

Jan. 22, 1952

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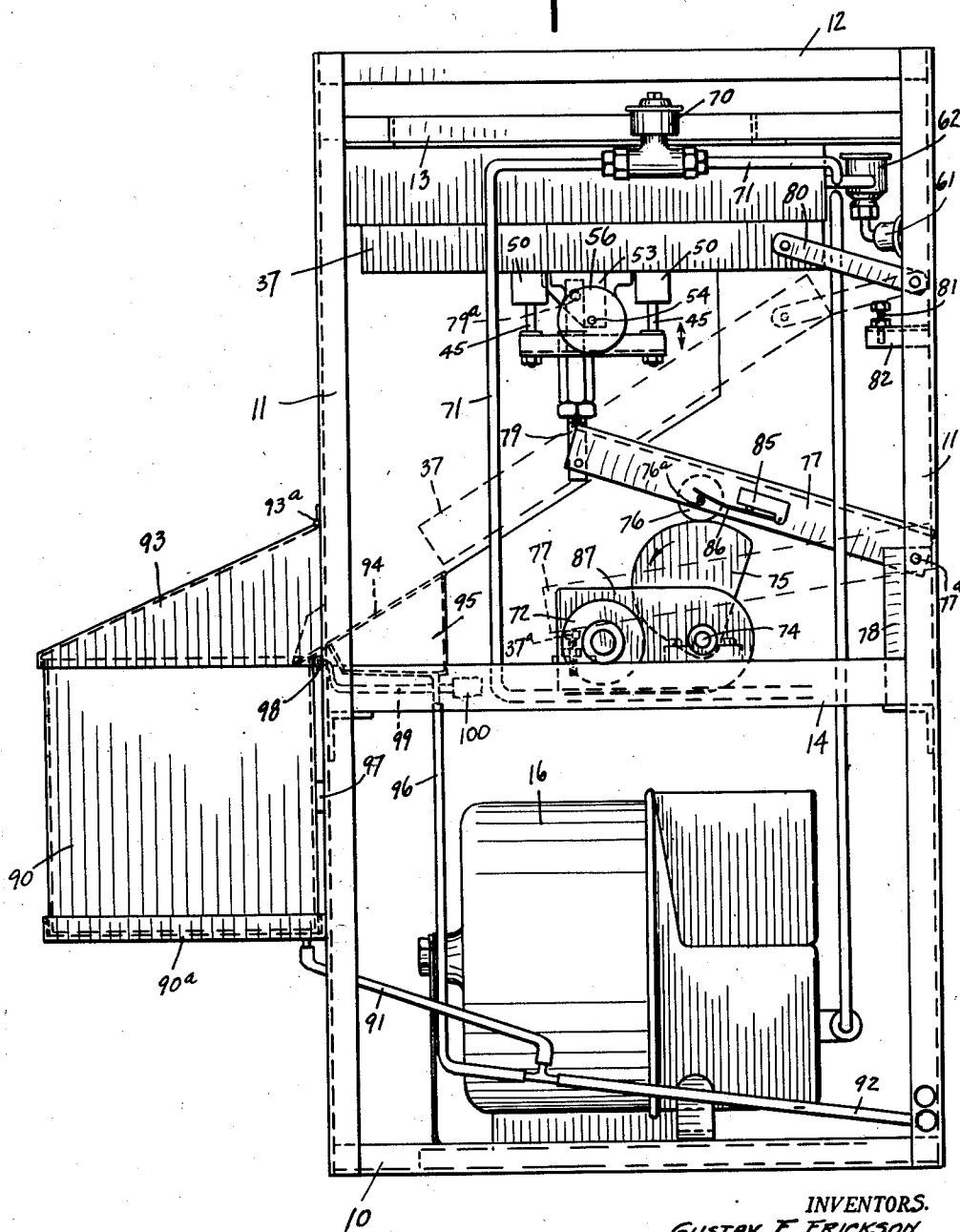
2,583,294

ICE-MAKING MACHINE

Filed May 3, 1949

5 Sheets-Sheet 1

FIG. 1



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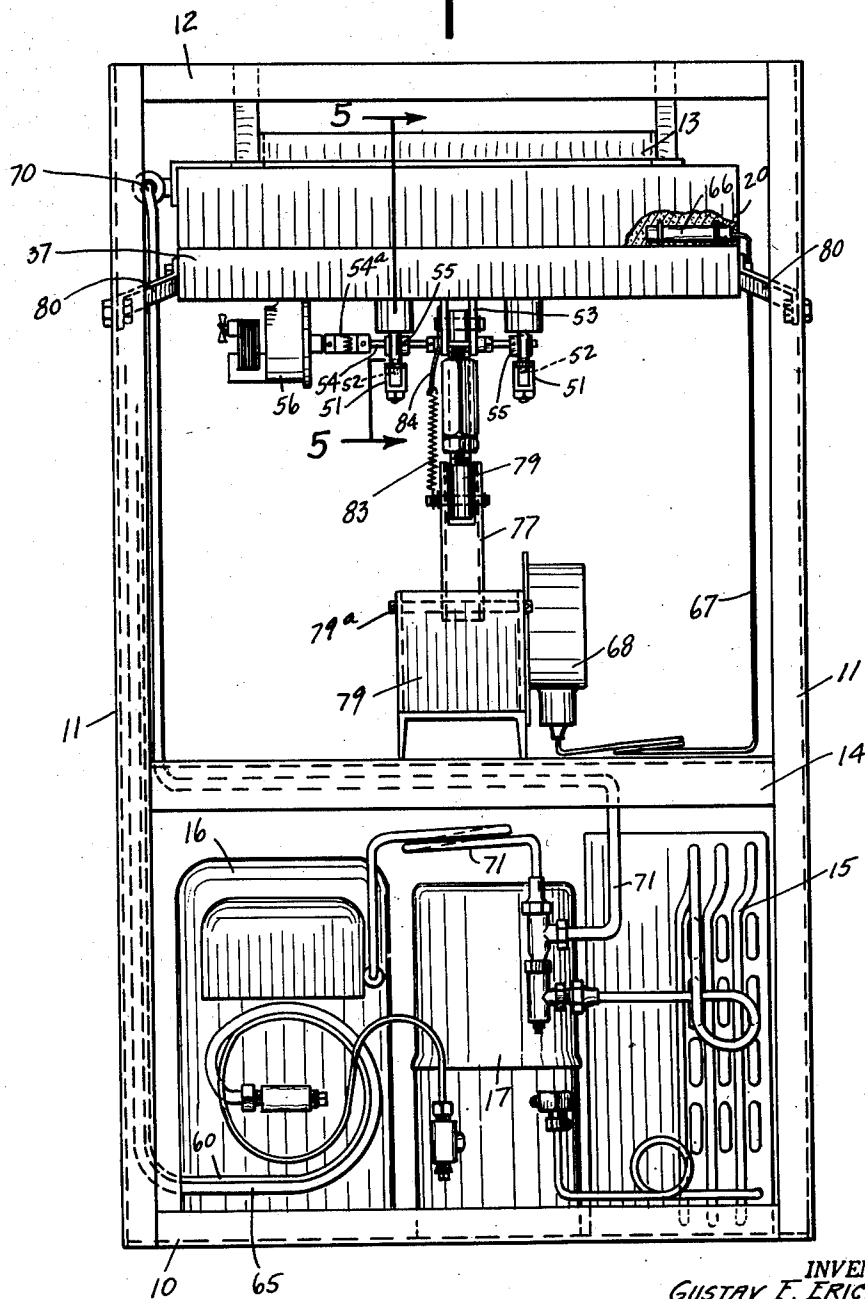
2,583,294

