W. H. A. HALSALL.

ICE MAKING APPARATUS.

APPLICATION FILED JULY 26, 1909.

975,523.

Patented Nov. 15, 1910

2 SHEETS—SHEET 1.

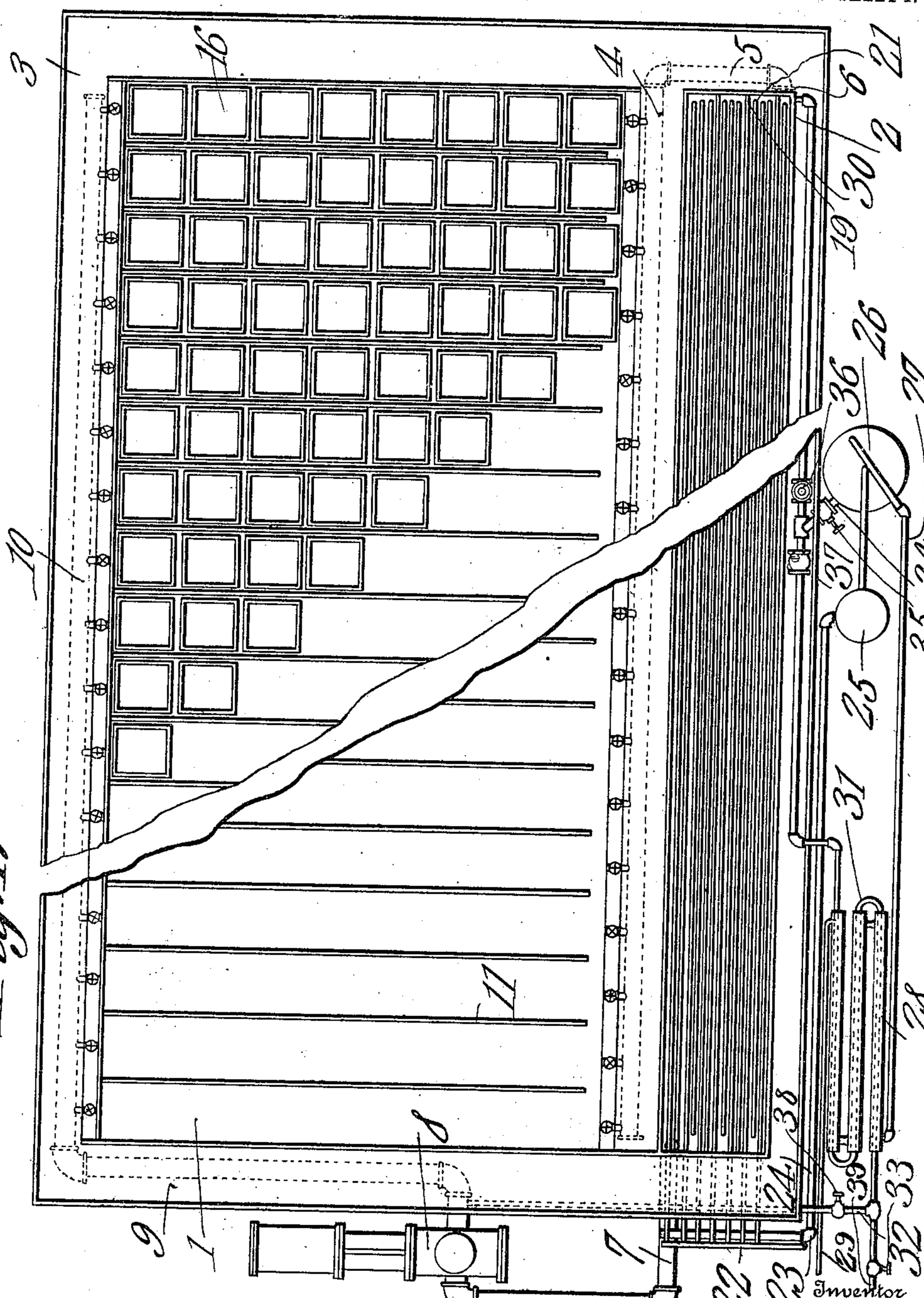

