

April 9, 1940.

D. H. REEVES

2,196,476

REFRIGERATING APPARATUS

Filed March 6, 1937

4 Sheets-Sheet 1

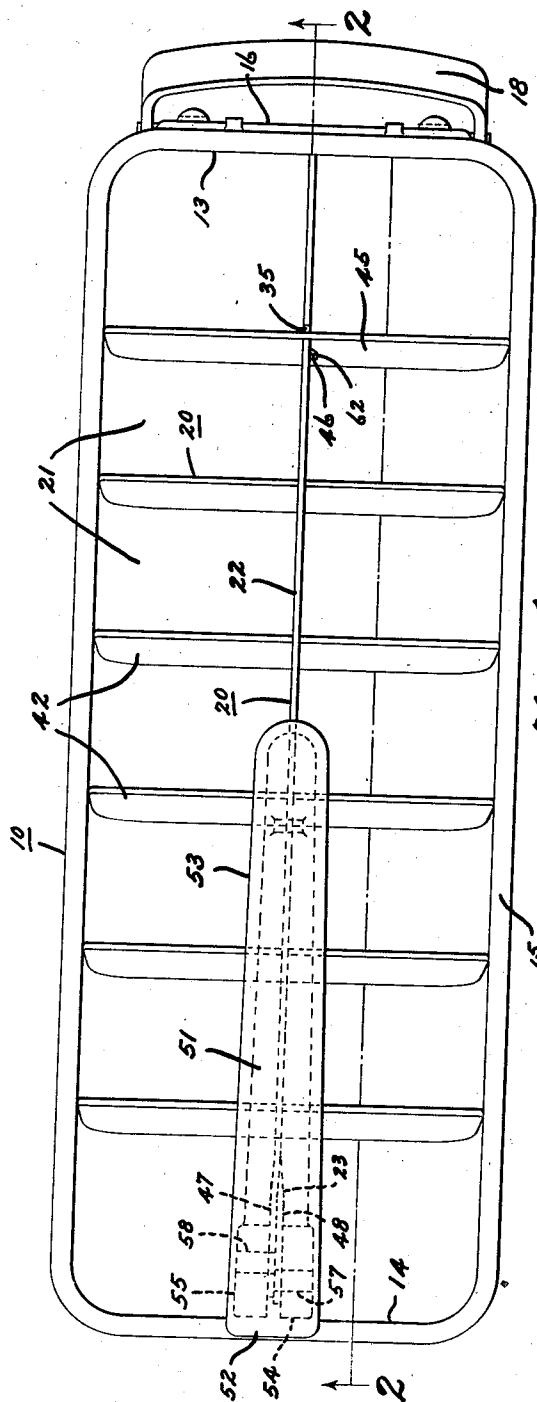


Fig. 1

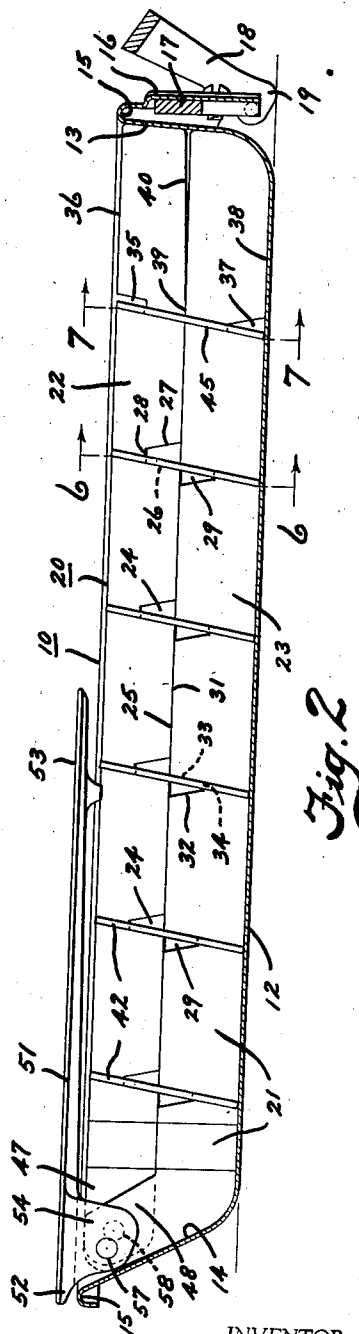


Fig. 2

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4 Sheets-Sheet 2

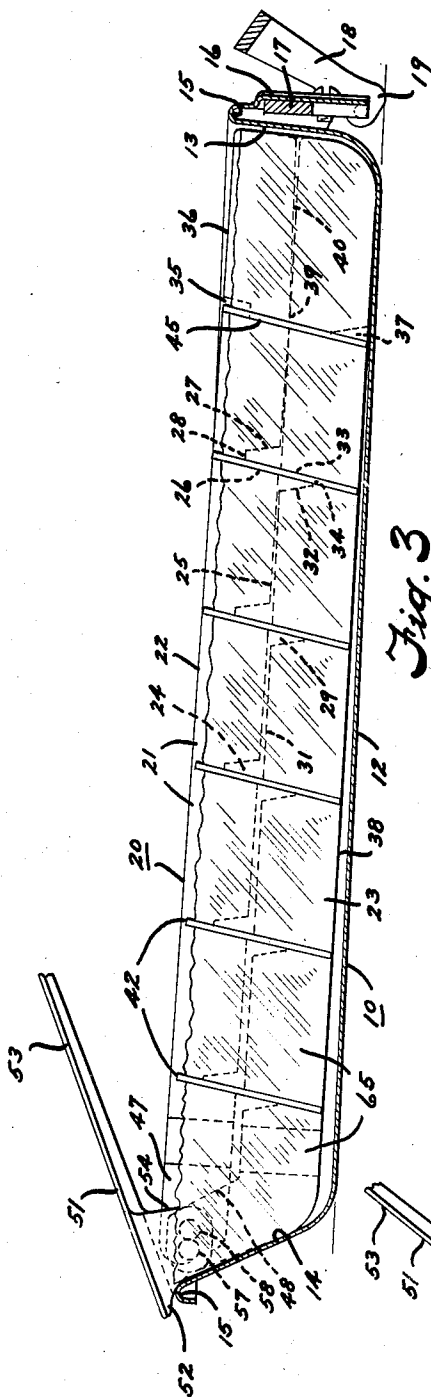


Fig. 3

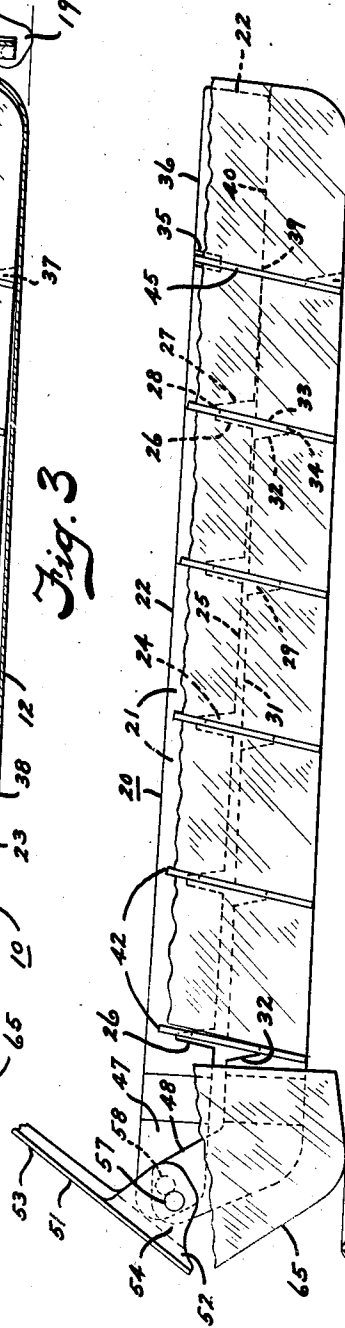


Fig. 4

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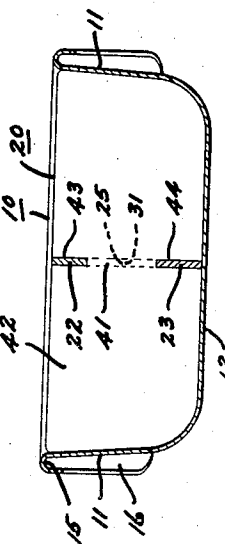
