

Dec. 5, 1944.

R. M. STORER

2,364,559

ICE-PRODUCING MECHANISM

Filed July 22, 1941

5 Sheets-Sheet 1

Fig. 1.

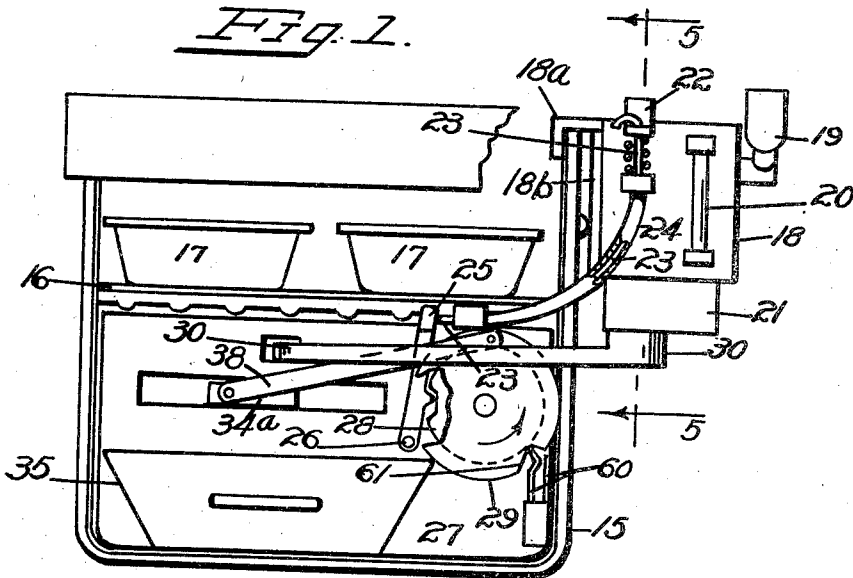
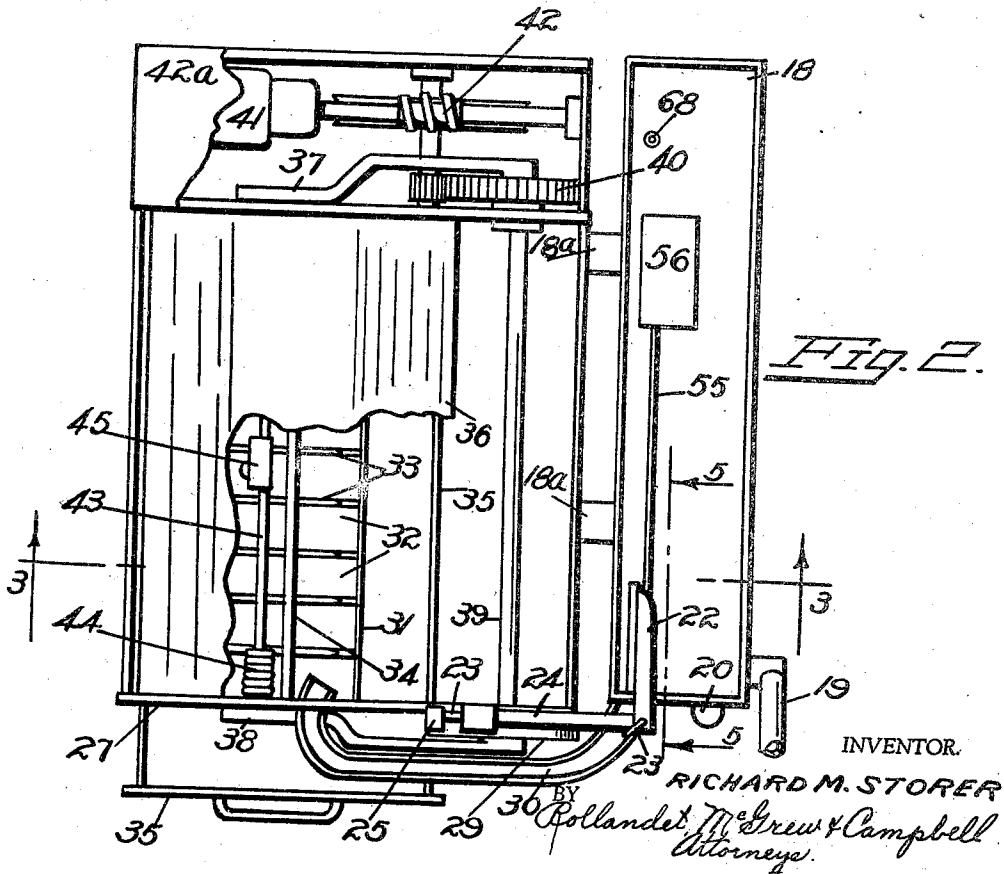


Fig. 2.



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Fig. 3.

