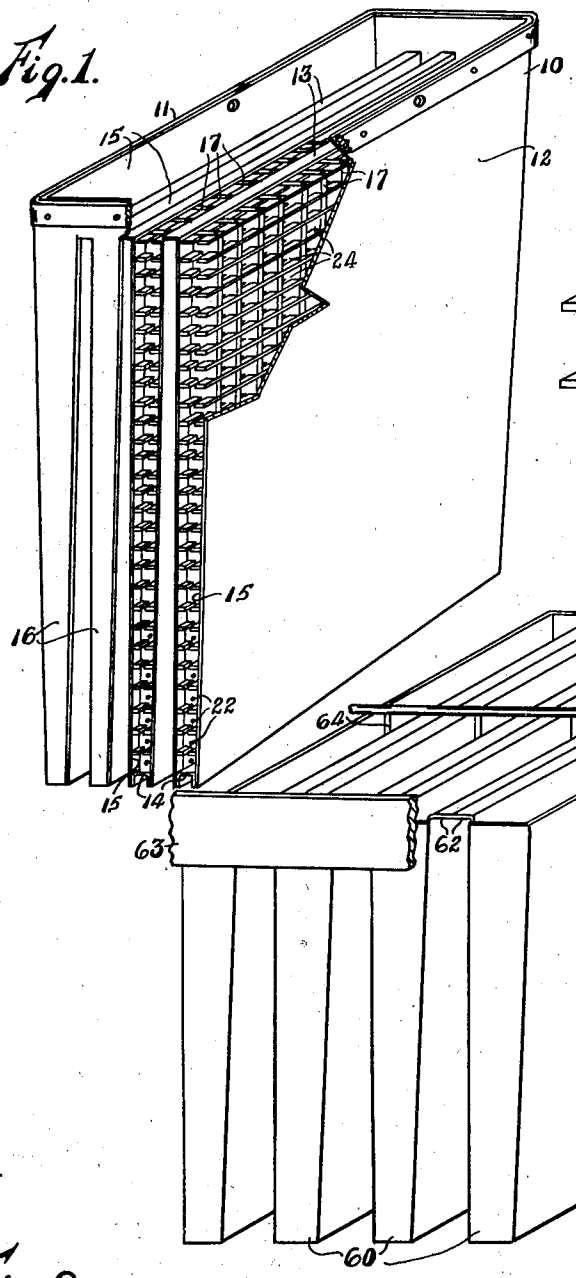
March 26, 1935. G. L. POWNALL 1,996,049

ICE PRODUCING APPARATUS

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Fig. 1.



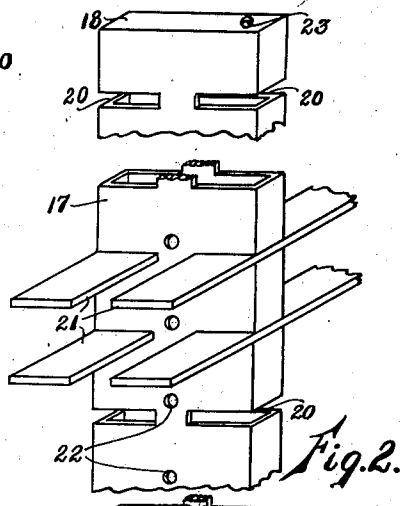


Fig. 2.

