March 3, 1953 B. K. ROBERTS 2,629,986

METHOD FOR PRODUCING ICE BODIES AND APPARATUS FOR PRODUCING THE SAME

Filed Jan. 21, 1948 2 SHEETS—SHEET 1

Fig. 1

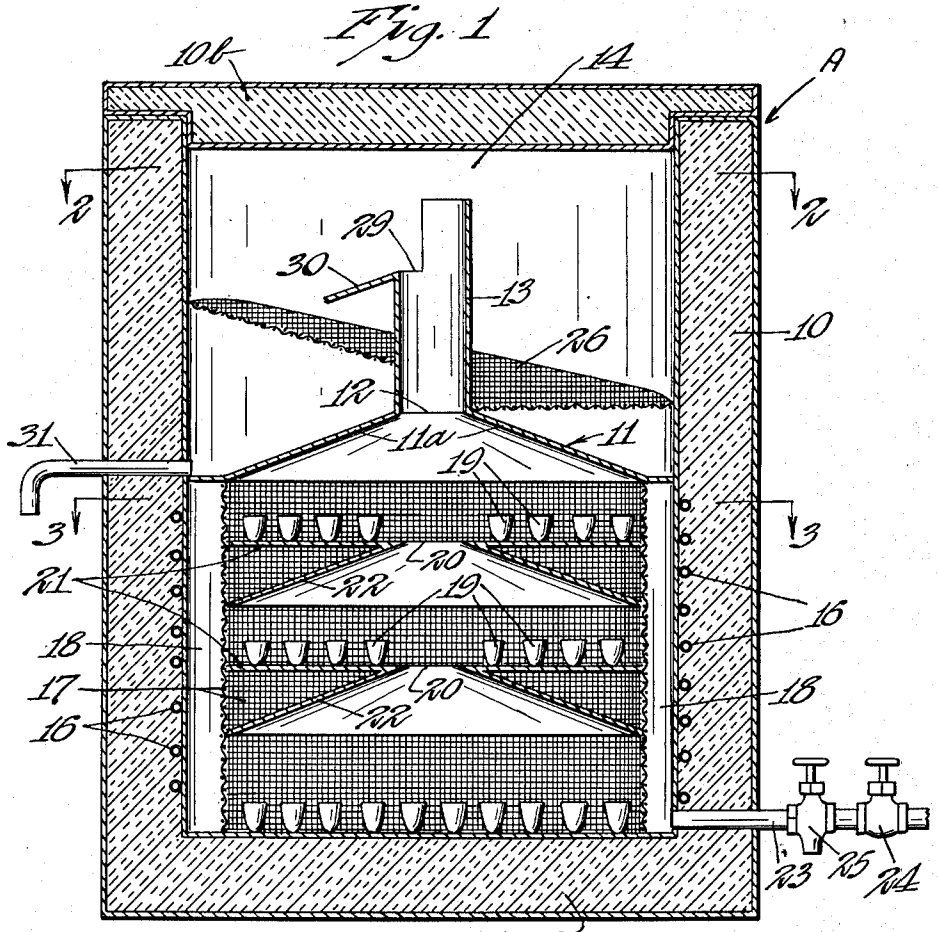
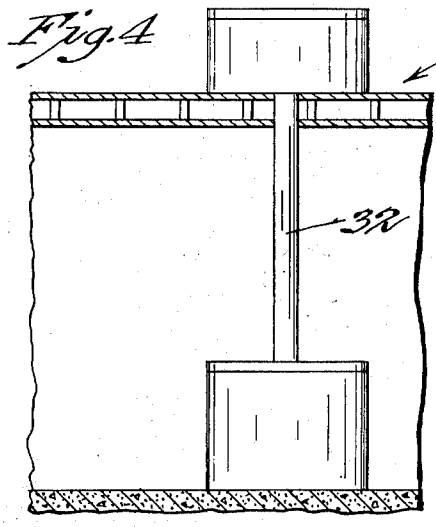



Fig. 4



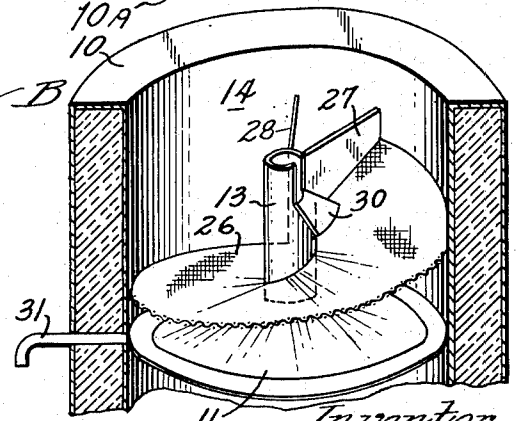




Fig. 5.