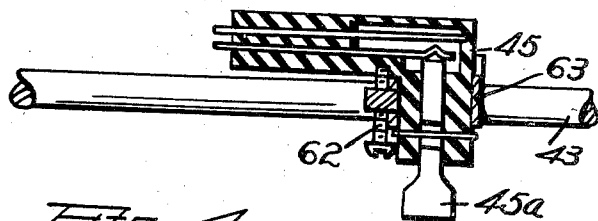
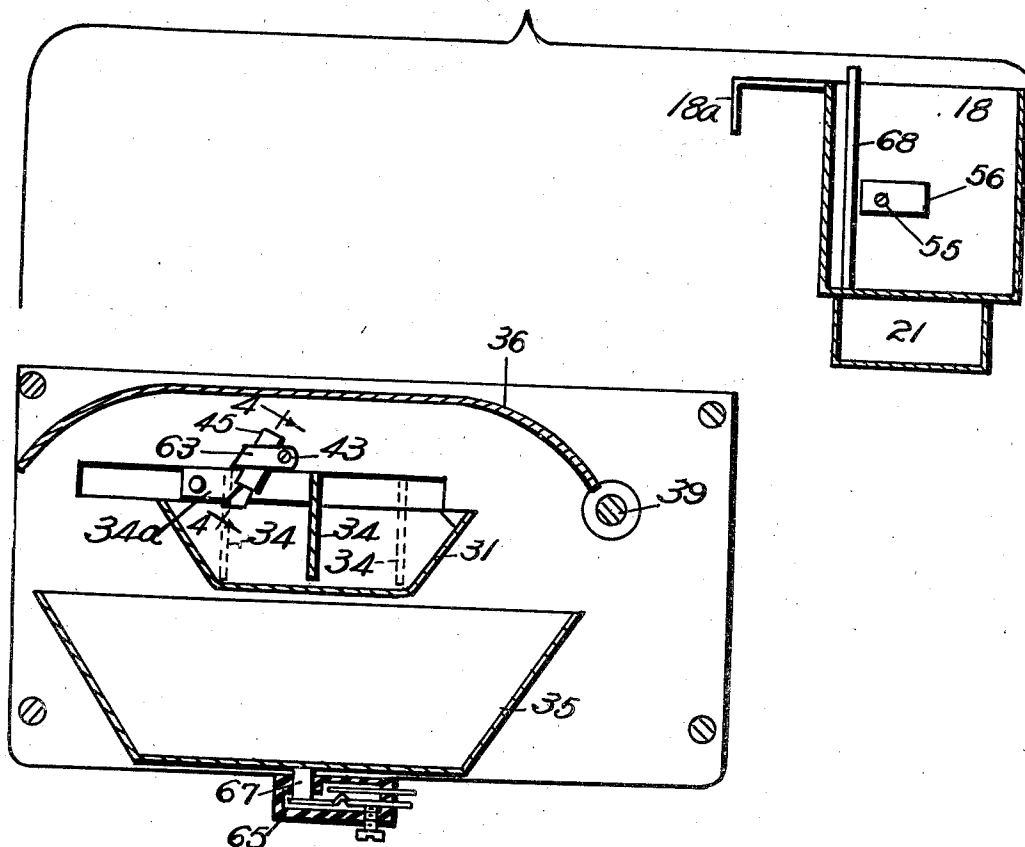


Fig. 4.

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5 Sheets-Sheet 3

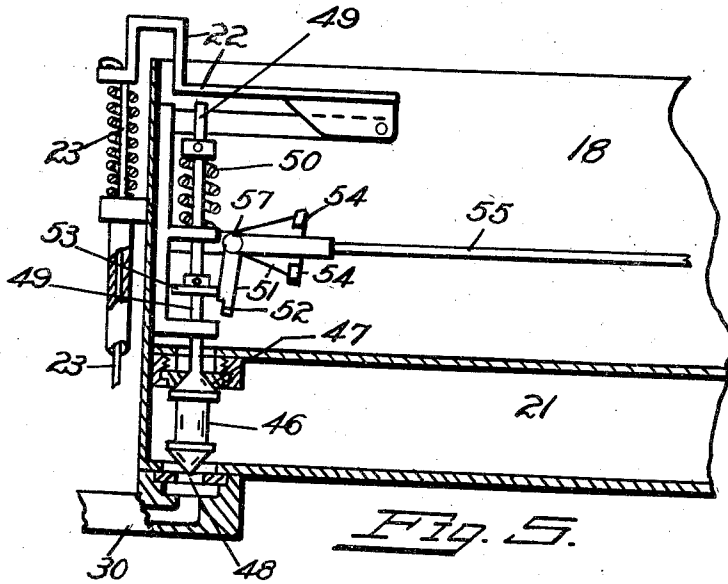


Fig. 6.

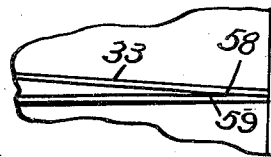
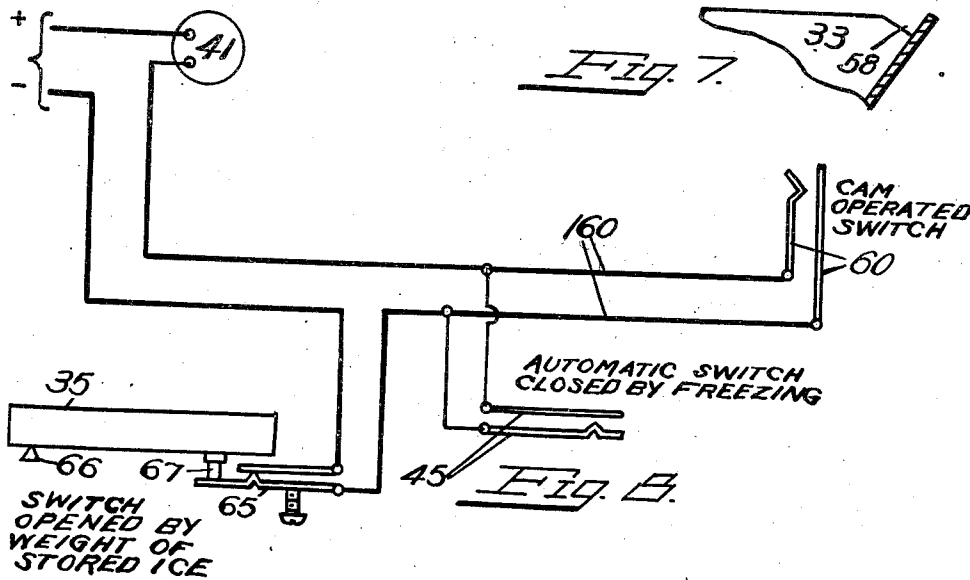
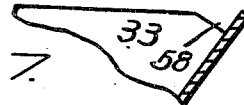


Fig. 7.



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ICE-PRODUCING MECHANISM

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Fig. 9.