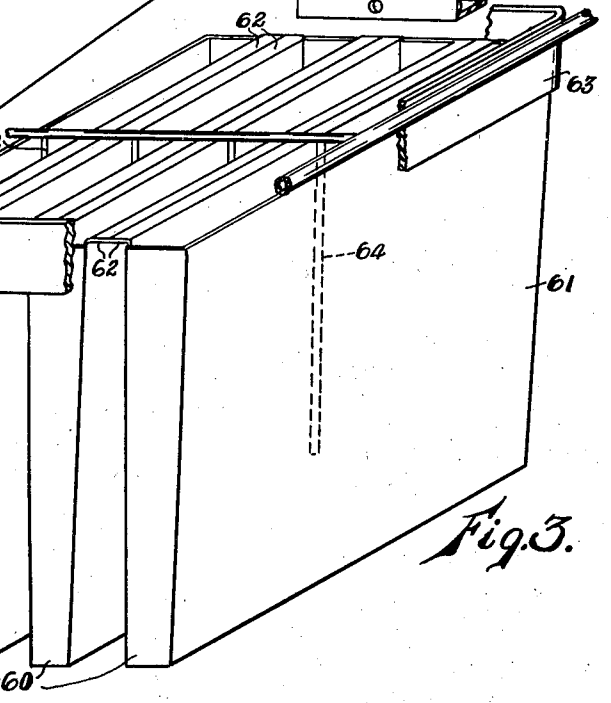
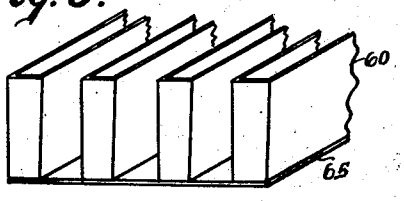


Fig. 3.

Fig. 9.



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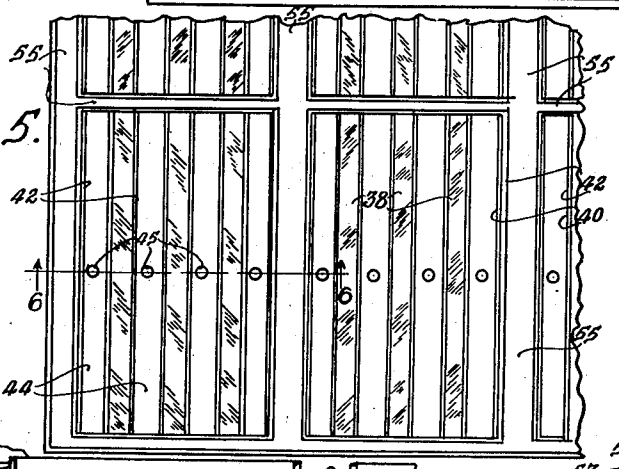
ICE PRODUCING APPARATUS

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Fig. 4.



Fig. 5.



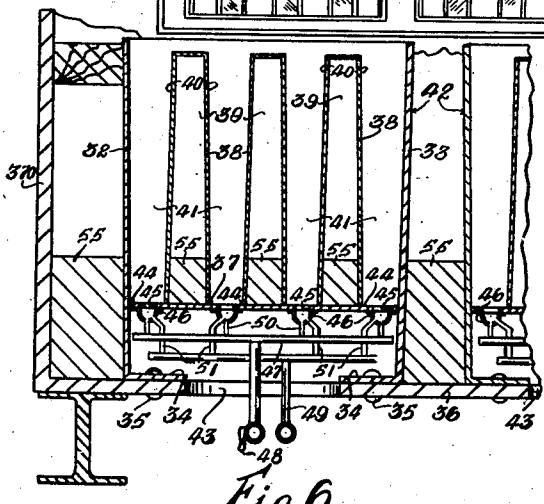


Fig. 6.

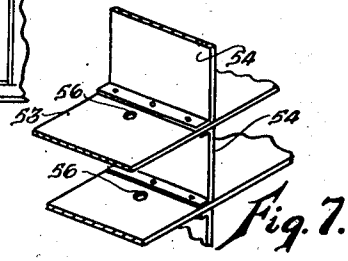


Fig. 7.

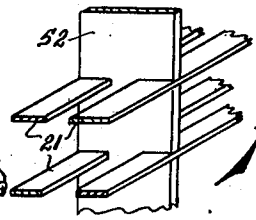


Fig. 8.

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UNITED STATES PATENT OFFICE

1,996,049

ICE PRODUCING APPARATUS

George L. Pownall, Columbus, Ohio

Application January 22, 1932, Serial No. 588,175

18 Claims. (Cl. 62—108)

This invention relates to an improved type of ice can or mold and means for providing artificial ice slabs and likewise small artificial ice cubes adapted especially for table use such as in drinking glasses and the like.