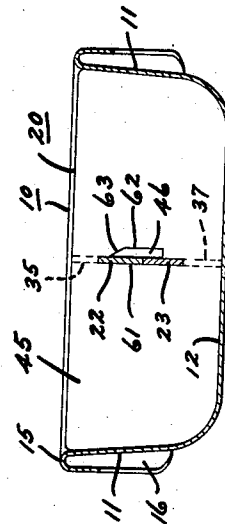
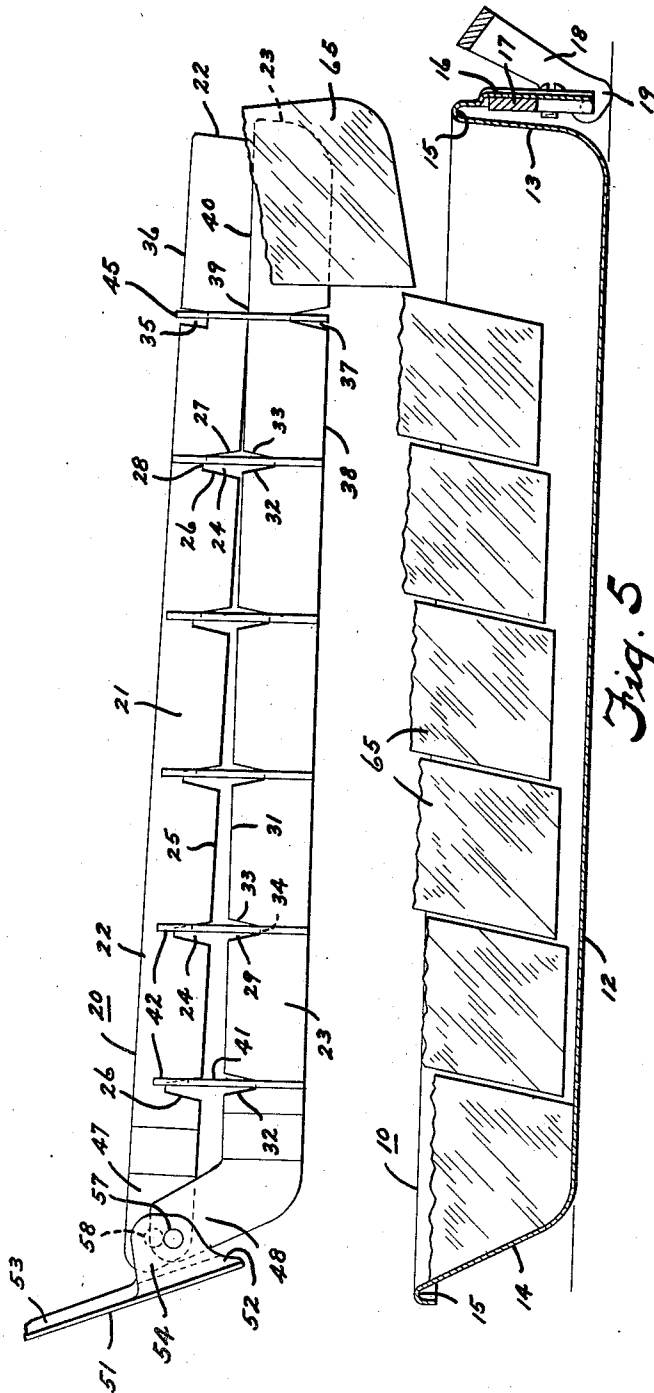
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REFRIGERATING APPARATUS

Filed March 6, 1937

4 Sheets-Sheet 3



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4 Sheets-Sheet 4

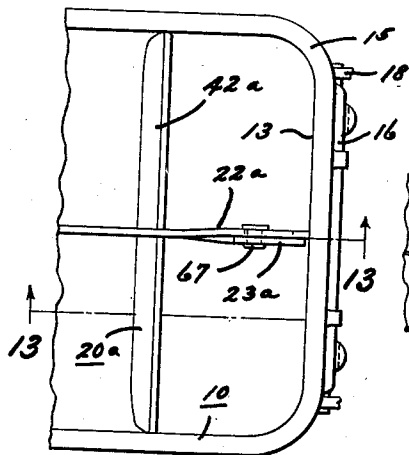


Fig. 12

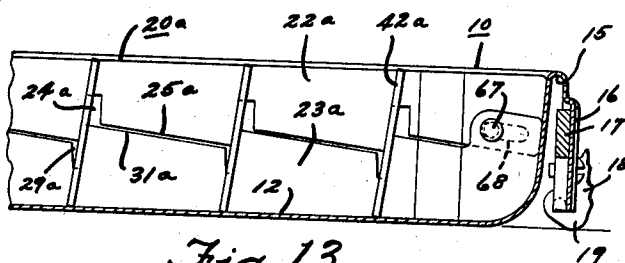


Fig. 13

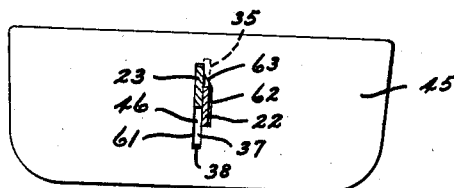


Fig. 9

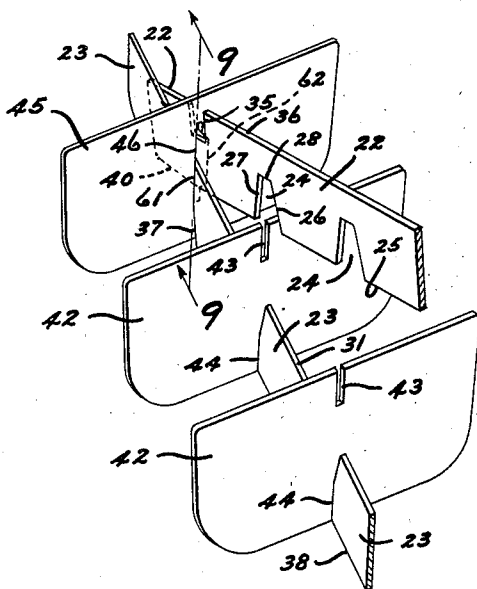


Fig. 8

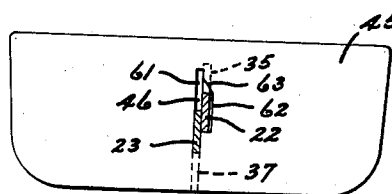


Fig. 10

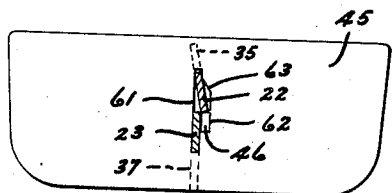


Fig. 11

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UNITED STATES PATENT OFFICE

2,196,476

REFRIGERATING APPARATUS

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Application March 6, 1937, Serial No. 129,443

9 Claims. (Cl. 62—108.5)

This invention relates to freezing apparatus for liquids such as ice trays employed in mechanically refrigerated household refrigerator cabinets.