ICE-MAKING MACHINE

Filed May 3, 1949

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FIG. 2



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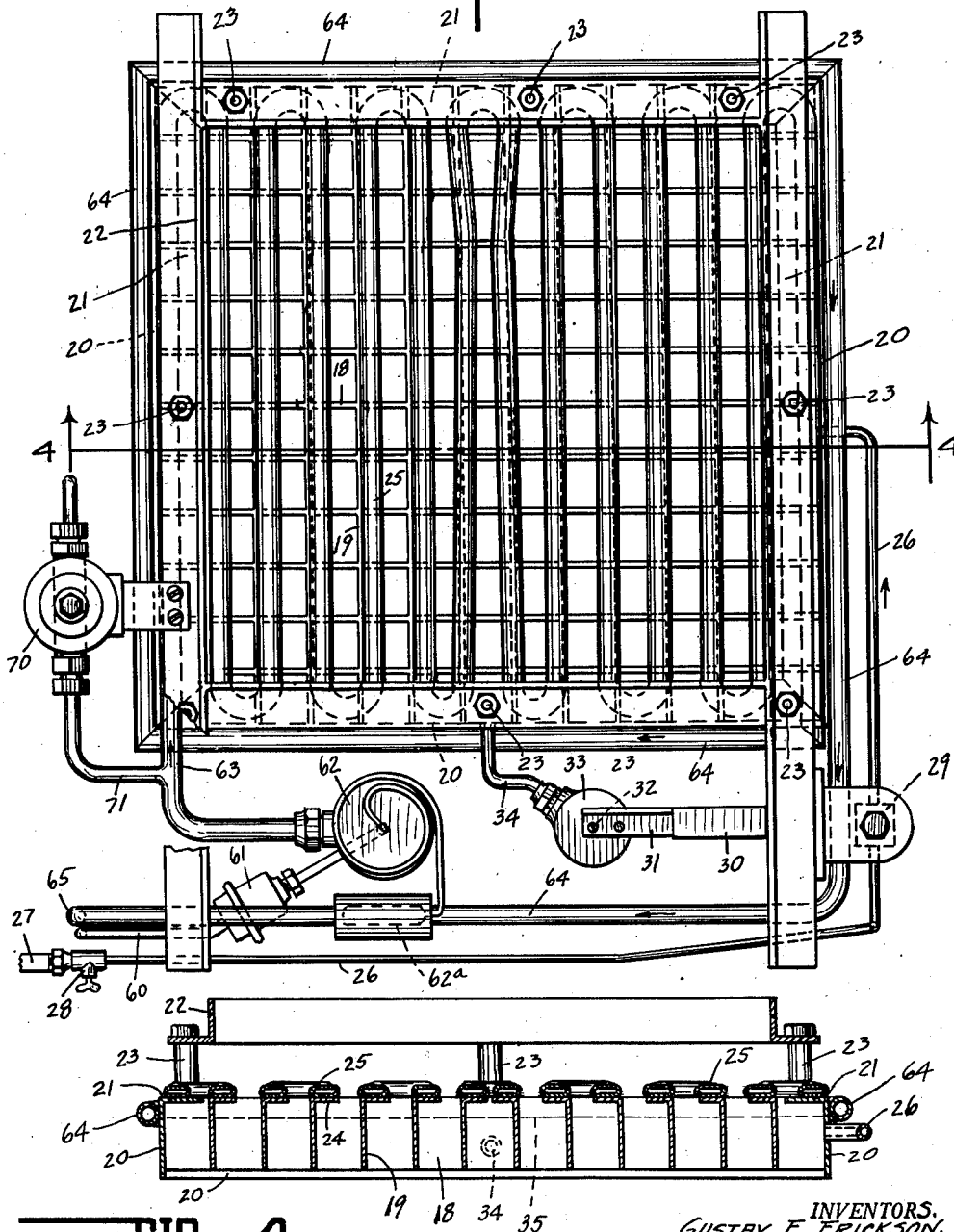
2,583,294