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METHOD FOR PRODUCING ICE BODIES AND APPARATUS FOR PRODUCING THE SAME

Filed Jan. 21, 1948 2 SHEETS—SHEET 2

Fig. 2

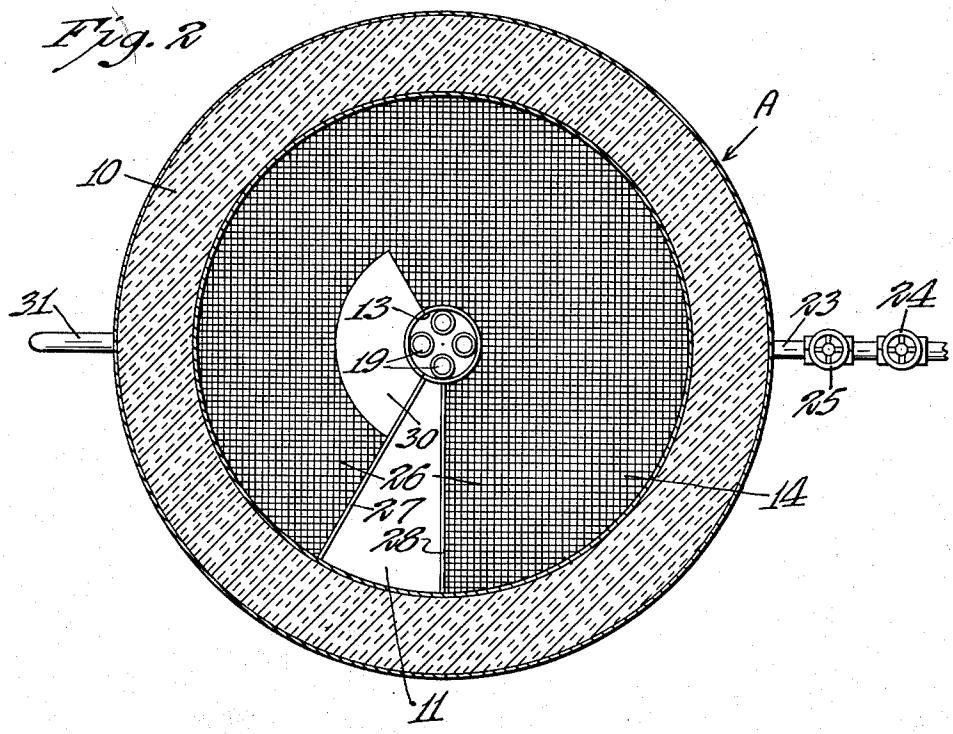
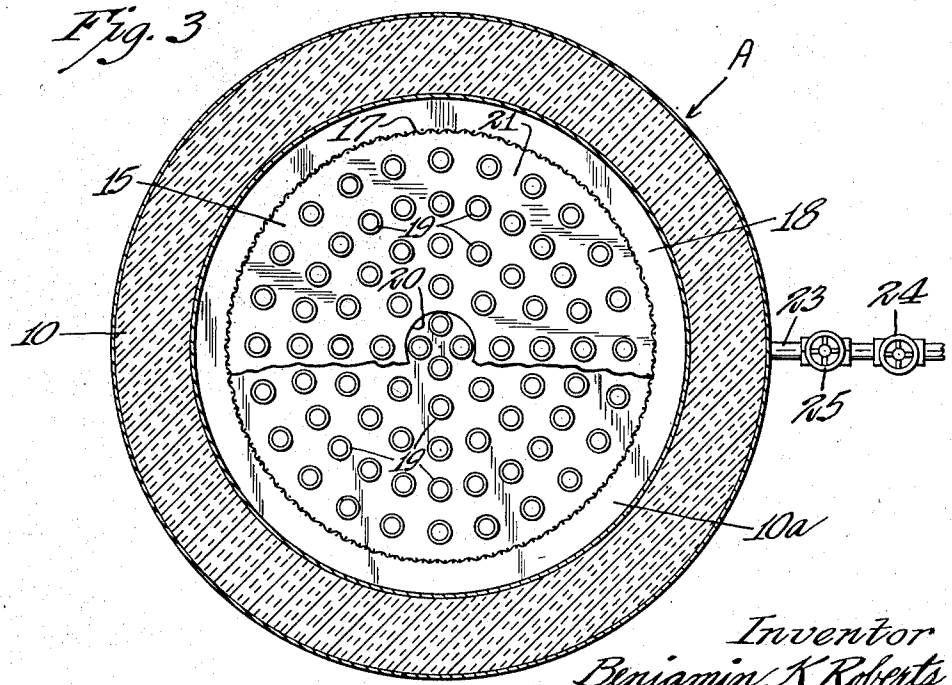