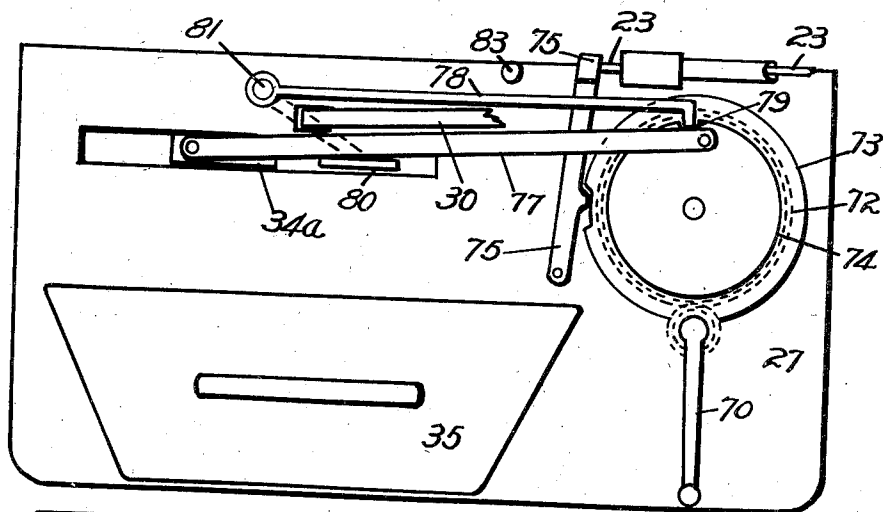
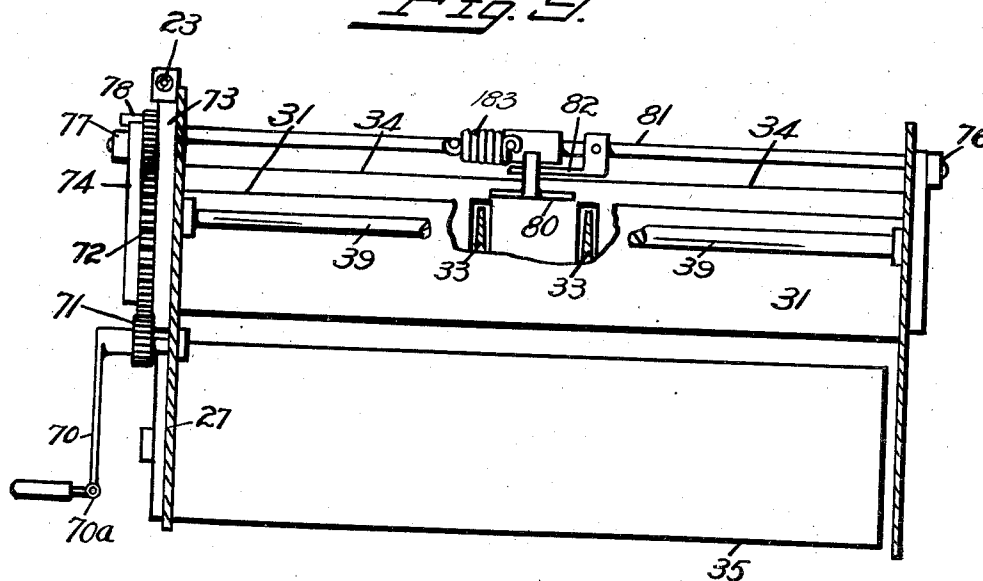


Fig. 10.

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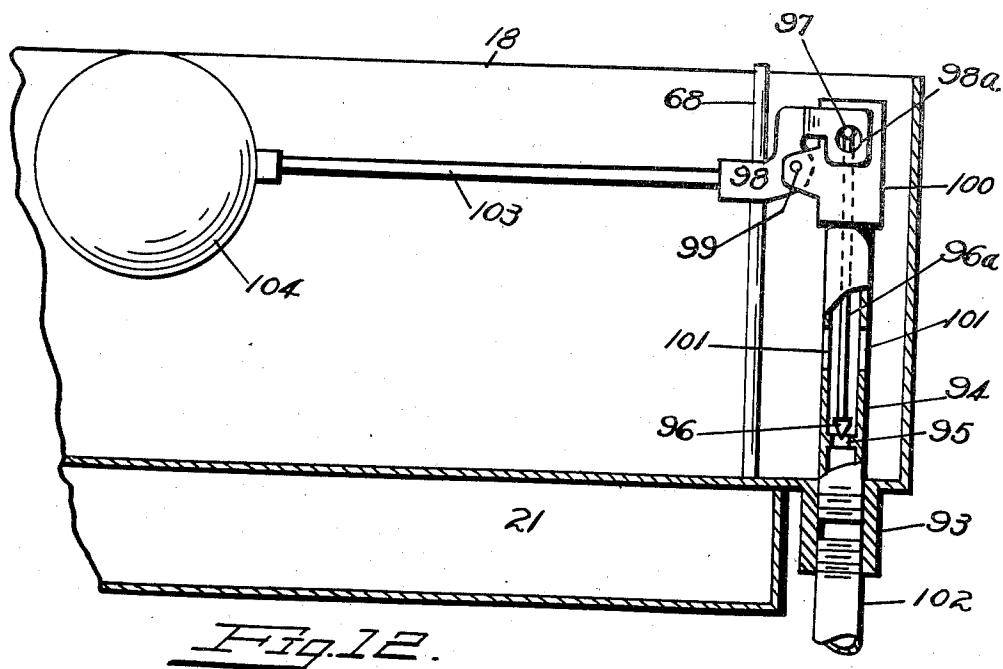
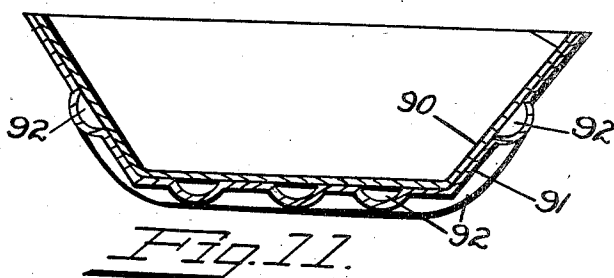
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ICE-PRODUCING MECHANISM

Filed July 22, 1941

5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,364,559

ICE-PRODUCING MECHANISM

Richard M. Storer, Denver, Colo.

Application July 22, 1941, Serial No. 403,524

28 Claims. (Cl. 62-105)

This invention relates to improvements in mechanical refrigeration and more particularly to improved mechanism for producing and harvesting blocks of ice.

As is now well known, mechanical refrigerators for homes, restaurants, hotels and the like are ordinarily provided with a plurality of trays in which are positioned relatively movable grids whereby individual blocks of frozen matter may be produced by pouring the unfrozen liquid into the trays and positioning said trays thus filled adjacent the freezing units of such mechanical refrigerators.