5 This invention relates more particularly to an ice tray and grid structure therefor of the general type disclosed in my copending application Serial No. 98,213 filed August 27, 1936, and it is an object of the present invention to provide an improved
10 grid structure possessing characteristics similar to those of the structure disclosed in my copending application but which is of increased structural strength, more efficient in operation, of simplified construction and consequently capable of
15 being manufactured at reduced cost.

In carrying out the features of the foregoing object in the production of a metallic grid structure for an ice tray from which ice blocks can be mechanically removed without applying artificial
20 heat to the structure, it is another object of my invention to provide an ice tray grid construction which will permit substantially the entire interior of the tray to be utilized for receiving substances to be frozen.

25 A further object of my invention is to provide an improved ice tray grid structure which has movable transverse walls extending parallel to one another and normally disposed at a predetermined angle relative to a line extended perpendicularly to the longitudinal extension of the
30 structure that are progressively rotatable out of their angled disposition for enlarging the ice compartments to cause ice blocks to be released therefrom.

35 A still further object of my invention is to provide a metallic grid structure having longitudinal dividing members disposed one above the other in substantially the same vertical plane and a plurality of transverse members all of which
40 members are movable relative to one another for breaking the bond between the members and ice formed in the structure to release ice blocks therefrom.

Still further and more specific objects and advantages reside in details of construction of my improved grid structure and in novel combinations and arrangements of parts thereof as will more fully appear in the course of the following description:

50 In the drawings:

Fig. 1 is a top plan view of an ice tray having a grid positioned thereon and constructed in accordance with my invention;

Fig. 2 is a side view of the device shown in Fig. 1 and is taken on the line 2—2 thereof;

Fig. 3 is a view similar to Fig. 2 showing the grid together with ice blocks frozen therein and adhering thereto elevated relative to the tray;

Fig. 4 is a view disclosing the grid and ice blocks adhering thereto removed from the tray and
5 showing certain walls of the grid structure moved relative to other walls thereof for releasing ice blocks therefrom;

Fig. 5 is a view similar to Fig. 4 showing the position of walls of the grid structure after having been moved to release all ice blocks therefrom;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2 showing the locking arrangement of the grid transverse walls between the movable portions of the longitudinal wall;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 2 showing the locking arrangement of the movable portions of the longitudinal grid wall within the end transverse wall thereof;

Fig. 8 is a fragmentary perspective view of the grid walls showing their association during assembly thereof to construct the unitary structure;

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8 showing one position of the longitudinal members within the end transverse member during assembly of the grid structure;

Fig. 10 is a sectional view similar to Fig. 9 showing another position of the longitudinal members within the end transverse member during assembly of the grid structure;

Fig. 11 is a sectional view similar to Figs. 9 and 10 showing a further position of the longitudinal members within the end transverse member during assembly of the grid structure;

Fig. 12 is a fragmentary top plan view of an end of a modified grid structure; and

Fig. 13 is a sectional view of the modified grid structure taken on the line 13—13 of Fig. 12.

Referring to the drawings, for the purpose of
40 illustrating my invention, I have disclosed in Figs. 1 to 7 a metal ice tray 10 having side walls 11 (see Figs. 6 and 7), a bottom wall 12 and opposed end walls 13 and 14. The tray side walls 11 and the front end wall 13 thereof converge outwardly
45 toward the top of the tray. The tray back wall 14 is converged outwardly toward the top of the tray a greater distance than other walls thereof for a purpose which will become apparent hereinafter. The walls 11, 13 and 14 of tray 10 have
50 their upper edge rolled over to form a rim 15 which extends continuously around the top of the tray. A portion of the metal tray 10 is extended downwardly from rim 15, as at 16, at the front end thereof and provides a mounting for a metal
55

piece 17 which has a handle 18 pivotally secured thereto. The handle 18 facilitates placing of tray 10 in or on a cooling element of a refrigerating system and a cam surface 19 formed thereon functions, upon actuating handle 18, to break an ice bond between the tray and its support to permit removal of the tray and its frozen contents from the cooling element as is well known in the art.