Fig. 1.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

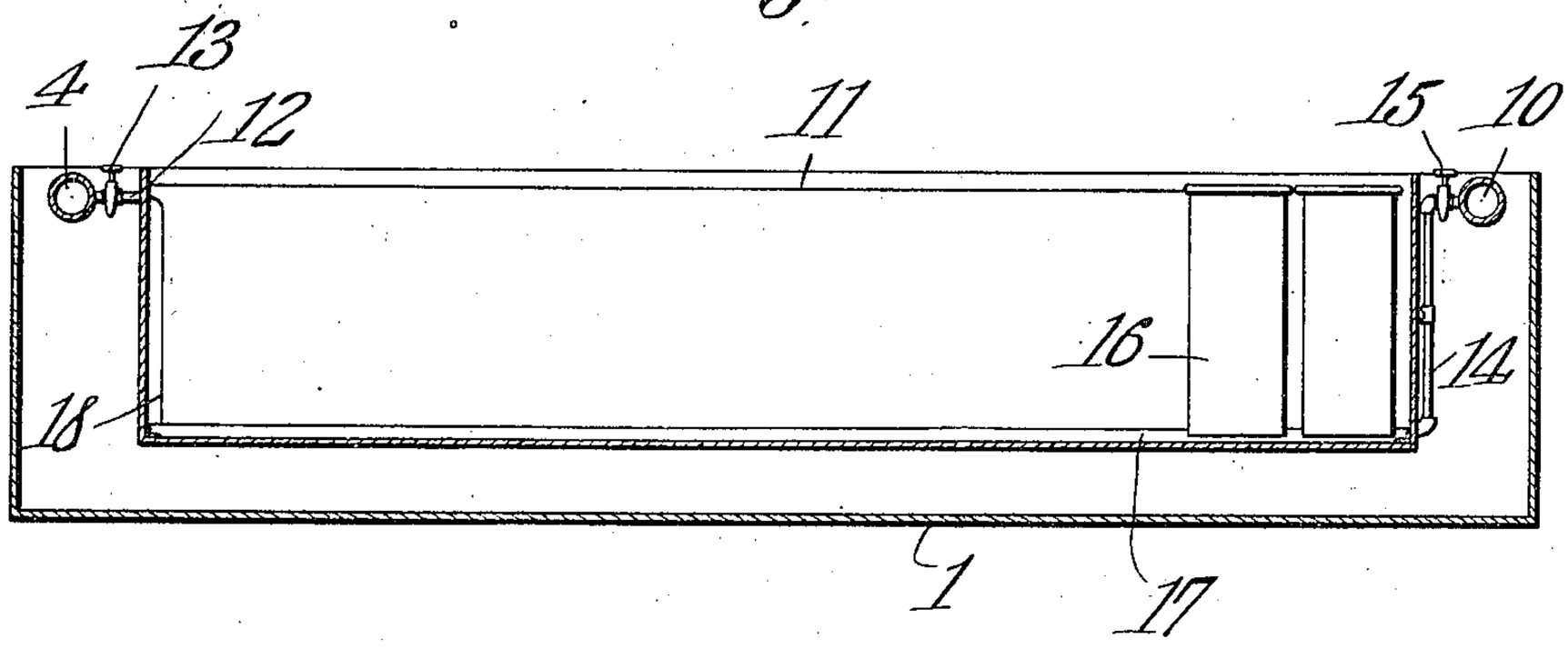
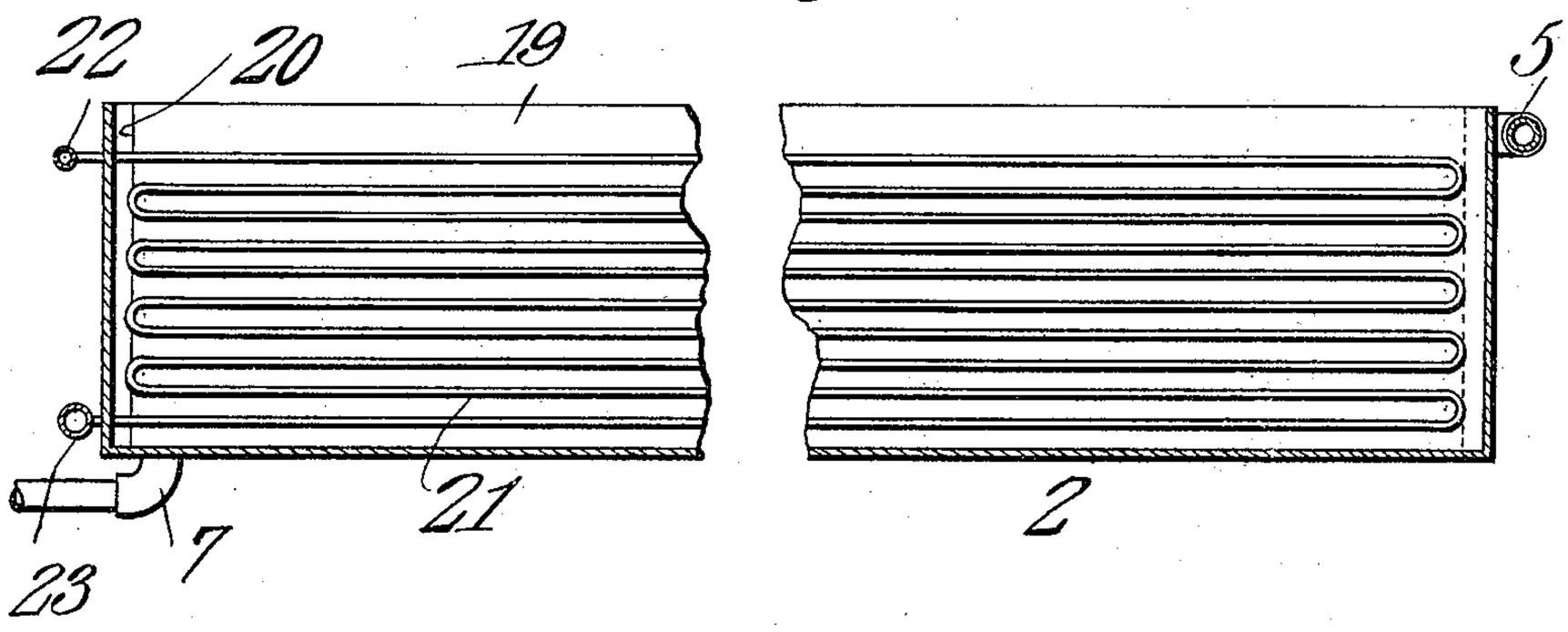