Under some circumstances, the demand for blocks of ice may be such that the contents of all of the trays in a given refrigerator may quickly be exhausted resulting in considerable inconvenience because a time period of some length is required before the contents of re-filled trays can be frozen.

Blocks of ice so formed in trays provided with grids may under some circumstances, be difficult to harvest since they have a tendency to adhere to the trays and the grids. This is true in spite of the fact that various types of ice tray and grid assemblies are provided with different kinds of mechanisms for releasing the ice cubes therefrom. Nevertheless, some time and effort is ordinarily required to harvest the blocks of ice. In some types of freezing trays, the removal of ice blocks is quite difficult.

Therefore, it is a general object of the present invention to provide a continuous freezing and storage mechanism for mechanical refrigerators whereby blocks of ice will continuously be produced and stored for future use, thus providing an unusually ample stored supply of such blocks of ice.

Another object is to provide ice block forming mechanism for mechanical refrigerators which will automatically discharge the blocks of ice after freezing, from the tray in which they are frozen into a suitable storage receptacle from which they readily can be removed when wanted since they will not adhere to the storage receptacle nor to each other after they have been frozen.

In addition to the above general objects, certain other advantageous details having to do with convenience of installation and dependability of operation will become manifest as this description proceeds.

In the drawings wherein like parts are similarly designated,

Figure 1 represents a front elevation, partially

in section, of mechanism embodying the present inventive concept in its operative position with reference to a freezing compartment of a typical mechanical refrigerator;

Figure 2 is a plan view partially in section, of mechanism similar to that illustrated in Figure 1 as it would appear apart from the refrigerator in which it is normally used;

Figure 3 is a sectional view taken approximately along the line 3-3 of Figure 2 and drawn on a somewhat larger scale;

Figure 4 is a fragmentary sectional view along the line 4-4 of Figure 3 and drawn on a somewhat larger scale;

Figure 5 is a fragmentary sectional view taken approximately along the lines 5-5 of Figures 1 and 2 and drawn on a larger scale;

Figures 6 and 7 are fragmentary details of certain portions of the mechanism illustrated in Figure 2 and drawn on a larger scale;

Figure 8 is a diagrammatic illustration of the electrical circuits incorporated in the mechanisms illustrated in Figures 1, 2, 3 and 4;

Figure 9 is a fragmentary sectional illustration of a modified, hand-operated form of the present inventive concept;

Figure 10 is a front end elevation of the mechanism illustrated in Figure 9;

Figure 11 is a sectional illustration of a freezing tray that is provided with means for circulating refrigerant in close contact therewith, and is therefore particularly well adapted for use with the present invention; and

Figure 12 is a fragmentary illustration, partially in section, of a modified liquid reservoir that is well suited for use with this inventive concept.

In order to disclose an operative reduction to practice of the present inventive concept, the accompanying drawings will be described in some particularity as a typical example.

First referring to Figure 1, reference character 15 denotes the freezing compartment of a typical mechanical refrigerator which is provided with passages for the refrigerant on both sides and across the bottom, as well as along the underside of a shelf 16. Two ordinary ice trays of a conventional type are indicated by reference character 17 and are positioned upon the shelf 16.

The mechanism that embodies the present improvement is built of a size and shape to be positioned partly within the freezing compartment 15 below the shelf 16, and partly outside of the compartment 15 but immediately adjacent thereto and supported thereby.

Reference character 18 denotes a reservoir for

liquid to be frozen, usually water. It is provided with an angularly movable filling spout 19 which may be rotated to an outwardly and upwardly extending position for convenience in pouring liquid to be frozen into the reservoir 18. When not in use, the filler 19 may be rotated out of the way so that the door of the refrigerator may be closed in the usual way. The reservoir 18 is supported on the freezing compartment 15 by means of hooks 18a, and is preferably insulated from said compartment by suitable material such as cork 18b.

A sight water glass may conveniently be provided on the reservoir 18 as indicated at 26.

Immediately below the reservoir 18 is a metering tank 21 that is in conductive communication with said reservoir, subject to the position of valve mechanism illustrated in enlarged detail in Figure 5.

The opening and closing of said valve mechanism is automatically controlled by means of a lever arm 22 connected with an actuating wire 23 in a housing 24. Wire 23 is connected at its opposite end to a lever cam follower 25 that is pivoted at 26 on an end plate 27 in a position to be moved by the inner portion 28 of a cam element 29 that is journaled for rotation upon the general assembly.

A trough or flume 30 is in conductive communication with the metering tank 21, subject to the position of the valve mechanism illustrated in Figure 5, and leads through the end plate 27 to a position of discharge immediately above a freezing tray 31, Figure 2, that is divided into individual ice-forming cells 32 by means of cross grid walls 33.

The freezing tray 31 is further provided with a laterally movable longitudinal grid member 34 which discharges the ice blocks after they are completely frozen, over the respective edges of the freezing tray 31 whence they fall into a drawer-like storage compartment 35, being guided in such discharge movement by a curved baffle plate positioned above the freezing tray and indicated at 36.

The lateral movements of the central longitudinal grid member 34 to discharge finished blocks of ice over the edges of the freezing tray 31 are effected by means of connecting rods 37 and 38 which are pivotally attached to sliding guides 34a that are an integral part of the longitudinal grid member 34. Connecting rod 38 is driven by the cam element 29 which is carried upon a shaft 39, and connecting rod 37 is driven by a spur gear 40 which is also mounted on the shaft 39.

The spur gear 40 is driven by motor 41 through the intermediary of suitable speed-reducing mechanism 42 which is subject to considerable variation according to circumstances. A cover 42a illustrated fragmentarily in Figure 2, may advantageously be provided for the motor 41 and its associated power-transmitting mechanism.

Mounted above the freezing tray 31 is a rod 43 which is capable of limited rotary movement against the torque of a coil spring 44. Carried upon the rod 43 is a switch 45, the details of which are well illustrated in Figure 4. This switch 45 is positioned immediately above one of the freezing cells 32 so that the natural expansion of the forming ice therebelow will actuate it as will be hereinafter more fully explained.

Referring to Figure 5, the valve mechanism hereinbefore mentioned will be explained in some particularity. A double-acting valve element 46

is positioned in the metering tank 21 to alternately govern the flow of liquid through a port 47 connecting the storage reservoir 18 with said metering tank 21, and a port 48 which connects the lower portion of the metering tank 21 with the trough or flume 30.