An object of the invention is to provide means for producing a group of small slabs of artificial ice in one ice can of commercial standard size.

Another object is to provide means for freezing a group of small slabs of artificial ice in one ice can in a relatively short time.

Another object is to provide an ice can of novel construction having brine passages through the can.

Another object is to provide means for manufacturing a group of clear artificial ice slabs in one ice can.

Another object is to provide means for manufacturing a group of opaque artificial ice slabs in one ice can.

Another object of the invention is to provide means for freezing ice cubes of the kind described which require no cutting before use.

Another object is to provide for producing a large number of such cubes joined by thin integral web portions easily broken for separating the mass of ice into individual cubes.

Another object is to provide means for manufacturing opaque ice cubes.

Another object is the provision of means of the kind described capable of producing ice cubes in an unusually short period of time.

Another object is to provide such means which are simple, efficient and readily installed.

These and other objects are attained by the means described herein and illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of ice cube producing means of the present invention, with parts broken away.

Fig. 2 is a fragmentary perspective view of a part of the invention.

Fig. 3 is a perspective view of modified means of the invention.

Fig. 4 is a conventional top plan view of a complete installation of the ice cube freezing means, with parts broken away.

Fig. 5 is a top plan view showing units of another modified form of the invention, installed and with parts broken away.

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5, with parts broken away.

Figs. 7, 8 and 9 are fragmentary detail views of modified forms of the invention.

Heretofore the manufacture of artificial ice in commercial ice plants, hotels etc., has been in a relatively large size ice can requiring a lengthy time for freezing the ice. The ice can has been ordinarily constructed of four solid walls and bottom with the top open, and upon the lowering or partial submerging of this ice mold in a brine tank, commercially known as an ice tank, the cold brine circulation around the four sides and bottom accomplished the freezing. This practice required a considerable period of time for freezing a given weight of ice due to the great thickness of ice through which the heat given up by the unfrozen water had to pass to reach the cold freezing medium outside the can. The size of the ice cans in use in commercial artificial ice making tanks is very much standardized and the wooden framework and steel group frames normally utilized at the top of the ice tank are constructed to receive the standard ice can sizes. Accordingly this invention provides ice cans of the standard outside dimensions at the top but said cans are constructed with open end walls to permit brine flow past eight side walls instead of the conventional two side walls. This is readily seen in Fig. 1. Actual freezing time with same brine temperatures and weight of ice in a given space of freezing tank is approximately a ratio of twenty to one.

The present invention likewise provides for the quantity production of ice cubes. Such production in a commercial ice plant has been accomplished through the use of ice cube cutting machines consisting of a number of circular saws which divide large blocks of ice into the required small cubes. This practice entails approximately a forty percent waste and has been found undesirable for the further reason that frequent injuries to operators have occurred with the use of such cutting machines. The means of the present invention materially eliminate the waste and the danger of injury by providing freezing means comprising containers adapted to be submerged in the freezing tanks of an ice-producing plant, and compartment-forming members receivable in said containers and adapted to effect the formation of a large number of web-joined ice cubes therein, said forming members being removable from the containers together with the frozen mass, and being readily separable from the formed cubes.

The form of the invention illustrated in Figs. 1 and 2 comprises ice can 10 substantially rectangular in horizontal cross-section and provided with sides 11 and 12 converging inwardly to a slight extent from top to bottom. Space-form-

ing partition members 13 are positioned within the ice can and form additional side walls for the ice can said partition members extending not so high as the outside walls of the ice can. Each partition member which forms a brine passage through the ice can, is of an elongated inverted U-shape in vertical cross-section, and is slightly divergent from top to bottom. They are held in place by spacing strips 14 which constitute the bases of the compartments 15 formed by the partition members 13. The ends of the ice can 10 are cut to provide downwardly-tapering tongues 16 adapted to close the ends of compartments 15 but not of the partition members, and to be secured to the end edges of the partition members.

