments with an opening into each compartment, a water container in each compartment removable through the opening therein, a cover for each of said openings, conduits for leading air into each container, means to force air through said conduits, conduits for returning air from the containers to said forcing means, and means in connection with each cover for interrupting the flow of the returning air in the corresponding conduit when the cover is opened, substantially as set forth.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

ROBERT H. HEMPHILL.