The double-acting valve element 46 is provided with a stem 49 and is urged upwardly by means of a compression coil spring 50. In its upper position, the valve element 46 closes the port 47 and opens the port 48.

The pivotal lever arm 22 which is connected with the actuating wire 23 is positioned above the end of the valve stem 49 so that when it is pulled downwardly by the wire 23, it will move the valve element 46 downwardly to open port 47 and close port 48.

Pivotally mounted adjacent the valve stem 49 is a bell crank 51 having on its downwardly extending leg a notch 52 positioned to cooperate under certain circumstances, with a disk 53 secured to the valve stem 49, to hold the valve element 46 in its lowermost position. On the horizontally extending leg of the bell crank 51 are a pair of spaced bosses 54 between which is positioned an arm 55 which carries a float 56 shown in Figure 2.

The arm 55 is mounted for limited angular movement on the pivot 57 which also carries a bell crank 51. It is manifest that movement of the arm 55 due to variation in the liquid level in the storage reservoir 18 which determines the position of the float 56, will effect the angular position of the bell crank 51 as will be herein-
after more fully explained.

Referring briefly to Figures 6, 7 and 2, it will be noted that the ends of the cross grid members 33 are each provided with a notch 58, and adjacent each notch 58 the grid walls 33 are reduced to a knife-like edge 59. These notches 58 are for the purpose of spilling liquid being introduced into the freezing tray 31 by means of the trough or flume 30, from one cell 32 to the next until the entire tray 31 is filled. The knife-like edge 59 facilitates the separation of the individual blocks of ice which may be joined with a fragile neck at each notch 58, and prevents adherence of the ice to the tray structure at the notches. Each cross wall 33 tapers upwardly and outwardly to facilitate ejection of the ice blocks.

A switch 60, Figures 1 and 8, is positioned to be actuated by the cam element 29, and controls the power input to the motor 41 through a suitable circuit 160 in which both the motor and said switch 60 are connected. When the notch 61 in said cam element is engaged by an arm of the switch 60, said switch is in its open position. When the cam element 29 is rotating and the notch 61 is not engaged by an arm of the switch 60, said switch is closed.

The switch 45, Figures 2, 3 and 8, is also connected across circuit 160 and is normally open but is closed by expansion of the liquid being frozen which actuates a plunger 45a raising it.

The switch 45 is carried upon the rod 43 and is adjustable up and down within reasonable limits by means of a screw 62 positioned in a carrier 63 on the rod 43, in which the body of the switch 45 is mounted.

Another switch element 65, Figures 3 and 8, may, if desired, be positioned beneath the ice storage receptacle 35 and is connected in series in one leg of the circuit 160. The ice storage receptacle 35 bears upon an edge of a cut-out in plate 27 as indicated diagrammatically at 66,

Figure 8. The other end of the storage receptacle 35 bears upon a plunger 67 which will open the normally closed switch 65 when the weight of stored ice in receptacle 35 builds up to a predetermined amount. As illustrated in Figure 8, the opening of switch 65 by the weight of the stored ice will stop the operation of the entire mechanism until such time as some of the ice is removed from receptacle 35.

Operation

Briefly stated, the operation of the device herein disclosed is as follows:

Water or any other liquid to be frozen is introduced into storage tank 18 until said tank is substantially filled. Initial manual closing of the switch 60 starts the motor 41 which will then run until the cam element 29 has made one complete revolution. As the cam element 29 turns in the direction indicated by the arrow, the cam follower 25 will be moved outwardly to pull the wire 23 which in turn will pull the lever 22 downwardly to move the valve element 46 to its lowermost position, opening port 47 and closing port 48 so that the metering tank 21 will be filled with liquid from the storage reservoir 18.

A vent 68 permits air to escape from the metering tank 21 as liquid flows therein, and the metering tank holds exactly the amount of liquid that is required to fill the freezing tray 31 to its optimum capacity.

When the cam element 29 has made one complete revolution, the switch 60 will automatically open to stop the motor 41 and the cam follower 25 will move inwardly, permitting the valve element 46 to raise to close port 47 and open port 48 in the bottom of the metering tank 21, thus permitting the measured amount of liquid in the metering tank 21 to flow by gravity through the trough or flume 30 to fill the freezing cells 32 in the tray 31.

Since the freezing tray 31 is normally positioned within the freezing compartment 15, cooling and eventual solidification of the liquid thus introduced into the tray 31 will occur. As the freezing of the liquid is completed, the switch 45 will be closed to start the motor 41 on another operating cycle.

As the motor 41 drives the gear 40 and the shaft 39, the connecting rods 37 and 38 will be moved, which in turn will move the central longitudinal grid member 34 transversely, first to one side and then to the other side of the tray 31, as indicated in dotted lines in Figure 3. It will be understood that the central longitudinal grid member 34 is suitably notched to receive the transverse grid walls 33 so that it extends well down in each individual cell 32.

Since the sides of the tray 31 are sloped outwardly as well shown in Figure 3, the bodies of ice formed in the cells 32 will be moved upwardly and outwardly over the edges of the freezing tray 31 and will be guided by the baffle plate 36 to fall into the drawer-like storage receptacle 35. The baffle 36 also serves the useful purpose of preventing drippage from falling into the freezing tray 31 during defrosting of the freezing compartment 15.

Due to the fact that the automatic switch 45 is carried upon the rod 43 which is mounted for limited angular movement, said switch 45 will be moved angularly upward by the lateral movement of the longitudinal grid member 34 to avoid a conflict between these two components. As the longitudinal grid member 34 moves back to its

normal central position as illustrated in Figures 2 and 3, the spring 44 will cause the rod 43 and the switch 45 to resume their normal position.

The discharge of the finished blocks of ice from the freezing tray 31 into the storage receptacle 35 is completed in one revolution of the gear 40, the shaft 39 and the cam element 29, during which phase of the operating cycle the valve element 46 is in its downward position, permitting the metering tank 21 to refill from the storage reservoir 18.

As the complete revolution of the cam element 29 is finished, the switch 60 is again opened and the port 48 is also opened to refill by gravity the freezing tray 31 with the measured amount of liquid from metering tank 21.