Fig. 3.



Witnesses

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ICE-MAKING APPARATUS.

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Application filed July 26, 1909. Serial No. 509,623.

To all whom it may concern:

Be it known that I, WILLIAM H. A. HALSALL, 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.

This invention relates to ice making apparatus and has special reference to the construction of the freezing tank and the means for cooling the poor-liquor.

The invention consists in certain novel features which are illustrated in the accompanying drawings and which will be hereinafter fully described and claimed.

In the drawings, of which mention has just been made, Figure 1 is a plan view of my improved apparatus. Fig. 2 is a transverse section of the freezing tank. Fig. 3 is a longitudinal section of the brine cooling tank.

In the preferred arrangement of my apparatus, the freezing tank 1 and the brine cooling tank 2 are separate compartments within an inclosing frame or box 3 and the outlet side of the freezing tank is provided with a header 4 connected by a pipe 5 with one end of the brine cooling tank, as indicated at 6, while the opposite end of the said brine cooling tank is connected by a pipe 7 with the pump 8 from which a conducting pipe 9 extends to an inlet header 10 at the inlet side of the freezing tank, as will be readily understood. Arranged transversely within the freezing tank are a series of partitions 11, dividing the said tank into a number of compartments, and outlet pipes 12 lead from the said compartments to the outlet header 4, valves 13 being provided in the said pipes so as to control the flow from the compartments to the outlet header, as will be readily understood. The inlet header 10 is connected with the said compartments by pipes 14 provided with valves 15, and by reason of this arrangement, the brine may be admitted to any one of the compartments, while cut off from the others so that the cans 16 in which the ice is formed may be cut out from this brine circulation according to the stage of the freezing process within the individual cans. The partitions 11 are preferably constructed of sheet iron and are secured to the front side and the bottom of the freezing tank by means of angle irons 17, while the rear edges of the partitions are cut away, as indicated at 18, so that the brine may pass around the rear edges of any partition and thereby reach cans which may be frozen up.