10 A unitary metallic grid structure, generally represented by the reference character 20, is removably disposed within tray 10 and divides the interior of the tray into a plurality of rows of open-top molds, cells or compartments 21. The

15 grid structure 20 includes two sections which are movable relative to one another and which are in the form of longitudinal dividing members 22 and 23 disposed one above the other in substantially the same vertical plane. By disposing the members

20 22 and 23 one above the other respectively they form complementary portions of a longitudinal wall of single thickness which wall is common to a plurality of the ice block compartments 21. Member 22 is provided with a plurality of spaced

25 apart slots or notches 24 extending upwardly from its bottom edge 25. These slots or notches 24 include side walls 26 and 27 cut at opposed angles to one another and a top horizontal wall

30 28. Member 23 is provided with a plurality of spaced apart slots or notches 29 extending downwardly from its top edge 31. The slots or notches

35 29 include side walls 32 and 33 cut at opposed angles to one another and a bottom horizontal wall 34. A slot 35 disposed at an angle but having substantially parallel side walls extends downwardly from the top edge 36 of member 22 near

40 the end thereof positioned toward the front wall 13 of tray 10. A slot 37 having walls similar in configuration to the walls of slots 29 extends upwardly from the bottom edge 38 of member 23. It is to be noted that a portion of the bottom edge

45 25 of longitudinal member 22 is tapered upwardly from the point 39 below slot 35 to the end of member 22, as indicated at 40, for a purpose to be hereinafter described. The slots or notches 24 in

50 member 22 and slots or notches 29 in member 23 register with one another and receive a web portion 41 of members 42 provided between a pair of notches or slots 43 and 44 cut therein (see Fig. 6) and which members extend transversely to

55 the longitudinal members. Thus the transverse members 42 extend and are locked between the two longitudinal members 22 and 23 forming the single longitudinal wall of the grid. Slot or notch

60 35 in longitudinal member 22 and slot 37 in longitudinal member 23 cooperate to receive another transverse member 45. The longitudinal members 22 and 23 pass through an opening 46 provided in transverse member 45 and are movably

65 locked relative to one another in this end transverse member in a manner which will be more fully described hereinafter. By referring again to Fig. 2 of the drawings it will be noted that the walls 26 of slots 24 and walls 33 of slots 29 are

70 disposed in slightly spaced apart parallel planes. These slots 24 and 29 cooperate with one another to cause the walls 26 of slots 24 to abut the upper part of one side of the web portion 41 of transverse members 42 and to cause the walls 33 of

75 slots 29 to abut the lower part of the opposite side of the web portion 41 of members 42. This abutment of longitudinal members 22 and 23 with transverse members 42 normally maintains the members 42 in parallel relation to one another and in a predetermined position disposed

at an angle to a line extended perpendicularly to the longitudinal extension of grid structure 20 or to the bottom wall 12 of tray 10. The slots 35 and 37 provided in members 22 and 23 respectively are also shaped and arranged to cooperate in maintaining the one transverse member 45 at a predetermined angle parallel to the other transverse members 42. This normal angled disposition of transverse members 42 is for a purpose to be hereinafter more fully described. The end, opposite the end tapered as at 40, of longitudinal member 22 is bent outwardly as at 47 out of the plane of an upwardly directed extension 48 provided on longitudinal member 23 and overlaps this extension 48.

A lever 51, having a short extending end portion 52 and a relatively long handle end portion 53, is provided with a pair of legs 54 and 55 which straddle the bent end portion 47 of longitudinal member 22 and the upwardly extended portion 48 on longitudinal member 23. A pin 57 secured to the one leg 54 of lever 51 and passing through a suitable opening provided in extension 48 pivotally attaches the lever 51 to longitudinal member 23. A second pin 58 is secured to the other leg 55 of lever 51 and passes through a suitable opening provided in end portion 47 pivotally attaches the lever 51 to the longitudinal member 22. The pin 58 is located below pin 57 and the spaced apart pivoting centers of these pins form a toggle connection which serves to maintain the lever 51 in its lowered or normal non-operative position as shown in Figs. 1 and 2 of the drawings. The toggle connection thereby prevents accidental raising of levers 51 into a position where it will interfere with removal of the tray from the cooling element. Thus it will be seen that in addition to the ends of longitudinal members 22 and 23 disposed at the front of tray 10 being movably locked together by cross member 45 the opposite ends thereof are also movably locked together by the pins 57 and 58 and lever 51 to provide a unitary grid structure.

It is to be noted that the walls 26 of slots or notches 24 are equally spaced apart along the member 22 while the walls 27 thereof are progressively spaced a greater distance from the walls 26 from the lever end to the opposite end of the grid structure to thus provide successively wider slots or notches toward the end of the grid disposed at the front of tray 10. The slots or notches 29 are spaced an equal distance from one another and the walls 32 and 33 thereof are also uniformly spaced apart. Therefore upon moving the longitudinal member 22 lengthwise of longitudinal member 23 the walls 27 of the slots 24 will engage the web portion 41 of the transverse members 42 progressively from the lever end to the other end of the grid structure.