Thus is provided a continuously operating mechanism for freezing and storing blocks of ice and as the weight of the stored blocks of ice in the drawer-like receptacle 35 builds up to a predetermined amount, the switch 65 will be opened to stop the operation of the entire mechanism.

Referring particularly to Figure 5, an added factor of safety is provided whereby if the water level in the storage tank 18 is so reduced that there is not enough water left again to fill the metering tank 21, then the arm 55 will be moved angularly downward to move notch 52 on bell crank 51 over into engagement with disk 53 on valve stem 49 when said valve stem is in its lowermost position, thus latching the valve element 46 in its downward position to close port 48 to prevent a situation wherein less than the full amount of water will be flowed from the metering tank 21 to the freezing tray 31. Obviously, if less than the full amount of liquid to be frozen is introduced into the freezing tray 31, the automatic functioning of the device would be defeated.

Since the arm 55 operates between the two bosses 54, refilling of the storage tank 18 will move the bell crank 51 to a position wherein the notch 52 is out of engagement with the disk 53, thus releasing the valve element 46 for normal operation. By spacing the bosses 54 well apart, a certain amount of "lost movement" is permitted the arm 55 so that its effect upon the bell crank 51 is not immediate but rather is delayed to insure proper refilling of the metering tank before release.

To accelerate the freezing in the tray 31 said tray may itself, if desired, be provided with coils or passages as an integral part of its construction, for circulation of the refrigerant along its exterior surfaces. This form of freezing tray is illustrated in Figure 11.

Since the storage receptacle 35 is constructed like a drawer, it may be withdrawn at will and the ice bodies stored therein will be free and separate from each other and from their container so that they may be lifted therefrom as readily as any other object of similar size.

The drawer-like storage receptacle 35 may be of a size to store much more ice in the form of individual blocks than would ordinarily be the capacity of a mechanical refrigerator using only the standard equipment of individual freezing trays. In the present example, two trays 17, Figure 1, of the conventional type may remain in their ordinary use.

Next referring to the hand-operated form of the present invention illustrated in Figures 9 and 10, it will be seen that the operating principle is quite similar to that embodied in the motor-driven apparatus.

The freezing tray 31 and the drawer storage receptacle 35 are essentially the same as heretofore described.

Instead of the motor, a hand crank 70 is mounted for rotation on the front plate 27 and carries a pinion 71 that meshes with a spur gear 72 which is integral with the cam 73 at the back of said gear and a cam 74 at the front thereof.

A cam follower 75 is actuated by the cam 73 and is entirely comparable to the cam follower 25 of Figure 1. Cam follower 75 is connected with valve actuating wire 23 and performs exactly the same functions as heretofore set forth.

Connecting rods 76 and 77 are entirely comparable to and function like connecting rods 37 and 38 already described, to move the central longitudinal grid member 34 laterally to move the ice bodies from the freezing tray 31.

A particular feature of the hand-operated form of the invention is a latch element 78 which engages in a notch 79 in the cam 74. When the latch 78 so engages the notch 79, the hand crank 70 cannot be turned.

A plate 80 is carried upon a rod 81 that is mounted for limited angular movement. The latch element 78 is also carried on the rod 81 so that the angular position of the rod 81 governs the angular position of said latch.

The plate 80 is positioned immediately above the normal liquid level in the freezing tray 31 so that when the liquid expands as a result of the freezing thereof, upward pressure will be applied against the plate 80 which in turn will rotate the rod 81 to lift the latch 78 out of the notch 79, in which position the hand crank 70 may be rotated to perform a complete cycle of ejecting ice from the freezing tray 31 and operating the valve element 46 and its associated mechanism.

An arm 82 carried upon the rod 81 serves to position the plate 80 with reference to the surface of the liquid. A stop 83 limits the upward angular movement of the latch 78.

When the central longitudinal grid component 34 moves toward the plate 80, said plate 80 can rotate upwardly with reference to its supporting rod 81, such movement being permitted by a spring 83 connecting the rod 81 with the plate 80. This arrangement permits the central longitudinal grid component 34 to perform its normal function.

The automatic latching feature of this form of the invention is of importance because it permits the manual operation of the device only when such operation is desirable; in other words, the crank 70 can be turned only after the freezing of the ice bodies has been completed.

It is manifest that the crank 70 should not be turned prior to the completion of the freezing process since this would disarrange the normal cyclic function of the device. This proposition resolves itself into the situation that whenever the crank 70 can be turned it is proper to turn it, but it cannot be turned when it is improper to turn it. The hand crank 70 may conveniently be of hinged construction as illustrated at 70a, so that the front door of the refrigerator may be closed.

Figure 11 illustrates a form of freezing tray that is well adapted for use with the present inventive concept, wherein the tray is made of an inner ply of material 90, preferably heat-conducting metal, and an outer ply 91 in which are formed a plurality of conductive passages 92 through

which may be circulated the refrigerant for quick freezing of the liquid in the tray.

Figure 12 illustrates a modified form of the present inventive concept wherein the reservoir 18 is provided with a threaded connection 93 into which is screwed a standpipe 94 having a port or valve seat 95 which is controlled by a valve 96 that is connected by means of a stem 96a with bosses 97 positioned loosely in apertures 98a in a bifurcated arm 98 pivoted at 99 to a head 100 carried upon the standpipe. Apertures 101 are provided in the standpipe 94 above the valve 96 and the threaded connection 93 is conductively connected with any convenient source of water under pressure such as a public water system, through the intermediary of a pipe 102.

An arm 103 carries an actuating float 104 and is securely threaded into the bifurcated arm 98 whereby the opening and the closing of the valve 96 may be controlled by the position of the float 104, which in turn is moved up and down by the level of liquid in the reservoir 18.

It is manifest that the connection 93 may be provided on all reservoirs 18 if desired, and it may be closed by a simple threaded plug when manual filling of the reservoir 18 is preferred as hereinbefore described. If at any time it is preferred to connect the reservoir 18 with a source of water under pressure such as a public water system, then the plug may be removed from the connection 93 and the parts illustrated in Figure 12 and hereinbefore described in some particularity, may readily be installed thus eliminating the necessity of manual filling of the reservoir 18.