The ice cube forming means are adapted to be received in the compartments 15. Said means comprise a plurality of regularly-spaced vertically-positioned tube members 17, rectangular in cross-section and closed at their top and bottom ends, 18 and 19, respectively. Tubes 17 are formed to fit within compartments 15 and are cut each to provide a plurality of opposed rectangular apertures 20 extending at uniform distances along the lengths of the tubes. Strips 21 are receivable in the apertures 20 and extend in pairs along the length of the compartments 15, each pair being disposed in the same plane. Adjacent the bottom ends of tubes 17 air holes 22 are provided centrally of said tubes and extending vertically therealong for a limited distance. The top end 18 of each tube is perforated as at 23 for connection with air supply means to be later indicated.

It will be seen that when the forming means just described have been positioned in compartments 15 they form, with the walls of said compartments and of the ice can 10 and tongues 16, a plurality of small ice forming chambers 24 (Fig. 1). The complete unit is adapted to be positioned in a suitable brine tank 25 (Fig. 4), with the top of ice can 10 above the level of the brine, and with the compartments 15 filled with pure water to be frozen. Air under pressure is passed from a suitable source through a main line 27 and connection 28, into a header 29, positioned adjacent one end of each ice can 10. An auxiliary conduit 30 extends from header 29 along the top of each row of tubes 17, said conduit 30 being provided with suitable connections entering the ports 23 in the tops of said tubes. Air is passed downwardly through the tubes and out the air holes 22 and bubbles upwardly through the water in the compartments, agitating the water during the process of freezing, whereby the resultant ice is rendered clear and unclouded. The freezing is accomplished effectively and in a minimum of time by the circulation of cold brine in the tank 25, the brine completely encompassing the ice-forming compartments by circulation through the partition members 13 and all around the ice can 10. When the freezing process has been completed the ice cans are removed from the brine tank in the conventional manner by means of a crane and hoist and carried by the crane to the usual dip tank where the can is lowered into a bath of warm water which thaws the frozen mass in the various compartments from the ice can sidewalls and bottom and the ice slabs or the ice cube forming frames are then readily removed from the can. The ice cube forming frame may be manufactured of a flexible material in which case a slight bending or disaligning movement will release the ice cubes. In event the ice cube forming frame is manufactured of a rigid metal the cubes can be released by inserting a conventional thawing needle supplying warm water to the opening 23.

A modification of the ice can means is shown in Fig. 3. Herein, separate narrow cans 60, having downwardly convergent sides 61, are connected laterally to one another by spacing strips 62. The unit may be further bound together by a strap 63 extending around the top portion of the unit. The cube forming structure heretofore described may be used in each can 60, said structure extending upwardly in the cans to a short distance from the tops thereof. It is obvious that a single one of the cans 60 might be utilized, separate and apart from a unit, where a limited number of ice cubes is to be manufactured. The action of the brine and the removal processes heretofore set forth are identical in connection with the unit shown in Fig. 3, and with the single can usage referred to.

In Figs. 5, 6, 7 and 8, modified forms of the invention are shown. Ice can units 42 of the stationary type are provided, each comprising a pair of outer side wall members 32 and 33 formed at their bottoms with inwardly turned flanges 34 adapted to be permanently attached, as by rivets 35, to the floor 36 of a brine tank 370. A raised bottom 37 is positioned between said wall members. Partition members 38, of inverted U-shape in vertical cross-section, extend longitudinally of and are secured upon the bottom 37. The ends of the partitions are open as at 39 and the freezing compartments 40, formed between the partitions and the wall members 32 and 33, have closed ends 41. Each ice can unit 42 is adapted to be placed in vertical alignment with a hole 43 in the floor 36 of the brine tank 370. The base portion 44 of each freezing compartment 40 is provided with a central perforation 45 and over this perforation, upon the under face of each base portion 44, is secured a bowl member 46. Pipe connections into said bowl provide for supplying precooled fresh water through a pipe line 47 and auxiliary pipes 50 to fill all the freezing compartments at a single operation. The same water system may be used to drain said compartments, by use of a valve, conventionally represented at 48. Air under pressure is supplied to each compartment 40 through an air supply line 49 and auxiliary pipes 51, this air supply system is used to agitate the water during freezing and replaces the one explained above as associated with the upper parts of can units. The tubes 17 previously explained are replaced by solid vertical strips 52 (Fig. 8), the same kind of horizontal strips 21 being utilized. As another modification of the ice cube forming frame, the means shown in Fig. 7 may be employed. Single horizontal strips 53 provided with perforations 56 and of substantially the width of the freezing compartments, have secured thereto, in vertical continuity, and at regular intervals along the strips, the vertical sections 54, which replace the tubes 17 heretofore described. The frames so formed produce opaque ice in distinction to the other type of frame which permits formation of clear ice. The perforations 56 are preferably positioned adjacent the vertical members 54 and provide for the escape of air and the expansion of water during freezing. In order to preclude freezing of water in the bowls 46, the spaces between the ice can units and between the freezing compartments of the units may be filled with some insulating material 55, such as asphaltum, extending above the line of the base portions 44,