When the inlet and outlet valves of any one compartment in the freezing tank are both open the brine will, of course, flow directly between the said valves and through the compartment without appreciably entering the adjoining compartment. By closing the inlet valve of frozen compartments, however, the brine will be caused to flow to other adjoining compartments and there perform the desired freezing function. The provision of the partitions within the freezing tank forces the brine to circulate on the sides of all the cans equally so that the ice will be formed in solid blocks within the cans, as will be readily understood, the distance between the partitions being slightly greater than the width of a can.

Within the brine cooling tank are a series of partitions 19 consisting of sheet iron plates disposed longitudinally within the tank and terminating alternately short of the opposite ends of the tank, as indicated at 20, so that the brine entering the said tank will be forced to flow through the same in a tortuous passage before leaving the tank. Arranged within this tank, between the partitions, are series of coils 21 through which liquefied gases expand and circulate to absorb the heat from the brine and reduce the temperature of the said brine before it returns through the pump and its connections to the freezing tank. Liquefied gases admitted to the several coils 21 enter the brine cooling tank from the upper header or manifold 22 and leave the tank at the same side to enter a lower header or manifold 23, the upper manifold 22, as will be readily understood, being connected with the liquid receiver from cooling coils or gas condensers. The lower header 23 communicates through a pipe 24 with a storage tank 25 in which is contained the distilled water and through which the gases returning from the coils 21 flow on their way to the absorber 26. The absorber 26 has connected to its upper end a spray pipe 27, through which the poor-liquor disperses itself after passing through my double pipe cooler. Said cooler comprises a double coil 28, the inner pipe 31 of said coil being connected by a pipe 32 to the discharge pipe 9 of the brine pump. A pipe 30 is connected at the entrance end of the brine cooling tank to allow brine to

flow in the brine cooling tank after passing through the pipe 31 and absorbing heat from the poor-liquor, the branches of the pipe 31 passing through the branches of the outer pipe of the coil 28. 29 shows the inlet to the pipe 28 which leads from the poor liquor cooling coils over which water flows.

In order to permit the direct expansion of liquefied gas through the double coil cooler, I provide the inlet pipe 32 with a brine inlet valve 38 and a pipe 39 leads from the junction of the pipes 31 and 32 to the liquid refrigerant receiver. Beyond said junction, this pipe 39 is provided with an expansion valve 33, liquefied gas passing through said valve to pipe 31 and thence through a branch pipe 34 from the pipe 30 to the absorber. The branch pipe 34 is provided with an ammonia cut-off valve 35 and the pipe 30 is provided with a brine cut-off valve 36 in rear of the branch and a check valve 37 in advance of the branch, as clearly shown.

From the foregoing description, taken in connection with the accompanying drawing, it is thought that the operation and advantages of my improved apparatus will be readily understood.