ICE-MAKING MACHINE

Filed May 3, 1949

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FIG. 3



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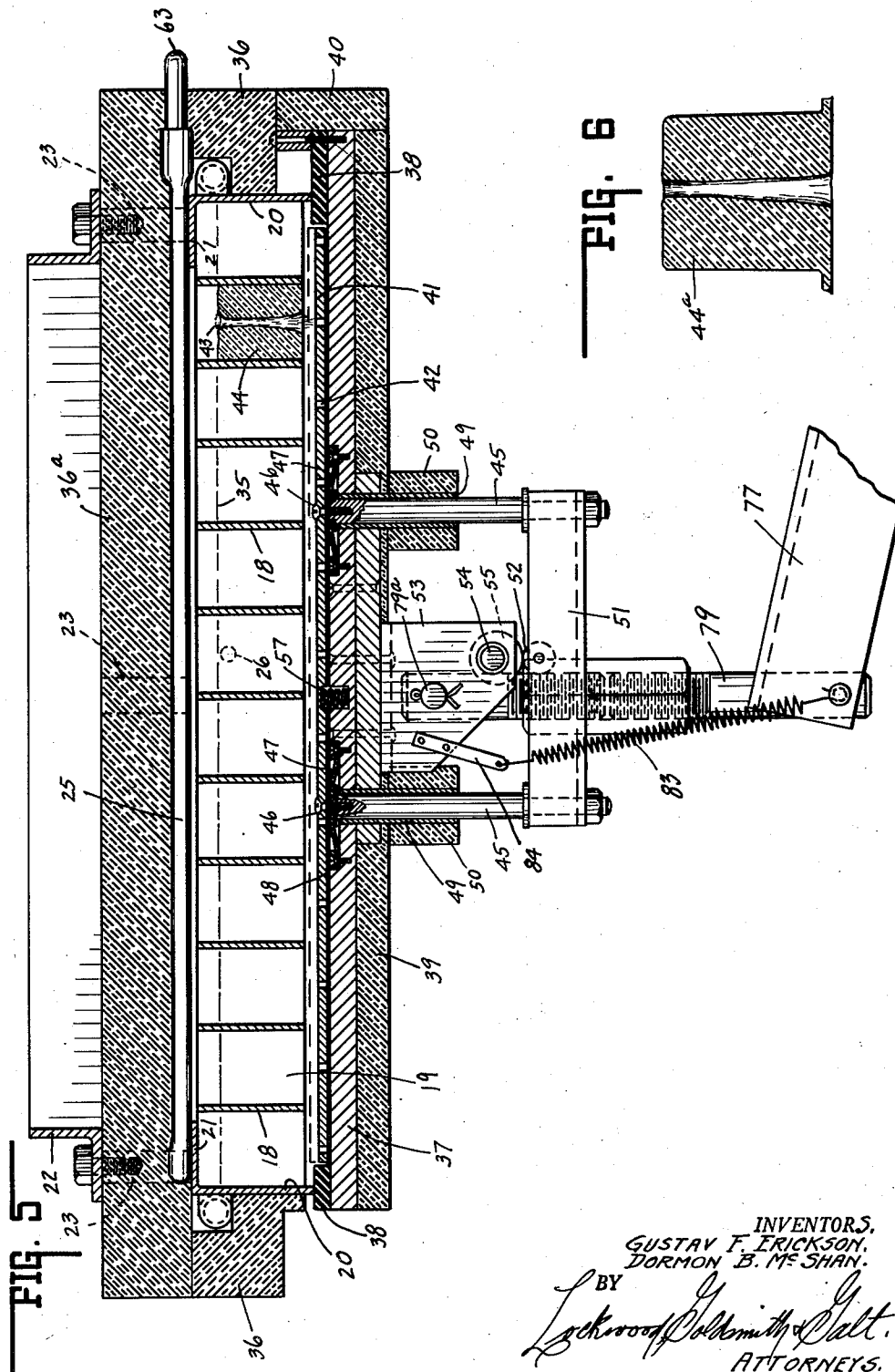
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2,583,294