whereby the brine surrounding the can units and the freezing compartments is unable to affect water in said bowls. When the freezing process has been completed, the cold brine in tank 37 is replaced by warm brine which loosens the ice from the partitions 38 and side wall members 32 and 33. Thereafter the congealed masses are removed from the compartments 40 together with the ice cube forming frames. The ice cubes may be released from their frames in the manner previously indicated.

The means of this invention, therefore, in addition to providing for the freezing of large quantities of small ice cubes, likewise provide for freezing large slabs of ice, each occupying one of the large compartments of the ice can units herein described. Such slabs, due to the increased brine circulation, may be frozen in a greatly reduced period of time. When the ice can units are so utilized, drop tubes 64 (Fig. 3) forming part of an air supply system, provide for agitation of the water during freezing, for producing clear ice. In the modification shown in Fig. 9, an ice can unit such as seen in Fig. 3, has secured to the bottoms of the individual containers 60, a plate 65 rigidifying and strengthening the unit.

Reference is made to my copending applications Serial No. 632,923 filed September 13, 1932, allowed July 18, 1934; and Serial No. 632,924 filed September 13, 1932.

What is claimed is:

1. An ice cube freezing unit comprising an ice can open at top and bottom, partition members of inverted U-shape in cross section adapted for positioning in the ice can, strips spacedly connecting the partition members at the bottoms thereof and forming compartments between the partition members, the ice can walls at the ends of said compartments being cut to provide tongues closing said ends and leaving open the spaces within the partition members, and ice cube forming apparatus comprising a plurality of support members disposed in vertical evenly-spaced relationship in each of said compartments, each support member being provided laterally along its length with regularly spaced pairs of opposed apertures, and a plurality of strips disposed in said apertures and extending the length of said compartments, the freezing unit being adapted for insertion in a brine tank whereby circulation of brine around each of said compartments may be effected, the compartments being adapted to be filled with water to be frozen, and the positioned forming apparatus being adapted to effect formation of a plurality of ice cubes interconnected by ice webbing and to be withdrawn from the compartments and flexed to fracture said webbing and loosen the cubes.

2. The combination with a brine tank and air pressure means, of an ice cube freezing unit comprising an ice can open at top and bottom, partition members of inverted U-shape in cross-section adapted for positioning in the ice can, strips spacedly connecting the partition members at the bottoms thereof and forming compartments between the partition members, the ice can walls at the ends of said compartments being cut to provide tongues closing said ends and leaving open the spaces within the partition members, and ice cube forming apparatus comprising a plurality of tubes disposed in vertical evenly-spaced relationship in each of said compartments, each tube being provided laterally along its length with regularly-spaced pairs of opposed apertures and having a vertical row of perforations adjacent its lower end, and a plurality of flexible strips disposed in said apertures and extending the length of said compartments, the freezing unit being adapted for insertion in said brine tank to effect circulation of brine around each of said compartments, the compartments being adapted to be filled with water to be frozen, and the positioned forming apparatus being adapted to effect formation of a plurality of ice cubes interconnected by ice webbing and to be withdrawn from the compartments and flexed to fracture said webbing and loosen the cubes, said tubes being adapted for connection at their tops with said air pressure means for passing air through said perforations to effect clarification of the ice during the freezing thereof.