By referring now to Figs. 7 to 11 inclusive of the drawings I will describe the method of assembling the wall parts of the grid together to provide the unitary structure. It is to be noted that the opening 46 in the one end transverse member 45 includes a vertically elongated portion 61 and a shorter wide portion 62 which has its top converging into the elongated portion 61 by an angled wall 63. In assembling the parts of the grid structure 20 the one end of longitudinal member 22 is first inserted into the opening 46 and is moved through the opening until the slot or notch 35 provided therein aligns or registers with the opening 46. By virtue of the slot 35 longitudinal member 22 can then be moved over into the wide portion 62 of opening 46 as shown

in Fig. 9 of the drawings thus leaving the elongated portion 21 of opening 46 open for the reception of member 23. The end of longitudinal member 23 is then inserted into the elongated portion 61 of opening 46 as shown in Fig. 9 and moved therethrough until the notch or slot 37 provided therein aligns or registers with the opening 46. Thereupon longitudinal member 23 is lowered, by virtue of notch 37, within the elongated portion 61 of opening 46 so that its bottom edge 38 aligns with the bottom edge of transverse member 45 as shown in Fig. 10. This downward movement of longitudinal member 23 leaves the upper part of elongated portion 61 of opening 46 free to receive the web portion below notch 35 of longitudinal member 22. Therefore member 22 may now be turned, by virtue of the angled wall portion 63 of opening 46, and raised so that the web part thereof below notch 35 attains the tilted elevated position within portions 61 and 62 of opening 46 as shown in Fig. 11. The opposite ends of the longitudinal members 22 and 23 are then moved away from one another into a position resembling that shown in Fig. 8 and the transverse members 42 may be placed between the longitudinal members with their bottom notches or slots 44 straddling the web portions of member 23 below the notches 29 provided therein. After all the transverse members 42 have been placed in straddling position upon longitudinal member 23 the spaced apart opposite ends of the members 22 and 23 are brought together with the notches 24 in member 22 registering with the notches 43 provided in the upper part of transverse members 42. Thereafter longitudinal member 22 is moved upwardly into the elongated portion 61 of opening 46 from the position shown in Fig. 8 to the position shown in Fig. 7 of the drawings. The longitudinal members are thus positioned one above the other within the portion 61 of opening 46 in substantially the same vertical plane. The walls bounding the portion 61 of opening 46 are arranged to maintain the longitudinal members 22 and 23 in vertical alignment as long as the lever ends of these members are retained in close together relationship. The brought together lever ends of the longitudinal members 22 and 23 are now ready to be movably secured to one another. Lever 51 is therefore placed over the lever ends of members 22 and 23 with the holes therein registering with the holes provided for pins 57 and 58 in the portions 47 and 48 of the longitudinal members. Pins 57 and 58 are driven into their respective openings provided in the legs 54 and 55 of lever 51 and project into the openings provided therefor in members 22 and 23. Lever 51 is thereby secured to longitudinal member 22 and longitudinal member 23 by the pins 57 and 58 to thus complete the assembly to form the unitary grid construction 20. The dividing walls 22, 23, 42 and 45 of the unitary grid structure 20 are constructed preferably of sheet aluminum to afford good heat conductivity and fast freezing of the contents of the metal tray 10. The metallic dividing elements 22, 23, 42 and 45 of the grid structure may be impregnated and coated with a wax to thereby render the dividing walls substantially water repellant and to facilitate the removal of ice blocks therefrom.

Assume that water has been frozen in the tray 10 in the form of blocks 65 in compartments 21, by the cooling effect produced by a cooling element of a refrigerating system, and the tray handle 18 has been manipulated to remove the