ICE-MAKING MACHINE

Filed May 3, 1949

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ICE-MAKING MACHINE

Filed May 3, 1949

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FIG. 7

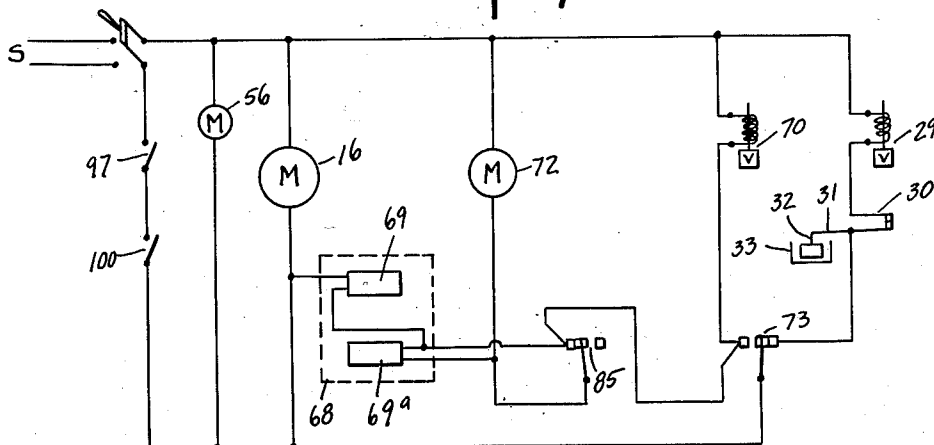


FIG. 8

FIG. 9

FIG. 10

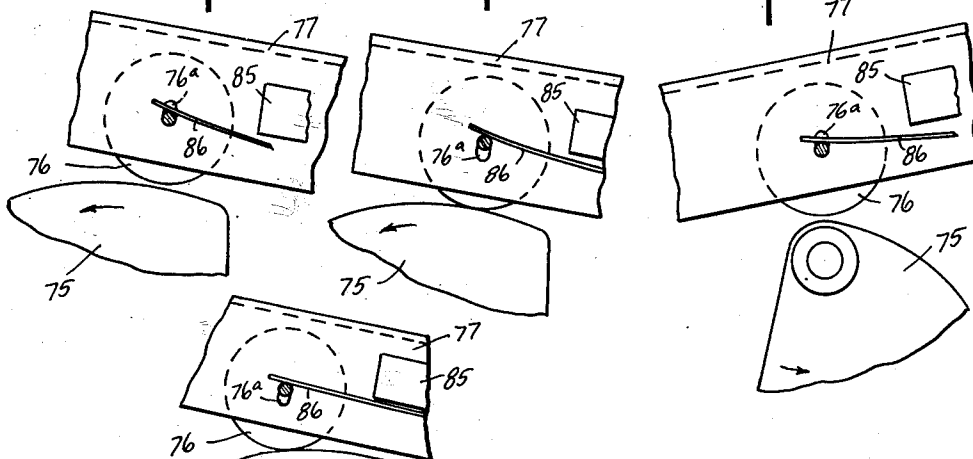
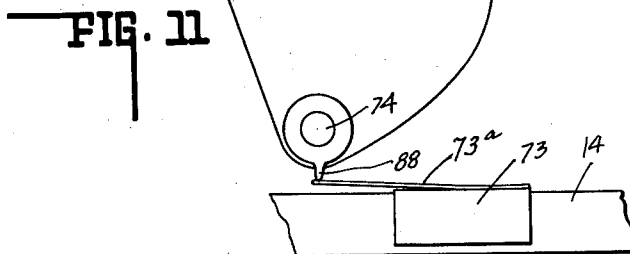


FIG. 11



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UNITED STATES PATENT OFFICE

2,583,294

ICE-MAKING MACHINE

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Application May 3, 1949, Serial No. 91,088

19 Claims. (Cl. 62—105)

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This invention relates to a machine for manufacturing and delivering ice cubes automatically wherein a number of individual ice cubes are simultaneously frozen and thereupon automatically released from their freezing cells for discharge to a delivery chute, as generally disclosed in the application of John R. Bayston, Serial No. 80,265, filed March 8, 1949, for Ice Making Machine, now Patent No. 2,563,093.

One object of the invention is to provide a structure and mechanism applicable to a machine of this general type for subjecting the liquid during the freezing cycle to just sufficient agitation and washing action as to prevent incorporation of impurities in the ice being formed, to thereby produce substantially clear ice cubes as distinguished from cubes generally referred to as cloudy. This is accomplished by submerging an apertured plate in the liquid and beneath the group of cells within the freezing unit adapted to be vibrated toward and away from the cells for pulsating the liquid centrally thereof. Such pulsations provide just sufficient agitation of the liquid in each cell to permit freezing about the surface thereof while maintaining a washing action for removing impurities as the freezing progresses.

A feature of the invention resides in the structural mounting of the refrigerant channel or coils of the evaporator relative to the freezing cells for accomplishing the twofold purpose of providing maximum efficiency in the heat transfer therebetween and permit of economic and convenient manufacture of the freezing unit.

A further feature of the invention resides in the mechanism for lowering and raising the closure or platen from and toward the open bottom of the cells, with means for providing a pause during the lowering movement to permit complete freeing thereof from the formed ice in the cells before being permitted to drop to its extreme open and ice discharging position.

An additional feature involves the separation of the ice cubes from the excess liquid and impurities trapped or remaining therein. The ice cubes, being frozen free of the impurities carried by the liquid, are discharged over an apertured chute into a container free of liquid; the unfrozen liquid being first dumped or spilled over the chute to pass therethrough into a drain sump.

Other features of the invention reside in the control circuit and mechanism operated thereby to effect complete automatic operation of the machine to insure continuous production through alternate freezing, releasing, and discharging of frozen cubes.

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The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a side elevation of the machine with cover plates removed showing the closure platen in freezing position by full lines, and discharge position by dotted lines.

Fig. 2 is the same as Fig. 1 showing a rear elevation thereof.

Fig. 3 is a top plan view of the freezing unit with the cover plate and insulation removed.

Fig. 4 is a section taken on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged sectional view through the freezing unit, platen, and agitating plate.

Fig. 6 is a central vertical section through a discharged ice cube.

Fig. 7 is a wiring diagram of the electric control circuits.

Fig. 8 is a partial elevation showing the relation of the platen elevating cam and follower after initial opening movement.

Fig. 9 is the same as Fig. 8 after ice freeing of the platen.

Fig. 10 is the same as Fig. 8 at platen lowered position.

Fig. 11 is a view from the opposite side of the cam from Fig. 1, showing it in the same, or platen raised position.

In the drawings there is shown an ice cube producing machine having a supporting frame structure including a bottom frame member 10, up-rights 11, top frame member 12, and cross frame members 13 and 14. In the lower compartment of the frame structure and below the frame member 14 there is mounted a suitable refrigerating apparatus of any well known make, shown herein for example, as having a condenser 15 and a motor driven compressor 16 arranged to compress a gaseous refrigerant and deliver it to the condenser and from the condenser to the receiver 17, all as generally referred to in the above mentioned application.

In the upper section of the frame structure there is provided a freezing unit including a plurality of individual cube forming cells open at their top and bottom as shown in Figs. 3, 4, and 5. Said cells are in the form of square sleeves defined by the partition walls 18 crossed by transversely extending partition walls 19, all of which are surrounded by the outer walls 20 of greater depth. The outer walls 20 are formed with inwardly extending top flanges 21 upon which the supporting frame 22 is bolted and spaced by the spacing sleeves 23.

Each of the partition walls 19 of the cells is

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formed with a top flange 24 extending approximately half way to the next adjacent wall to partially close the top of each cell, but primarily to provide a heat exchange support for the circuitous refrigerant coils 25 as shown in Figs. 3 and 4. Said coils provide the passageway through which the refrigerant is caused to flow in the direction of the arrows. They are in the form of flattened tubes secured in intimate contact and substantially coextensive with the flanges 24 of the cell walls 19 to provide efficient heat exchange therebetween.