The brine is caused to circulate through the freezing tank and through the brine cooling tank in the manner described so that the water will be frozen and the brine cooled and then again sent through the freezing tank in a continuous process. The construction and arrangement of the partitions in the freezing tank will permit the brine to circulate between cans that may be frozen up and to keep the temperature at a low degree without having to open all of the inlet valves 15, these valves being opened only to permit the flow of brine to any row or rows of cans that are being filled with water. The partitions being attached to the freezing tank at their lower and front ends, the brine can escape only at the outlet end, and consequently will be compelled to flow around each can on its way to the outlet. The brine after leaving the freezing tank being caused to flow in a tortuous path over a series of coils in the brine cooler will be greatly reduced in temperature, owing to the fact that it will be acted upon by the cooling or expansion coils for a considerable interval of time before being forced back to the freezing tank by the pump, as will be readily understood. As the brine is greatly reduced in temperature within a comparatively short period of time, the cost of manufacturing ice is greatly reduced, and the time necessary for its production is lessened. If the valves 36 and 38 be open, cold brine from the outlet of the pump will pass through the inner pipe 31 of the double coil and thence into the pipe 30 and through the same into the entrance end of the brine cooling tank. If the valve 38 be now closed, the brine will drain from the pipe 31 into the brine cooling tank through the valve 36. After the pipe 31 is free of brine, the valve 36 is closed and the valves 33 and 35 are opened so that liquefied gas may flow through the pipe 31 and the branch pipe 34 into the bottom of the absorber, while the poor liquor passes through the inlet pipe 29 to the outer pipe 28 of the double coil and thence through the pipe 27 into the top of the absorber. The poor-liquor passing from the generator through a stand of cooling coils and then passing through the pipe 29 to the cooling coils 28 will be greatly reduced in temperature. The brine passing through the pipe or coil 31 absorbs the heat from the poor-liquor and greatly reduces the temperature of the same before it enters the absorber 26. The exhaust gases entering the absorber from the pipe 34 will be readily absorbed by the cooled poor-liquor and the back pressure in the absorber will, consequently, be greatly reduced. The arrangement permits the poor liquor to be cooled by either the brine or the ammonia gas at will so that the reduction in temperature may be continuous and effectual.

Having thus described my invention, what I claim is:

1. The combination of a brine cooling tank, cooling coils within the said tank, a storage tank, a pipe leading from the cooling coils to the said storage tank, an absorber connected with the said storage tank, a brine conveying pipe connecting with the tank, and a weak liquor coil inclosing the said pipe and connected with the absorber.

2. An ice making apparatus comprising two brine circuits, a common cooling means for said brine circuits, means for cutting out the brine from one of said brine circuits, and means for feeding a different cooling medium to said last mentioned circuit when the brine is cut out.

3. The combination with a brine cooling tank, of a brine conveying pipe connected with the discharge from said tank and entering the inlet end thereof, an absorber, and a poor liquor coil inclosing said brine conveying pipe and connected with the absorber.

4. The combination of a brine cooling tank, an absorber, a poor liquor coil connected with the absorber, a pipe passing through said coil and connected with the tank and with the absorber, and means whereby brine may be sent through said pipe to the tank or gas may be sent therethrough to the absorber.

5. An ice making apparatus having a primary brine circuit, a secondary brine circuit, a common cooling tank for said brine circuits, weak liquor cooling means combined with said secondary brine circuit, means for cutting out the brine from said secondary

brine circuit, and means for supplying an expansible cooling medium to said secondary brine circuit when the brine is cut therefrom.

6. An ice making apparatus having a primary brine circuit, a secondary brine circuit, a common cooling tank for said brine circuits, a common pump for said brine circuits, cooling pipes for conducting an expansible cooling medium through said cooling tank, a storage receptacle in communication with said cooling pipes, an absorber in communication with said storage receptacle, a valved connection between said absorber and said secondary brine circuit, weak liquor conducting means surrounding a portion of said secondary brine circuit, and communicating with said absorber, means for cutting said brine circuit off from said pump, and a valved by-pass leading into said brine circuit for supplying an expansible cooling medium thereto when said circuit is cut off from said pump.

7. An ice making apparatus comprising a primary brine circuit, a secondary brine circuit, a common cooling tank for said brine circuits, an absorber in valved connection with said secondary circuit, means for cutting the brine off from said secondary brine circuit, a valved by-pass communicating with said secondary brine circuit for supplying an expansible cooling medium thereto, and weak liquor conducting means combined with said secondary brine circuit and communicating with said absorber.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM H. A. HALSALL.

Witnesses:
THOS. S. SIROHLER,
J. S. MOSELEY.