Fig. 3




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## METHOD FOR PRODUCING ICE BODIES AND APPARATUS FOR PRODUCING THE SAME

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4 Claims. (Cl. 62—106)

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This invention relates to a method for producing ice bodies and to apparatus for producing the same.

It is an object of my invention to provide an ice cube producer adapted to quickly freeze a large number of solid cubes and to thereafter store the same in a substantially dry chamber or station where said cubes will remain separately frozen for relatively long periods of time.

It is another object of my invention to provide an ice cube producer having a plurality of cube containers and adapted to release frozen cubes from said containers, carry said released cubes to a storage chamber or station and fill said containers with liquid to be subsequently frozen by a single operation simultaneously performing the three above mentioned functions.

More specifically it is an object of my invention to provide an ice cube producer having a production chamber with refrigeration means therefor and a substantially dry cube storage chamber disposed above said production chamber and in communication therewith, the refrigeration means in said production chamber being adapted to produce freezing temperatures within said chamber to produce ice cubes. The temperature within the storage chamber is such that it is slightly above the freezing point of the cubes so that the cubes are prevented from freezing together and thus they may be stored for relatively long periods of time.

It is a further object of my invention to provide a novel and improved ice cube producer having a refrigerated production chamber and an insulated storage chamber separated from said production chamber in spaced relation thereto with intercommunicating means extending between said chambers to permit the ice cubes to be produced in one location and thereafter carried to a storage chamber in another location.

It is still another object of my invention to provide a novel and improved method of producing, collecting and accumulating ice cubes in which the cubes are initially produced in a mold-containing chamber and liquid collection means which is adapted to carry the frozen cubes from said chamber to an accumulation and storage chamber and simultaneously fill the molds in said mold containing chamber with liquid to be subsequently frozen.

These and other objects and advantages of my invention will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a vertical central sectional view showing one form of my invention;

Fig. 2 is a horizontal sectional view taken substantially along the line 2—2 of Fig. 1;

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Fig. 3 is a horizontal sectional view taken substantially along the line 3—3 of Fig. 1; and,

Fig. 4 is a vertical sectional view of an alternative form of my invention showing the same mounted in a building.

Fig. 5 is a perspective view of the upper compartment.

As shown in the accompanying drawings, I provide two forms of my invention. The form illustrated in Figs. 1 through 3 inclusive, is designated by the letter A. In form A of my invention, I provide an insulated casing such as the cylinder 10 with the insulated bottom 10a and the removable insulated cover 10b. The inside of the cylinder 10 is divided into two chambers by a transverse partition 11 with conical side portions 11a sloping upwardly toward the center thereof. The outer periphery of said partition 11 is sealingly fixed to the inner wall of casing 10 disposed substantially medially between the top cover 10b and the bottom 10a. A communicating aperture 12 is formed in the central upper portion of said partition 11 and a cylindrical conduit 13 is sealingly fixed to partition 11 in upstanding relation thereto and surrounds the aperture 12. The partition 11 divides the cylindrical casing 10 into two chambers. The upper chamber 14 is the ice cube storage station or chamber and the lower chamber 15 is the ice cube production chamber.