The liquid such as water to be frozen is discharged into the freezing unit through the tube 26 below, but adjacent the liquid level 35. Said tube 26 is connected with a source of supply indicated at 27 which is controlled by the hand valve 28. In the tube 26 there is provided a solenoid actuated shut off valve indicated at 29 controlled by a micro switch 30 having a float controlled arm 31, which is in turn operated by the stem 32 carried by a float within the float chamber 33. Said chamber is connected by the duct 34 with the freezing unit and cells adjacent the lower portion thereof. Thus, the liquid to be frozen is introduced into the freezing unit to a predetermined liquid level in the cells as indicated at 35, whereupon the flow of liquid thereto is automatically shut off by the float controlled valve. The liquid will be distributed to each of the cells within the outer walls 20 to flow below the cell partitions 18 and 19.

Surrounding the freezing unit there is a wall of insulating material 36 covered by a top layer of insulating material 36a. For closing and sealing the unit from the bottom there is provided a platen 37 having a rubber sealing gasket 38 adjacent its edges adapted to engage the outer walls 20. Said platen 37 carries over its lower surface a layer of insulating material 39 and about its sides and rear edges outer insulating strips 40 which are adapted to engage the walls 36 to provide an insulated closure for the freezing unit and platen when the latter is in its closing and sealing position as shown in Fig. 5.

Said platen carries within the sealing gasket 38 an agitating plate 41, which is coextensive with the cells of the unit. Said plate is provided with a series of apertures 42, each being centrally disposed with respect to said cells. Sufficient space is provided between the platen 37 and the lower edges of the cell partitions 18, 19 to permit a slight reciprocatory movement of the agitating plate toward and away from the cells as indicated by full and dotted lines in Fig. 5. Through this action the liquid to be frozen is gently agitated, while on the downward stroke small streams are projected upwardly and centrally of each cell through the respective apertures 42. Thus, through the reciprocating movement of the agitating plate, there is an agitation of the liquid in each cell with an intermittent pulsating stream directly upwardly and centrally thereof.

Due to agitation of the liquid in each cell and the pulsating stream centrally thereof, ice may gradually form over the surface of the partitions 18, 19 progressively toward the center with a continuous washing away of impurities as the ice is formed. It is well understood to be the tendency of the freezing action to expel entrapped air and impurities provided they are carried away as the ice is being formed, and it is the purpose of the pulsating streams of liquid injected centrally of each cell through each aperture to wash such impurities and entrapped air into the center of

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the cell, so that they will not be entrapped by the ice being formed. Through this medium the formed ice becomes clear, and the usual cloudiness due to entrapped air and impurities is thereby eliminated. However before the center core of each cube is frozen, which would then trap the concentrated impurities, the freezing cycle is terminated and upon discharge of the cubes the remaining liquid and impurities are drained away.

As illustrative of the above there is shown in Fig. 5 a pulsating stream of liquid indicated at 43 within a shell of ice being built up about the partitions 18, 19 as indicated at 44, resulting in the finally formed ice cubes 44a shown sectionally in Fig. 6.

For effecting the reciprocating action of plate 41, it is provided with a plurality of downwardly extending rods 45 secured thereto at their upper ends by the screws 46, the upper end of each rod is reduced to receive a flexible sealing gasket 47 secured about its outer periphery within a recess of the platen by an anchor ring 48. Surrounding the upper portion of each rod there is a bearing sleeve 49 through which the rod may reciprocate, the bearing sleeve being surrounded by a block of insulating material 50. Said rods are arranged in opposed pairs, and secured to the lower end of each pair in spaced relation to the platen there is a cross bar 51, each cross bar carrying a roller 52 substantially centrally thereof. Depending from the platen there is a bracket 53 which carries a shaft 54 having a pair of cams 55 secured thereto extending into aligned engagement with the roller 52. Enclosed in aligned recesses provided in the platen and agitating plate respectively, there is a compression spring 57 for yieldingly maintaining the rollers 52 in engagement with their respective cams 55. The shaft 54 is driven through a coupling 54a by the motor 56. Through the driving action of the motor cams 55 are rotated to impart the reciprocating action through the platen to the agitating plate 41 for the purposes above described.

The refrigerant coils 25 constituting the evaporator receives the refrigerant from the liquid receiver 17 through the refrigerant tube 60, drier 61, and expansion valve 62. The expansion valve is provided with the usual thermal controlled bulb 62a attached to the outflow portion of said duct 64. From the expansion valve the liquid enters the refrigerant coils 25 through the intake end thereof at 63. The coils of the evaporator at the discharge end wrap around the freezing unit returning the refrigerant through the duct 64 to the suction line 65 (Figs. 2 and 3) and compressor 16. During the freezing cycle the temperature is dropped to a predetermined low after a time interval depending upon the temperature of the liquid delivered to the freezing unit. Upon reaching such predetermined low temperature the thermostatic control bulb 66 (Fig. 2) causes the refrigerant circuit to be reversed for providing a reverse flow of refrigerant such as to direct the hot gases through the refrigerant coils 25 of the evaporator. This is for the purpose of inducing a thawing action for lubrication of the ice formed in the cells to free them and permit them to drop by gravity upon lowering of the platen 37. The thermo bulb 66 is secured adjacent the outer wall 20 of the freezing unit and is connected by the tube 67 to suitable bellows within the temperature controller 68, which controller through bellows

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action controls an adjustable low temperature mercury switch 69 and high temperature mercury switch 69a (Fig. 7). Switch 69 causes the hot gas valve 70 to open which permits the hot gas to flow directly from the compressor to the coils 25 of the evaporator, by-passing the condenser, through the hot gas connections 71 (Fig. 3).