3. Ice cube freezing means comprising a unit having laterally spaced chamber portions depending from a level below the top thereof, and unitary frames adapted each for vertical positioning in one of said containers and removable therefrom and comprising interconnected horizontal and vertical members forming with the walls of said containers, a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the containers the horizontal members of the frame being apertured to provide water expansion spaces.

4. Ice cube freezing means comprising a unit having spaced vertical compartments terminating below the top of the unit and having brine flow spaces therebetween, unitary frames adapted each for vertical positioning in one of said containers and removable therefrom and comprising interconnected horizontal and vertical members forming with the walls of said containers a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the containers, the horizontal members provided with communicating apertures between the compartments, and means for passing air through the containers during the freezing period to effect clarification of the ice formed therein.

5. Ice cube freezing means comprising a container, a unitary frame adapted to be positioned vertically in the container and removable therefrom, said frame comprising horizontal strips and vertical tubular members interconnected to form with the container walls a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the container, the horizontal members being apertured intermediate their edges to provide continuous water expansion spaces vertically through the compartments, the tubular members being perforated adjacent their lower ends and at their upper ends being adapted for connection with air pressure means, whereby air may be passed through the water during freezing thereof to effect clarification of the ice formed in the container.

6. Ice cube producing apparatus comprising a container and a flexible frame for vertical positioning therein and removable therefrom, said frame comprising interconnected vertical tubular members and horizontal strip members, said strip members being disposed in pairs in opposed apertures at opposite sides of the tubular members whereby to effect lateral spacing of the pairs of strips, said frame forming with the walls of the container a plurality of small communicating compartments adapted when the container is filled with water, to effect formation of ice cubes interconnected by ice webbing and releasable upon removal and flexing of said frame, the lower

ends of the tubular members being provided each with a central vertical row of perforations and the upper ends of said members being adapted for connection with air pressure means whereby air may be passed through the water for clarifying the ice formed in the container.

7. The combination of a brine tank provided with a hole in the floor thereof, an ice can secured in the tank over said hole and comprising side walls with a raised bottom therebetween, partition members positioned upon said bottom, said members being of inverted U-shape in cross-section and open at their ends and forming compartments between said side walls, closures for the ends of said compartments, the base portion of each compartment being provided with a perforation, a bowl member secured upon the outer face of each base portion and embracing said perforation, and a water supply and drain pipe and an air supply line entering the brine tank through the floor hole therein and all communicating with said bowls and the compartments thereabove.

8. Ice cube producing apparatus comprising a container and a frame for vertical positioning therein and removable therefrom, said frame comprising interconnected vertical members and horizontal strip members, said strip members being disposed in pairs in opposed apertures at opposite sides of the vertical members whereby to effect lateral spacing of the pairs of strips, said frame forming with the walls of the container a plurality of small communicating compartments adapted when the container is filled with water, to effect formation of ice cubes interconnected by ice webbing and releasable upon removal of said frame.

9. The combination of a brine tank provided with a hole in the floor thereof, an ice can secured in the tank over said hole and comprising side walls with a raised bottom therebetween, partition members positioned upon said bottom, said members being of inverted U-shape in cross-section and open at their ends and forming compartments between said side walls, closures for the ends of said compartments, the base portion of each compartment being provided with a perforation, a bowl member secured upon the outer face of each base portion and embracing said perforation, a water supply and drain pipe and an air supply line entering the brine tank through the floor hole therein and all communicating with said bowls and the compartments thereabove and means on the floor of the brine tank and extending between the ice cans and through the bottom portions of said partition members for insulating said bowls from the cold brine normally contained in the brine tank.

10. The combination of a brine tank provided with a hole in the floor thereof, an ice can secured in the tank over said hole and comprising side walls with a raised bottom therebetween, partition members positioned upon said bottom, said members being of inverted U-shape in cross-section and open at their ends and forming compartments between said side walls, closures for the ends of said compartments, the base portion of each compartment being provided with a perforation, and means entering the floor hole in the brine tank and associated with the perforations of said compartment bases for supplying to and draining water from said compartments and for providing air under pressure thereto.