The refrigeration coil 16 is mounted around the inner wall of the production chamber 15 and constitutes a component of any of the well known types of refrigeration systems, the other components of which are not shown. A cube retaining screen 17 extends upwardly from the bottom 10a on which it is mounted to the partition 11 to which the upper extremity of said screen 17 is fixed. The screen 17 has a slightly smaller diameter than the inside diameter of the casing 10 and thus forms an annular chamber 18 therebetween. A plurality of individual ice cube molds 19, in the form of open-tapered cups, are fixed in upstanding relation to the bottom 10a of the casing 10. A number of annular mold supporting rings 21 can be mounted within the screen 17 to carry additional molds. Each ring 21 has an aperture 20 formed in the center thereof and conical cube guiding braces 22, with similar apertures at the upper central portion thereof, are fixed to the inner extremity of the respective rings 21 and extend outwardly and downwardly therefrom to have the outer peripheries respectively fixed to the screen 17. Each of the rings 21 carries a plurality of molds 19. An inlet and drainage port 23 is formed at the bottom of casing 10 and extends therethrough. A source of liquid supply is provided and is controlled by the valve 24. A drain valve 25 is also connected to the port 23.

A spiral screen 26 is mounted around the upstanding conduit 13 and has its outer extremity fixed to the inner wall of casing 10 and a pair of vertically disposed radial plates 27 and 28 have their inner ends fixed to said conduit and extend radially outwardly therefrom to form the initial terminus 27 of said spiral screen 26 as well as the end terminus 28 thereof. As best shown in Fig. 2, the angle between the initial terminus plate 27 and the end terminus plate 28 is a relatively small acute angle and the spiral screen extends substantially the entire angular distance around said central conduit 13. The top portion of the conduit 13 is partially cut away beginning at the initial terminus plate 27 and extending a slight angular distance therefrom above said spiral screen 26 to form a cube discharge opening 29.

A sloping baffle plate 30 is fixed to the outer periphery of the conduit 13 adjacent the cube discharge opening 29 and extends outwardly in downwardly sloping relation therefrom. The lower end of the screen 26 is disposed a slight distance above the conical side portions of partition 11 to form a drainage chamber below said screen 26. A drainage outlet 31 is formed through the side wall of said casing 10 at the bottom of said storage chamber 14.

The following is a description of the operation of form A of my invention. With the drainage valve 25 closed, the production chamber 15 is initially filled with liquid such as water to a level at least above the upper tier of cube molds. The liquid supply valve 24 is then closed and the drainage valve 25 is opened to drain off the excess liquid and leave the molds 19 full of liquid to be frozen. The refrigeration system is then started and the coil 16 is cooled thereby to cool the production chamber 15 to a temperature below the freezing point of the liquid to be frozen. When the liquid within the cups 19 has been frozen, the refrigeration system is shut off and with the drain valve 25 closed, the liquid supply valve 24 is opened to flood the production chamber 15 and completely fill the same to force the liquid up through conduit 13 and out through opening 29 over baffle plate 30 and through the upper portion of the screen 26 on to the sloping sides 11*a* of the partition 11 and outwardly through the drainage outlet 31 of the storage station. Of course, the liquid introduced into the production chamber through the port 23 will be above the freezing point and will thus melt the peripheral surface of the individual cubes contained in the molds 19. This will release the frozen cubes from the molds 19 and being less dense than the surrounding liquid, said cubes will float upwardly therein and will be guided by the conical braces 22 and side portions 11*a* of the partitions 11 up through the conduit 13 and carried out with the liquid through cube discharge opening 29 over baffle plate 30 to be discharged on to the upper portion of spiral screen 26. The slope of the spiral screen 26 is sufficient so that the force of gravity will carry the cubes downwardly thereon and deposit them in abutted relation against the end terminal plate 28.

The water will, of course, be drained out through outlet 31 and the storage position of the cubes will be maintained in a substantially dry condition during the deposit of the other cubes on to the upper portion of the screen 26. As soon as all the cubes have been carried upwardly and discharged on to the screen 26, the liquid supply valve 24 is closed and the production chamber drain valve 25 is opened to drain the liquid therefrom and thus leave the cups 19 filled and ready to be frozen.