It is obvious that the mechanism illustrated in Figure 12 will automatically maintain a predetermined liquid level in the reservoir 18 within reasonable limits since the valve 96 will open the port 95 to permit water to flow into the reservoir 18 when the liquid level in said reservoir permits the float 104 to fall. Conversely, when the liquid level in reservoir 18 rises to its optimum height, then the float 104 will cause the valve 96 to close the port 95 shutting off the flow of water from pipe 102 until the float shall again fall.

It is preferred to install the mechanism illustrated in Figure 12 at the end of reservoir 18 that is opposite the mechanism illustrated in Figure 5, for purposes of convenience. The operation of the device when provided with the apparatus illustrated in Figure 12, is, of course, the same as heretofore set forth except that the water supply is automatically provided for the reservoir 18.

Since the float 56, Figure 2, and its associated mechanism, best illustrated in Figure 5, are primarily for the purpose of safeguarding the automatic operation of the device against neglect in manual filling of the reservoir 18, said float 56, arm 55, and valve latching mechanism 51-52-54 may be omitted when the automatic mechanism of Figure 12 is used. However, the float 56 and its associated latching mechanism need not necessarily be omitted since by proper arrangement of the floats 56 of Figure 2 and 104 of Figure 12, they can both operate in the reservoir 18 without conflict.

More briefly summed up, the present invention includes means for holding liquid to be frozen, means for introducing therein an optimum amount of liquid to be frozen, means for removing frozen matter from the container in which it is frozen, and means actuated by the expansion of the liquid being frozen for governing the operation of the device.

The means actuated by the expansion of the liquid being frozen, in the motor-driven form, starts the mechanism on one complete cycle of operation. The means actuated by the expansion of the liquid being frozen, in the manually operable form, may well be said to govern the operation of the device since the mechanism cannot be manually operated until the governing factor is released.

Therefore, in the following claims, it is believed the term "govern" as applied to the means actuated by expansion of the material being frozen is generic to all forms of the invention.

What I claim and desire to secure by Letters Patent is:

1. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, means within the tray for removing ice therefrom, and means actuated by expansion of the liquid being frozen in the tray for initiating operation of said liquid-introducing means and said ice-removal means.
2. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, mechanical means for forcing ice from the tray, means actuated by expansion of the liquid being frozen in the tray for governing operation of said liquid-introducing means and said ice-forcing means, and means for receiving and storing ice so removed from said tray.
3. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, manually operable means for removing ice from the tray, and means actuated by expansion of the liquid being frozen in the tray for governing operation of said liquid-introducing means and said ice-removal means.
4. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means associated with said tray for removing ice therefrom, a reservoir for liquid, a metering tank in conductive communication with said reservoir, conductive means connecting said metering tank with said tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the tray, and means actuated by expansion of liquid being frozen in the tray for initiating operation of said valve element and said ice-removing means.
5. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means associated with said tray for removing ice therefrom, a reservoir for liquid, means for automatically maintaining a predetermined amount of liquid in said reservoir, a metering tank in conductive communication with said reservoir, conductive means connecting said metering tank with said tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the tray, and means actuated by expansion of liquid being frozen in the tray for initiating the operation of said valve element and said ice-removing means.
6. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means associated with said tray for removing ice therefrom, a reservoir for liquid, a metering tank in conductive communication with said reservoir, conductive means connecting said metering tank with said tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the tray, means actuated by expansion of liquid being frozen in the tray for initiating the operation of said valve element and said ice-removing means, and means operable by liquid in said reservoir for holding said valve element against operation when the level of said liquid falls to a predetermined point.
7. Apparatus of the character disclosed comprising a tray for liquid to be frozen, means associated with said tray for removing ice therefrom, means for receiving and storing ice so removed, a reservoir for liquid, a metering tank in conductive communication with said reservoir, conductive means connecting said metering tank with said tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the tray, means actuated by expansion of liquid being frozen in the tray for initiating the operation of said valve element and said ice-removing means, and means for stopping the entire operation of the apparatus actuated by a predetermined amount of stored ice.
8. Apparatus of the character disclosed comprising a tray divided by transverse grid walls into freezing cells for liquid to be frozen and having outwardly inclined sides, a longitudinal grid member positioned for lateral movement in said tray and notched to receive said cross walls, a reservoir for liquid positioned adjacent said freezing tray, a metering tank in conductive communication with said reservoir, means for conducting liquid from said metering tank to said freezing tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the freezing tray in its other position, an electric motor, a conductive circuit inclusive of a source of electrical energy for said motor, a motor-stopping switch in said circuit, a motor-driven cam element for opening and closing said switch, a cam follower associated with said cam element for operating said valve element, a motor starting switch positioned adjacent said freezing tray for actuation by expansion of the liquid being frozen therein, and transmission means connecting said motor with the longitudinal grid member for moving the same laterally to push ice blocks from the tray.
9. Apparatus of the character disclosed comprising a tray divided by transverse grid walls into freezing cells for liquid to be frozen and having outwardly inclined sides, a longitudinal grid member positioned for lateral movement in said tray and notched to receive said cross walls, a reservoir for liquid positioned adjacent said freezing tray, a metering tank in conductive communication with said reservoir, means for conducting liquid from said metering tank to said freezing tray, a double-acting valve element movable to one position permitting the flow of liquid from the reservoir to the metering tank and movable to a second position permitting the flow of liquid from the metering tank to the

freezing tray in its other position, a manually rotatable cam element, a cam follower associated with said cam element and connected to operate said valve element, means connecting said cam element with the longitudinal grid member for moving the same laterally to push ice out of the tray, means for latching said cam element against rotation, and means operable by the expansion of liquid being frozen in said tray for releasing said latching element.

10. In apparatus of the character disclosed inclusive of a tray for liquid to be frozen, means for filling the tray with liquid and means for removing ice from the tray, the improvement which comprises means positioned above and adjacent said liquid and actuated by the upward expansion of the liquid as it freezes for initiating a cycle of removal of frozen matter from the tray in which it is frozen and the refilling of said tray with liquid.