tray from the element and it is now desirable to remove the ice blocks 65 from the unitary grid structure 20. The handle end 53 of lever 51 is therefore elevated to pivot the lever 51 about pin 57 and to cause the short end portion 52 of the lever to engage the rim 15 of tray 10 and exert a force against the tray. This force applied to tray 10 causes the unitary grid structure 20, together with the ice blocks 65 adhering thereto, to be elevated relative to the tray. This initial movement of lever 51 overcomes the force afforded by the toggle connection, formed by the normal disposition of pivot pin 57 below pin 58, and causes pin 58 secured to the upper longitudinal member 22 to rotate about pin 57. Rotation of pin 58 about pin 57, during the initial movement of lever 51 described, applies force between the longitudinal members 22 and 23 and elevates member 22 relative to member 23 (see Fig. 3) during elevation of the structure 20 and ice blocks 65 adhering thereto relative to the tray. The tapered edge surface 40 provided on longitudinal member 22 permits movement of the opposite end of member 22 downwardly relative to member 23 and this longitudinal member 22 fulcrums upon the edge 31 of member 23 at the juncture 39 of the tapered edge 40 with the straight flat bottom edge 25. Further movement of lever 51 about its pivot 57 continues to elevate the longitudinal member 22 and also slides member 22 lengthwise of longitudinal member 23 toward the lever end of the structure by virtue of rotating pin 58 secured to member 22 about pin 57 (see Fig. 4). The initial sliding movement of member 22 relative to member 23 moves the side wall 26 of the slot 24, nearest the lever end of the structure, away from the first transverse member 42 and causes the opposite side wall 27 of slot 24 to engage the web portion 41 of transverse member 42 and move this first member 42 out of its normal predetermined angle of disposition. The transverse member 42 pivots about the bottom wall 34 of slot 29 provided in member 23 and about the lower portion of the ice block 65 and may also be moved upwardly relative to member 23 due to the now elevated position of longitudinal member 22. It will be seen that substantially a rotary motion is imparted to the transverse members 42 to thereby substantially peel the first two ice blocks 65 away from the first transverse member and to break the blocks loose from the lower longitudinal member to which they have adhered during movement of the longitudinal members 22 and 23 relative to one another. It should be noted by reference to Fig. 4 of the drawings that movement of the one transverse member 42 just described does not cause movement of any of the adjacent transverse members 42. However, additional movement of lever 51 causes further sliding of longitudinal member 22 relative to member 23 and by virtue of the addition in the widths of slots 24 progressively from the lever end to the opposite end of the structure 20 the side walls 27 thereof will be progressively brought into engagement with the webs 41 of transverse members 42. Therefore the transverse members are moved out of their predetermined angled position progressively from one end to the other end of the grid structure to thereby release all ice blocks 65 therefrom. The slots 35 and 37 are of such size and configuration as to insure that the transverse member 45 will be moved last to provide progressive releasing of the ice blocks 65 which occurs in moving the lever 51, through its single direc-

tion of motion, from its position shown in Fig. 3 to its position shown in Fig. 5 of the drawings.

By virtue of positioning transverse members 42 and 45 substantially parallel to one another and at an angle other than a right angle to the bottom of the grid structure 20 the compartments 21 have an acute parallelogram shape in cross section and the distance between adjacent transverse members, taken on a line perpendicular to the surfaces thereof, will be increased by movement of the transverse members out of their normal position. This thereby increases the size of the compartments 21 to enlarge same relative to the ice blocks 65 and when the ice blocks are tilted by movement of succeeding transverse members, their dimension, taken on a line perpendicular to the parallel sides thereof which normally abut the transverse members, will be less than the distance between the transverse members to thus permit ice blocks to freely fall from the enlarged compartments. Therefore it will be seen that the normal angled disposition of the transverse members has a definite purpose in the function of the improved grid structure.

In Figs. 12 and 13 of the drawings I have disclosed a modified grid structure having all the characteristics of and operated in substantially the same manner as the structure shown in Figs. 1 to 11 inclusive but which modified structure is of slightly different construction. Referring to Fig. 13 it will be noted that the bottom edge 25a and the top edge 31a of the longitudinal members 22a and 23a respectively are cut on angles to a line extending parallel with the longitudinal extension of the structure 20a to form somewhat of a zigzag structure. In Fig. 12 it will be seen that the ends of the two longitudinal members 22a and 23a disposed toward the front of the tray are locked together in movable relation to one another by a pin 67 secured to member 23a. Pin 67 passes through elongated slot 68 provided in member 22a (see Fig. 13) which slot permits lengthwise movement of member 22a relative to member 23a for the same purpose described relative to the grid structure 20. The ends of the longitudinal members 22a and 23a lie side by side and this provides a hinge for permitting the lever end of the member 22a to be elevated relative to member 23a. This modified construction permits the use of transverse members 42a throughout the entire length of the grid structure 20a instead of employing the slightly different cut transverse member 45 as in the structure 20.

From the foregoing it will be seen that I have provided an improved ice tray grid structure which is of low cost, strong and durable, capable of being operated with a minimum of force and effective to remove ice blocks therefrom without unduly shattering the blocks and which device is constructed entirely of metal to thereby retain the fast freezing characteristics of metal tray and grid combinations. The improved grid structure is of the single wall type and the structure is devoid of large operating shafts or other such members which ordinarily reduce the cubical capacity of the tray or which project a substantial distance above the top of the tray to occupy valuable space in the compartment adapted to receive the tray. By employing portions of the ice block compartment forming walls for moving certain of the walls or parts thereof relative to one another in my improved construction the entire interior of the tray may be utilized for storage of the liquid or other substance

to be frozen without jeopardizing the operation of moving parts of the grid structure. By constructing a grid structure so that the ice blocks are progressively released therefrom a minimum of force releases all ice blocks therefrom to thus overcome objections to prior devices wherein utmost effort is required to release ice blocks. In the present device I have provided a single lever which is operable, in the same direction of motion, to remove the unitary grid together with ice blocks adhering thereto from the tray and to release ice blocks from the grid structure.