11. The combination of a brine tank provided with a hole in the floor thereof, an ice can secured in the tank over said hole and comprising side walls with a raised bottom therebetween, partition members being of inverted U-shape in cross-section and open at their ends and forming compartments between said side walls, closures for the ends of said compartments, the base portion of each compartment being provided with a perforation, means entering the floor hole in the brine tank and associated with the perforations of said compartment bases for supplying to and draining water from said compartments and for providing air under pressure thereto, and means on the floor of the brine tank and extending between the ice cans and through the bottom portions of said partitions for insulating said water drain and supply means from the cold brine normally contained in the brine tank.

12. The combination of a brine tank provided with a hole in the floor thereof, an ice can secured in the tank over said hole and comprising side walls with a raised bottom therebetween, partition members of inverted U-shape in cross-section and open at their ends and forming compartments between said side walls, closures for the ends of said compartments, the base portion of each compartment being provided with a perforation, means entering the floor hole in the brine tank and associated with the perforations of said compartment bases for supplying to and draining water from said compartments and for providing air under pressure thereto, means on the floor of the brine tank and extending between the ice cans and through the bottom portions of said partitions for insulating said water drain and supply means from the cold brine normally contained in the brine tank, and frames insertable one each in one of the compartments and removable therefrom, each frame comprising a plurality of interconnected vertical and horizontal members forming with said partitions and said side walls a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the ice cans.

13. An artificial ice making can comprising sides, ends cut out from the bottom to a distance below the top thereof at intervals and connected to said sides and bottom members and forming with said sides and ends a plurality of separate compartments with brine flow channels between them.

14. An artificial ice making can comprising sides, ends slotted downwardly at intervals from a level below the top thereof, open top and a bottom, and brine flow channels extending through the can and forming separate compartments therein, the base portion of each compartment having a perforation therein to accommodate suitable connections with water and air supply means.

15. Ice cube producing means comprising an ice can having sides, ends, open top and a bottom, brine flow channels extending through the can and forming separate compartments therein, the base portion of each compartment having a perforation therein to accommodate suitable connections with water and air supply means, and ice cube forming frames adapted to be positioned one each in one of said compartments and each comprising a plurality of interconnected horizontal members forming with the can walls and compartment walls a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the can.

16. Means for producing clear ice cubes and

comprising an ice can having sides, ends and closed bottom, brine flow channels extending through the can and forming separate compartments therein, and frames adapted to be positioned one each in one of said compartments and each comprising a plurality of vertical tube members perforated adjacent their lower ends, a plurality of horizontal strip members interconnected with the tube members and disposed in spaced pairs along the length of the tube members, the strips of each pair being spaced and disposed in a common plane, the frames forming with the can walls and compartment walls a plurality of small compartments adapted to effect formation of ice cubes upon freezing of water in the can, said tube members being adapted for connection at their tops with suitable air pressure means for aerating the water through said tube perforations during the freezing period to effect formation of clear ice, and the spaces between the strips forming the various pairs being adapted to effect formation of an integral ice web interconnecting the ice cubes produced in the ice can.

17. An ice cube freezing unit comprising an ice can and ice cube forming apparatus insertable in the can and comprising vertical support members and spaced horizontal strips arranged in horizontally spaced pairs and carried by the vertical support members, the freezing unit being adapted for insertion in a brine tank for effecting brine circulation around it, the can being filled with water to be frozen, whereby the cube forming apparatus effects formation of a plurality of ice cubes interconnected by ice webbing formed between the strips, the forming apparatus and the cubes being withdrawable from the can for flexing the strips to fracture the ice web and loosen the cubes.

18. A clear ice cube freezing unit comprising an ice can, ice cube forming apparatus comprising spaced vertical support strips and spaced horizontal strips supported thereon in horizontally spaced pairs, and air pressure means for introduction into the can with the apparatus therein, the can being filled with water and adapted for insertion in a circulating brine tank for freezing the water into a plurality of ice cubes interconnected by thin ice webbing formed between said pairs of horizontal strips.

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