However, the operation of the low temperature switch 69 through the temperature controller 68 is momentary or of a short duration only sufficient to energize the cam motor 72, since the hot gases immediately cause a sufficient rise of temperature in bulb 66 to reversely actuate the bellows and cause the low temperature switch 69 to open. Upon the cam motor 72 being energized and cam 75 partially rotated the hold switch 73 (Figs. 7 and 11) is closed which maintains a closed circuit through the hot gas valve 70 and cam motor 72 after the low temperature switch 69 opens. Hold switch 73 is closed by cam 88 riding off the end of its switch lever 73a upon the initial movement of cam 75. The hold switch 73 remains closed during one complete revolution of the cam shaft 74 driven by motor 72 after which it opens the circuit through the hot gas valve 70 and closes the circuit through the float switch 30 to open the liquid shut off valve 29 for recharging the freezing unit. This occurs when cam 88 again engages the switch lever 73a.

Upon the cam motor 72 being energized, the shaft 74 rotates the cam 75 (Fig. 1) in the direction of the arrow (Figs. 8 to 11). Cam 75 has a cam follower 76 in the form of a roller carried on a lever 77. One end of lever 77 is pivoted at 77a to a bracket 78 carried by the frame. At the other end of lever 77 there is pivotally mounted an adjustable link 79 having its opposite end pivoted at 79a between the brackets 53 secured to the platen 37. The platen 37 is supported at its rear end upon the rear uprights 11 of the frame by a pair of links 80 which are restricted in their downward drop by adjustable stop screws 81 carried by the brackets 82.

When the cam 75 is in the position shown in Fig. 1 with the follower 76 engaging its extending face, it holds the platen in its closed sealing engagement with the freezing unit as shown in Fig. 5. Upon rotation in the direction of the arrow the follower rides over the reduced portion of the cam permitting the platen to be lowered to its ice discharge position shown by dotted lines in Fig. 1. Said platen is lowered to an inclined position for discharging the ice cubes that are released from the cells upon the thawing action of the reverse flow hot refrigerant. However, upon initial release both by the action of said cam and the thawing of the ice, it is slightly tilted by a spring 83. Said spring has one end connected to an arm 84 secured to one of the brackets 53 and the other end secured to a pivot connection between lever 77 and link 79. As the spring is off center toward the forward end of the platen, it will cause the platen to first tilt downwardly to discharge excess liquid before the full lowering thereof. Further movement of the cam 75 with further lowering of the platen causes its rear end to move downwardly to the limit of movement of the links 80 at which position the platen will be arrested in its downward movement through the medium of the micro switch 85 in substantially parallel relation to the freezing unit.

The switch 85 is mounted on the lever 77.

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Its purpose is to break the circuit to the cam motor 72 after a short initial movement of the cam 75 until the platen is free to tilt down upon the release from the ice. Said switch is normally closed until the cam follower 76 drops relative to the lever 77 in its elongated bearing slot 76a through the initial movement of the cam 75, the lever being momentarily held in its upper position by the adhesion of the platen to the ice (Fig. 8). However, as soon as the platen is released so that the lever may drop (Fig. 9), raising the cam follower relative thereto, switch arm 86 is thereby actuated to again close the switch whereupon the motor drives the cam through a half cycle until the micro-switch 85 is again opened (Fig. 10). Such rotation of the cam permits the platen to tilt downwardly to its full inclined discharging position as shown by dotted lines in Fig. 1. It is arrested in this position by a suitable stop indicated at 37a opening switch 85. After discharging the ice, it will be returned to its closing and sealing position (Fig. 11) upon the high temperature switch 69a in the controller 68 being closed.

The motor 72 drives cam shaft 74 through suitable reduction gearing mounted within the gear housing 87. The hold switch 73 is mounted upon the cross frame 14 immediately below the cam shaft 74 which carries the switch actuating cam 88 adapted to engage the switch lever 73a to open the circuit through the cam motor upon completion of the cycle and close the circuit through the float switch 30 to open the liquid valve and permit a fresh charge of liquid to enter the freezing unit.

On the forward uprights 11 there is mounted an ice receptacle 90 removably seated in a fixed supporting tray 90a having a drain pipe 91 leading to the drain outlet 92 for receiving charges of ice cubes from the platen 37 when in its inclined discharging position. Said receptacle is closed by a cover lid 93 hinged at 93a to the uprights 11. Intermediate the end of the platen and the receptacle 90 there is a sloping drain chute 94 which may be in the form of a screen over which the ice cubes slide, but which permits the freed and unfrozen liquid to pass therethrough into a drain receptacle 95 from which the liquid passes through the discharge pipe 96 to the outlet 92.

When the receptacle 90 is in place on its supporting tray it closes the switch 97 in the circuit shown in Fig. 7, said switch being opened when the receptacle 90 is removed so that there will be no discharge of ice cubes at such time. Adjacent the upper portion of the ice receptacle 90 there is a thermo bulb 98 which leads through the tube 99 to a thermal switch 100 which operates to break the circuit and stop the machine when the receptacle 90 is sufficiently full of ice cubes to reduce the temperature of the bulb 98. By means of this control the machine will automatically discontinue its operations when the receptacle is filled with cubes so that there will be no overflow, the switch 100 being normally closed.

As shown herein the freezing unit contains 156 cells and the freezing cycle usually consumes between 20 and 30 minutes so that each 40 minutes to an hour 312 cubes of ice will be automatically discharged into the receptacle 90. With the receptacle in place the switch 97 is closed and with the bulb 98 at a high temperature the switch 100 is closed. At the beginning of the

freezing cycle the platen is at its upper position

as shown in Figs. 1 and 5. The float controlled switch 30 being closed and the cam actuated hold switch 73 closing the circuit therethrough (Fig. 11), liquid to be frozen is permitted to pass through line 26 and valve 29 into the cells until the liquid level 35 is reached. The float in chamber 33 will then open the switch 30 to break the circuit through valve 29, closing said valve and shutting off further inflow of liquid.

Refrigerant gases will circulate in the direction of the arrows through the refrigerating coils 25, the reverse flow or by-pass valve 70 being closed. With the low temperature thus produced in the freezing unit, ice will begin to form at 44 on the partitions 18, 19 of the cells as shown in Fig. 5. The motor 56 will operate during the introduction of the liquid into the cells and the freezing thereof, causing reciprocating action of the agitating plate 41 so that there will be a pulsation of the liquid in each cell accentuated by the central stream 43 forced through apertures 42 in the plate (Fig. 5).