11. A device of the character described comprising a tray, and a plural-cell mold in the tray formed by a plurality of walls positioned at substantially right angles one to another, one of said walls being mounted for oscillatory movement relative to the other walls across a substantial portion of the bottom surface of the tray, and means positioned and arranged to impart said oscillatory movement to the movable wall while the mold is in the tray.

12. A device of the character described comprising a tray, and a mold in the tray formed by a longitudinal wall and a plurality of transverse walls disposed at intervals along the length thereof, said longitudinal wall being mounted for movement lengthwise of said transverse walls substantially across the mold, and means positioned and arranged to impart said lateral movement to the longitudinal wall while the mold is in the tray.

13. A device of the character described comprising a tray, and a mold in the tray formed by a longitudinal wall and a plurality of transverse walls disposed at intervals along the length thereof, said longitudinal wall being mounted for transverse straight line movement along the transverse walls, and means positioned and arranged to impart said movement to the longitudinal wall while the mold is in the tray.

14. Apparatus of the character described comprising a liquid congealing tray having inclined sides and having its interior divided into two rows of compartments extending lengthwise of said inclined walls, means for introducing a predetermined amount of liquid into the tray, means for pushing congealed matter from one row of the compartments and across one of said sides in a continuous action, and means for automatically operating said liquid-introducing means and said ice-pushing means.

15. Apparatus of the character described comprising a liquid congealing tray having inclined sides and having its interior divided into two rows of compartments extending lengthwise of said inclined walls, means for introducing a predetermined amount of liquid into the tray, means for removing congealed matter from one row of the compartments and across one of said sides and then removing congealed matter from another row of the compartments and across another inclined side of the tray, and means for automatically operating said liquid-introducing means and said ice-removal means.

16. Apparatus of the character described, com-

prising a tray, and a plural-cell mold in the tray formed by a plurality of walls positioned at substantially right angles one to another, one of said walls being mounted for oscillatory movement relative to said other walls across a substantial portion of the area of the tray, means positioned and arranged to impart said oscillatory movement to the movable wall, and mechanism for stopping said means when the movable wall is at a predetermined position in its oscillatory cycle.

17. In a device of the character described, a pan, and a grid in the pan dividing its interior into a plurality of ice-forming molds, said grid including a plurality of transverse members and a lengthwise member mounted for movement along the transverse members through substantially the entire width of the pan, and means for so moving the lengthwise member.

18. In a device of the character described, a pan and a grid in the pan dividing its interior into a plurality of ice-forming molds, said grid including a plurality of rigid transverse members and a lengthwise member slotted for straddling said transverse members, said lengthwise member being mounted for linear movement between the transverse members in a direction transverse to its length, and means for so moving the lengthwise member.

19. In a device of the character described, a pan having an inclined wall, and a mold-forming member comprising three upright walls supported in the pan, one of said walls being constructed and arranged for straight line movement between the other two walls a distance sufficient to push matter frozen in said mold up and over said inclined wall, and means for so moving the movable wall.

20. Apparatus of the character described, comprising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, mechanical means for forcing ice from the tray, and means actuated by expansion of the liquid being frozen in the tray for governing operation of said liquid-introducing means and said ice-forcing means.

21. Apparatus of the character described, comprising a plural-cell mold adapted to contain a material to be frozen and including a movable lengthwise wall and a plurality of transverse walls, means for freezing the contents of said mold, means including the movable lengthwise wall for loosening and ejecting the frozen contents from said mold, and means responsive to the expansive action of frozen matter in the mold for initiating the ejection of frozen matter from the mold.

22. Apparatus of the character described, comprising a plural-cell mold adapted to contain a material to be frozen and including a movable lengthwise wall and a plurality of transverse walls, means for freezing the contents of said mold, means including the movable lengthwise wall for loosening and ejecting the frozen contents from said mold, and means for automatically causing successive freezing and ejecting of the contents of said mold.

23. Apparatus of the character described, comprising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, manually-operable means for forcing ice from the tray, and means actuated by expansion of the liquid being frozen in the tray for indicating when congealing within the mold is complete.

24. Apparatus of the character described, com-

prising a tray for liquid to be frozen, means for introducing a predetermined amount of liquid into the tray, manually-operable means for forcing ice from the tray, and indicating means associated with said manually-operable means and actuated by expansion of the liquid being frozen in the tray for indicating when congealing within the mold is complete.

25. Apparatus of the character described, comprising a plural-cell mold adapted to contain a material to be frozen and including a movable lengthwise wall and a plurality of transverse walls, means for freezing the contents of said mold, means associated with at least one of said walls for ejecting the frozen contents of the mold, supply means for replenishing the contents of said mold, and means associated with and controlling the operation of said supply means and said ejecting means for preventing the operation of said supply means prior to the operation of said ejecting means in each cycle of operation.

26. Apparatus of the character described, comprising a plural-cell mold adapted to contain a material to be frozen and including a movable lengthwise wall and a plurality of transverse walls, means for freezing the contents of said mold, means associated with at least one of said walls for loosening and ejecting the frozen contents of the mold, supply means for replenishing the contents of said mold, means responsive to the freezing action in the mold for initiating the said loosening and ejecting actions, and means including said last-mentioned means for automatically causing successive freezing, ejecting and filling actions in the mold in each cycle of operation.

27. Apparatus of the character described, comprising a plural-cell mold adapted to contain a material to be frozen and including a movable lengthwise wall and a plurality of transverse walls, means for freezing the contents of said mold, means associated with at least one of said walls for ejecting the frozen contents of the mold, supply means for replenishing the contents of said mold, and control mechanism constructed and arranged to maintain said ejecting means and said supply means inactive until the contents of said mold have congealed to a predetermined degree.

28. Apparatus of the character disclosed, comprising a tray for liquid to be frozen, means associated with the tray for removing ice therefrom, a reservoir for liquid, a metering tank communicating with said reservoir, means for conducting liquid from said metering tank to said tray, a valve movable alternately from one position to another to prevent the flow of liquid to said tank from said reservoir while permitting flow from said tank to said tray or to prevent flow from said tank to said tray while permitting flow from said reservoir to said metering tank, mechanism for operating the first-mentioned means and at the same time moving the valve from said one position to the second mentioned position, latching means for holding said mechanism against operation, and a device operable by the expansion of ice in said tray for releasing said latching means to permit operation of said mechanism.

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