As shown in Fig. 4, I provide form B of my invention in which the storage chamber and the production chamber are separated. A conduit 32 interconnects the two chambers and the operation of the production cycle is substantially the same as described for form A of my invention. The storage chamber is constructed in a similar manner to the storage chamber 14 in form A and also, the production chamber of form B of my invention is similarly constructed to the production chamber 15 of form A. As shown in Fig. 4, the production apparatus can be mounted in the basement of a dwelling or commercial establishment and the conduit extended up to the first floor where the storage chamber is disposed.

In both forms A and B of my invention, the refrigeration system in the production chamber also serves to cool the storage station slightly, but due to the fact that only the warmer air from the production chamber rises into the storage station, the temperature within the storage station will be maintained slightly above the freezing point of the cubes and thus the cubes will be prevented from freezing together.

By maintaining the storage station in a substantially dry condition, the cubes will last a great deal longer than they would if stored in a liquid at substantially the same temperature as the air in my storage station. This is because a liquid will transfer heat or cold much faster than a gas and, also any movement of the liquid will "wear away" the outside portions of the cubes at a relatively high rate.

It will be seen that I have provided an extremely simple, highly efficient ice cube producer which can be easily and inexpensively manufactured. By providing the individual cup molds 19, the speed of freezing and melting of the cubes will be substantially increased so that the time required for the entire production cycle will be substantially reduced. The liquid simultaneously performs three functions as it travels through the production and storage chambers. It initially melts the peripheral surface of the individual cubes to release the same from their respective molds, it carries the free cubes up through the production chamber 15 and conduit 13 to discharge the same on to the upper portion of the spiral screen 26 and, it also fills the individual molds to prepare them for subsequent freezing of the same to begin a second production cycle.

This makes a particularly efficient production cycle in which the cubes are floated in liquid for only a relatively short time which reduces the melting thereof to an absolute minimum. The conical sloping guiding surfaces within the production chamber prevent any clogging of the cubes therein and provide for smooth and quick transportation of the cubes up to the storage station.

From the foregoing description, it will be seen in addition to the novel and improved apparatus for producing ice cubes, that I have provided a new method for producing, collecting and accumulating ice cubes consisting in the initial freezing of cubes in individual molds or containers within a production chamber and thereafter introducing liquid into said chamber to release and remove said cubes from their respective con-

tainers and carry the same to a collection point for accumulation in a storage station while simultaneously filling said containers with liquid to be subsequently frozen and draining of the liquid from said storage station and draining of the liquid not retained in said containers from said production chamber.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What I claim is:

1. A method of producing and subsequently harvesting and collecting and substantially drying frozen solids consisting in freezing a plurality of confined portions of water into solids of predetermined shape in a production zone, introducing into the lower portion of the zone water in sufficient quantity and of sufficient temperature to harvest said ice solids and to carry the same upwardly into the top portion of said zone, introducing additional water into said chamber to provide a conveying current to carry said ice solids towards a collection zone, separating the conveying water from the ice solids and delivering said ice solids to a collecting zone.

2. Apparatus for producing individual frozen solids, said apparatus comprising an ice producing chamber having upwardly extending side walls, mechanism for freezing pieces of ice in said chamber, an upwardly sloping guiding and restricting baffle mounted in the upper portion of said producing chamber and having a diminished opening at the upper portion thereof, a conduit cooperatively associated with said baffle to receive the pieces of ice and overflow water carrying said ice pieces passing through said baffle opening, a storage station positioned to receive ice pieces from said conduit, means interposed between said storage station and the discharge of said conduit for separating the overflow liquid from the solids carried thereby, and mechanism for overflowing said production chamber



to carry solids released therein and deliver the same through said baffle opening, conduit and drainage means to said storage station.

3. The structure set forth in claim 2 and said freezing mechanism comprising an open topped upstanding mould structure mounted in said production chamber, and a refrigeration system associated with said mould structure for freezing liquid therein, and mechanism for removing the liquid from said production chamber during the freezing cycle to leave said mould structure filled with water.

4. Apparatus for producing frozen solids comprising a production chamber, a storage station removed from said chamber, a conical baffle mounted across the top of said chamber and having a diminished opening at the apex thereof, an upstanding conduit connected in sealed relation with the conical baffle and surrounding said opening with the discharge of said conduit disposed above said storage station, mechanism in said production chamber for freezing liquid therein to produce a plurality of frozen solids, and liquid supply mechanism connected with said production chamber to overflow said chamber through said diminished opening and conduit and carry frozen solids to said storage station.

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