Due to the position of the inlet pipe 26 adjacent but below the liquid level, ice will first freeze over the inlet and prevent additional liquid from entering the unit should contraction or agitation thereafter cause the float to drop and close the circuit through valve 29 to momentarily open it.

Upon the temperature in the freezing unit, due to the building up of ice, reaching a predetermined low temperature the thermo bulb 66 leading to the temperature controller 68 will cause the low temperature mercury switch 69 to momentarily close a circuit to the hot gas valve 70 to open it and thereby cause a reverse flow or by-pass of hot refrigerant. The reverse flow of the refrigerant through the tubes 71, by-passing the condenser 15, will pass hot gases through the refrigerant coils 25 such as to cause sufficient melting of the ice adjacent the partitions 18, 19 to free the cubes from their respective cells, and through the normally closed micro switch 85, cam motor 72 will be energized to rotate cam 75 sufficiently far to permit the cam follower 76 to drop down (Fig. 8) in position to open said switch and arrest the cam motor and further movement of the cam. This initial movement of the cam 75 will cause the actuating cam 88 to ride off the end of switch lever 73a to reverse hold switch 73 (Fig. 11) for holding valve 70 open. At this point, the platen will be free to move downwardly away from the freezing unit by gravity only a slight distance. However, it may be held in its closed position by the ice frozen to its gasket, but as the defrosting takes place, the platen soon breaks away freeing itself and tilting slightly about its pivotal connection with the links 80 through action of the spring 83. Thereupon the excess liquid in the unit will be freed to flow into the drain receptacle 95.

Upon ice release of the platen, its weight will be carried by the cam follower 76, the lever 77 moving downwardly relative thereto sufficiently to cause the cam follower to close switch 85 (Fig. 9) and again operate the cam motor 72. The cam 75 will then permit the platen to lower to its extreme inclined position shown in dotted lines in Fig. 1 and the ice cubes will drop from their respective cells on to the inclined platen as they are released by the reverse flow of the refrigerant, whereupon they slide downwardly over the drain 94 into the receptacle 90. At this point, with cam 75 in its lowermost position (Fig. 10)

below follower 76, switch 85 will again be opened to arrest cam 75 with the platen lowered.

After complete discharge of the ice, the temperature in the freezing unit will have risen sufficiently to cause the thermo bulb 66 to move the bellows in the temperature controller 68 to a predetermined high temperature position whereupon the high temperature mercury switch 69a will close. This switch again closes the circuit through the cam motor 72 causing the cam 75 to elevate the platen to its closing and sealing position. The cam 75 will thereupon have made one complete revolution which will bring the switch actuating cam 88 into engagement with the switch lever 73a of switch 73 to finally break the circuit through the cam motor 72 (Fig. 11) and the hot valve 70 which will thereupon be permitted to close so that the refrigerant will flow from the condenser through the refrigerant coils 25 to again reduce the temperature of the freezing unit. At the same time, switch 73 will close the circuit through the closed float switch 30 to energize liquid valve 29 and permit a fresh charge of liquid to enter the cells.

The invention claimed is:

1. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, an agitating member interposed between the bottom of said cells and said plate, and means operably connected with said member for imparting movement thereto to effect an agitation of the liquid during the freezing cycle.

2. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, a movable member submerged in the liquid at the bottom thereof, and means for continuously moving said member to effect an agitation of the liquid during the freezing cycle.

3. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, a pulsating member interposed between said cells and plate provided with a liquid emitting orifice substantially centrally of each cell, and means connected with said member for effecting pulsations of the liquid through said orifices into each of said cells for agitating the liquid confined therein during the freezing cycle.

4. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, an apertured plate extending between the bottom of said cells and closure plate to provide a pulsating orifice for

each cell, and means for reciprocating said agitating plate toward and away from said cells for withdrawing liquid therefrom and discharging it upwardly through said orifice for maintaining the liquid in each cell in an agitated condition during the freezing cycle.

5. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, a pulsating member interposed between said cells and closure plate submerged at the bottom of the liquid and provided with an aperture below each cell, and driving mechanism connected to said member through said closure plate operable to impart an up and down stroke thereto for ejecting a pulsating stream of liquid upwardly throughout the depth thereof on each down stroke to effect liquid agitation during the freezing cycle.

6. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit adapted to engage and seal said unit during the freezing cycle and in spaced relation to the lower edges of the cells, means for introducing into said cells and the space between said cells and closure plate a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, an apertured agitating plate carried by said closure plate coextensive with said cells, the apertures therein arranged substantially centrally thereof, and means on said closure plate extending there-through in operative engagement with said aperture agitating plate for imparting a reciprocating movement thereto toward and away from said cells submerged within the liquid between said cells and closure plate for ejecting a stream of liquid through each aperture upwardly into the respective cells on each downward movement of said apertured plate during the freezing cycle.

7. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit adapted to engage and seal said unit during the freezing cycle and in spaced relation to the lower edges of the cells, means for introducing into said cells and the space between said cells and closure plate a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze the liquid therein, and a pulsating plate coextensive with said cells mounted for reciprocating movement in the space between said cells and closure plate in a direction toward and from said cells, and means for reciprocating said plate to produce a turbulence of the liquid within the cells and throughout the depth thereof during the freezing cycle.

8. In an ice making machine, the combination with a freezing unit having a plurality of open bottom cells for receiving a liquid to be frozen and a removable closure therefor, of a pulsating member submerged within the liquid adjacent said closure, and means connected with said member operable to impart a pulsating action thereto for agitating the liquid in said cells during the freezing operation.

9. In an ice making machine, the combination with a freezing unit having a plurality of open bottom cells for receiving the liquid to be frozen

and a removable closure therefor, of an agitating member movably mounted between said closure and the bottom of said cells, and means connected with said member for imparting movement thereto while submerged in the liquid between said cells for agitating the liquid therein during the freezing cycle.