While the forms of embodiment of the invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In liquid congealing apparatus, the combination of an ice pan, a grid member removably disposed therein for dividing the ice pan into a plurality of ice cube forming cells, said grid member comprising a central longitudinal wall member formed of two superposed parts both of which divide the ice pan longitudinally thereof and one of which is movable lengthwise relative to the other and a plurality of transverse wall members movably attached to said longitudinal wall member, each of said transverse wall members being provided with vertically-extending slots in the top and bottom thereof for receiving said longitudinal wall sections, said slots being of sufficient width that the longitudinal wall sections may move freely therein in a longitudinal direction, said top longitudinal wall section being provided with a series of vertical slots in the bottom thereof and said bottom longitudinal wall section being provided with a series of vertical slots in the top thereof, the slots in said longitudinal wall sections receiving said transverse wall members and being of sufficient width to permit angular movement of said transverse wall members therein relative to the longitudinal wall members when one of said longitudinal wall members is moved lengthwise relative to the other, after the grid member has been at least partially removed from the ice pan.

2. A removable unitary grid structure for disposition in an ice tray comprising, a longitudinal wall member formed of two superimposed parts one of which is movable relative to the other and a plurality of spaced apart transverse wall members movably connected to said longitudinal wall member to provide a plurality of ice block compartments, each of said transverse wall members being provided with vertically-extending slots in the top and bottom thereof for receiving said longitudinal wall member parts, said slots being of sufficient width that the longitudinal wall parts may move freely therein, said top longitudinal wall part being provided with a series of vertical slots in the bottom thereof and said bottom longitudinal wall part being provided with a series of vertical slots in the top thereof, the slots in said longitudinal wall parts receiving said transverse wall members and being of sufficient width to permit movement of said transverse wall members in a direction lengthwise of said longitudinal wall member when one of said longitudinal wall parts is moved lengthwise relative to the other to break the bond between ice blocks and their compartment walls.

3. A structure in accordance with claim 2

wherein a lever is connected to one of the parts of the longitudinal wall member and engages the other part thereof for moving the parts relative to one another.

5 4. A structure in accordance with claim 2 wherein the transverse wall members are normally disposed in an inclined position and are movable toward the vertical to enlarge the ice block compartments.

10 5. A structure in accordance with claim 2 wherein the vertical slots in the movable longitudinal wall part are of increased width relative to one another and toward one end of the grid structure for causing the movable longitudinal wall part to sequentially engage the plu-
15 rality of transverse wall members and progressively move same.

6. A removable unitary grid structure for dis-
20 position in an ice tray comprising, a longitudinal wall member formed of two superimposed substantially non-flexible metal parts one of which is movable lengthwise relative to the other and a plurality of spaced apart substantially non-
25 flexible metal transverse wall members movably connected to said longitudinal wall member to provide a plurality of ice block compartments, each of said transverse wall members being pro-
30 vided with vertically extending slots in the top and bottom thereof for receiving said longitudinal wall member parts, said slots being of suf-
35 ficient width that the longitudinal wall parts may move freely therein, said top longitudinal wall part being provided with a series of vertical slots in the bottom thereof and said bottom longitudinal wall part being provided with a se-
40 ries of vertical slots in the top thereof, the slots in said longitudinal wall parts receiving said transverse wall members and being of greater width at their open end than at their closed end
45 to permit angular movement of said transverse wall members therein relative to the longitudinal wall parts when one of said longitudinal wall parts is moved lengthwise relative to the other, and the vertical slots in one of said longitudinal wall parts being of increased width relative to one another and toward one end of the grid structure for causing the movable longitudinal wall part to sequentially engage and move the plu-

rality of transverse wall members to progressively break the bond between ice blocks and their compartment walls.

7. A structure in accordance with claim 6
5 wherein a lever is connected to one of the parts of the longitudinal wall member and engages the other part thereof for moving the parts lengthwise of one another.

8. A structure in accordance with claim 6
10 wherein the slots in the longitudinal wall member parts cooperate to normally maintain the transverse wall members in an inclined position and the walls thereof upon engaging the trans-
15 verse wall members move same toward the vertical to enlarge the ice block compartments.

9. A removable unitary grid structure for dis-
20 position in an ice tray comprising, a longitudinal partitioning member formed of two superimposed parts one of which is movable relative to the other and a plurality of spaced apart trans-
25 verse partitions movably connected to said longitudinal partitioning member to form walls of a plurality of ice block compartments, the connection of certain of said transverse partitions with said longitudinal partitioning member per-
30 mitting elevation of at least a portion of one part of said longitudinal partitioning member and lengthwise movement thereof relative to the other part of said longitudinal partitioning
35 member for moving said transverse partitions in a direction lengthwise of the grid structure to break the bond between ice blocks and their compartment walls, means normally securing said
40 parts of said longitudinal partitioning member together at one end of the grid structure, the connection of one of said transverse partitions with the parts of said longitudinal partitioning member adjacent the opposite end of the struc-
45 ture being constructed and arranged to movably lock said two parts of said longitudinal partitioning member together at said opposite end of the grid structure, and said means including means for applying force between the parts of said longitudinal partitioning member to cause said movement of the ice block compartment walls.

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