10. The combination with a freezing cell for receiving liquid to be frozen to a solid state, of an agitating plate submerged in the liquid below the cell movable toward and away therefrom, said plate having a single aperture centrally located relative to said cell and means for moving said plate vertically relative to said cell for forcing a stream of liquid through the aperture therein to effect agitation of the liquid in the cell during the freezing cycle.

11. A freezing unit for an ice cube making machine adapted to receive the liquid to be frozen therein comprising a plurality of cells defined by one parallel series of spaced vertical walls extending transversely to a second parallel series of spaced vertical walls, said walls being of heat conductive material, one series of said walls being formed with an inwardly turned flange along its upper edge, a refrigerant evaporator comprising a sinuous tube secured to said flanges in heat convection engagement and means for passing a refrigerant through said tube to freeze the liquid in said cells.

12. A freezing unit for an ice cube making machine adapted to receive the liquid to be frozen therein comprising a plurality of cells defined by one parallel series of spaced vertical walls extending transversely to a second parallel series of spaced vertical walls, an evaporator in the form of a sinuous refrigerant conducting tube extending over said cells, laterally extending flanges formed on one series of said walls for supporting and securing said tube thereon in heat conductive relation and means for passing a refrigerant through said tube to freeze the liquid in said cells.

13. A freezing unit for an ice cube making machine adapted to receive the liquid to be frozen therein comprising a plurality of cells defined by one parallel series of spaced vertical walls extending transversely to a second parallel series of spaced vertical walls, said walls being of heat conductive material, one series of said walls being formed with an inwardly turned flange along its upper edge, a sinuous tube flattened to form an under surface of substantial width secured to said flanges in heat conductive relation therewith whereby a substantial heat transfer surface will be provided therebetween and means for passing a refrigerant through said tube to freeze the liquid in the cells.

14. In an ice cube making machine, the combination of a freezing unit normally open at the bottom, a closure plate for said unit movable to close and seal the bottom of said unit during the freezing cycle and means for refrigerating a liquid in said unit, of a pivotally mounted lever having a link connection with said plate, a cam movable to raise said plate into sealing engagement with said unit and permit it to drop therefrom to discharge position, an electric motor for driving said cam, and switch control mechanism for the circuit to said motor operable to arrest the movement of said cam after releasing said plate from sealing engagement with said unit until said plate is freed from the frozen liquid to drop a predetermined distance, and thereupon continue the movement of said cam to permit

the dropping of said plate to its lowermost discharge position.

15. In an ice cube making machine, the combination of a freezing unit normally open at the bottom adapted to receive liquid to be frozen therein, means for refrigerating said unit to freeze said liquid and a closure plate for said unit movable to close and seal the bottom thereof during a freezing cycle, of a pivotally mounted lever having a link connection with said plate, a cam movable to raise said plate to sealing engagement and permit the lowering thereof from said unit to discharge position, a cam follower carried by said lever movable relative thereto to one position under pressure of said cam and to another position when freed therefrom, an electric motor for driving said cam, and a switch for controlling the circuit of said motor operable by said follower to break the circuit to the motor upon said cam being moved free of said follower for limiting the dropping of the plate after it is freed from the frozen liquid, and close said circuit upon follower pressure by said cam to continue the movement of the cam to permit lowering of said plate to its full discharge position.

16. In an ice cube making machine, the combination of a freezing unit comprising a plurality of cells normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle, means for introducing into said cells a liquid to be frozen into ice cubes, means for refrigerating said unit to freeze a portion of the liquid therein, mechanism operable at the conclusion of the freezing cycle to remove said closure plate and permit discharge of the unfrozen liquid and frozen ice cubes from the freezing unit, and a drainage member below and spaced from said closure plate for receiving the unfrozen liquid and ice cubes therefrom and separating them to direct said ice cubes into one receptacle and permit the unfrozen liquid to pass into another receptacle.

17. In an ice cube making machine, the combination of a freezing unit normally open at the bottom, a closure plate for said unit movable to close and seal said unit during a freezing cycle and open said unit following the freezing cycle, means for introducing a liquid to be frozen into said unit, means for refrigerating said unit to freeze a portion of the liquid therein, means for discontinuing the refrigeration of said unit following the freezing of a portion of the liquid and releasing said closure plate to permit the frozen and unfrozen liquid to drop from said unit, and a sloping drainage screen positioned below said freezing unit for receiving the frozen and unfrozen liquid therefrom upon said closure

plate being moved to open position, a receptacle for receiving the unfrozen liquid passing through said screen and a separate receptacle mounted relative thereto for receiving frozen liquid therefrom free of unfrozen liquid.

18. In an ice making machine, the combination with a freezing cell for receiving liquid to be frozen and a refrigerating element carried by the upper portion of the walls of said cell for passing a refrigerant therethrough to reduce the temperature of the walls progressively from the top downwardly, of a liquid conduit connected with the wall of said cell adjacent and below a predetermined liquid level therein, a valve in said conduit operative to shut off the supply of liquid to said cell upon the liquid therein reaching a predetermined level, and means for effecting removal of frozen liquid from said cell upon completion of the freezing cycle and permit a new charge of liquid thereto, the connection of said liquid conduit with the wall of the cell becoming closed through ice formation thereover by reason of its submerged proximity to the refrigerating element for preventing additional liquid from entering said cell through opening of said valve upon momentary lowering of the liquid level.

19. In an ice making machine, a freezing cell for receiving a liquid to be frozen, a source of liquid supply having an inlet conduit connected with one wall of said cell below a predetermined liquid level therein but within close proximity of a refrigerating element associated therewith for forming an ice cap over said inlet during the initial freezing action, and a valve operative to close said conduit upon the liquid reaching a predetermined level in said cell, whereby liquid will be prevented from entering said cell after the initial closing of said valve in event of momentary drop of the liquid level during the freezing cycle.

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