April 20, 1937. E. A. ARP 2,077,820

REFRIGERATING METHOD AND APPARATUS

Filed Oct. 23, 1933 5 Sheets-Sheet 1

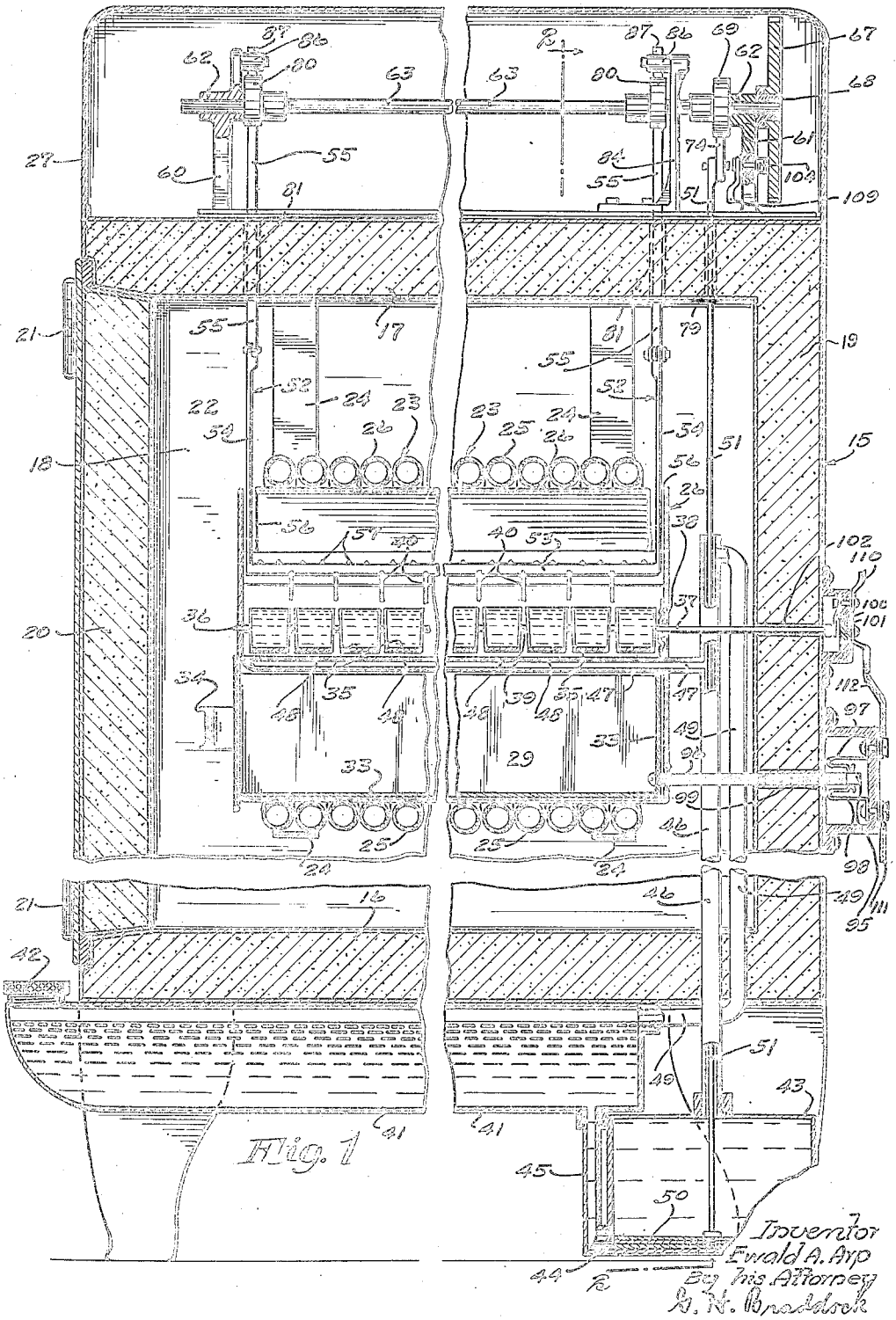


Fig. 1

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REFRIGERATING METHOD AND APPARATUS

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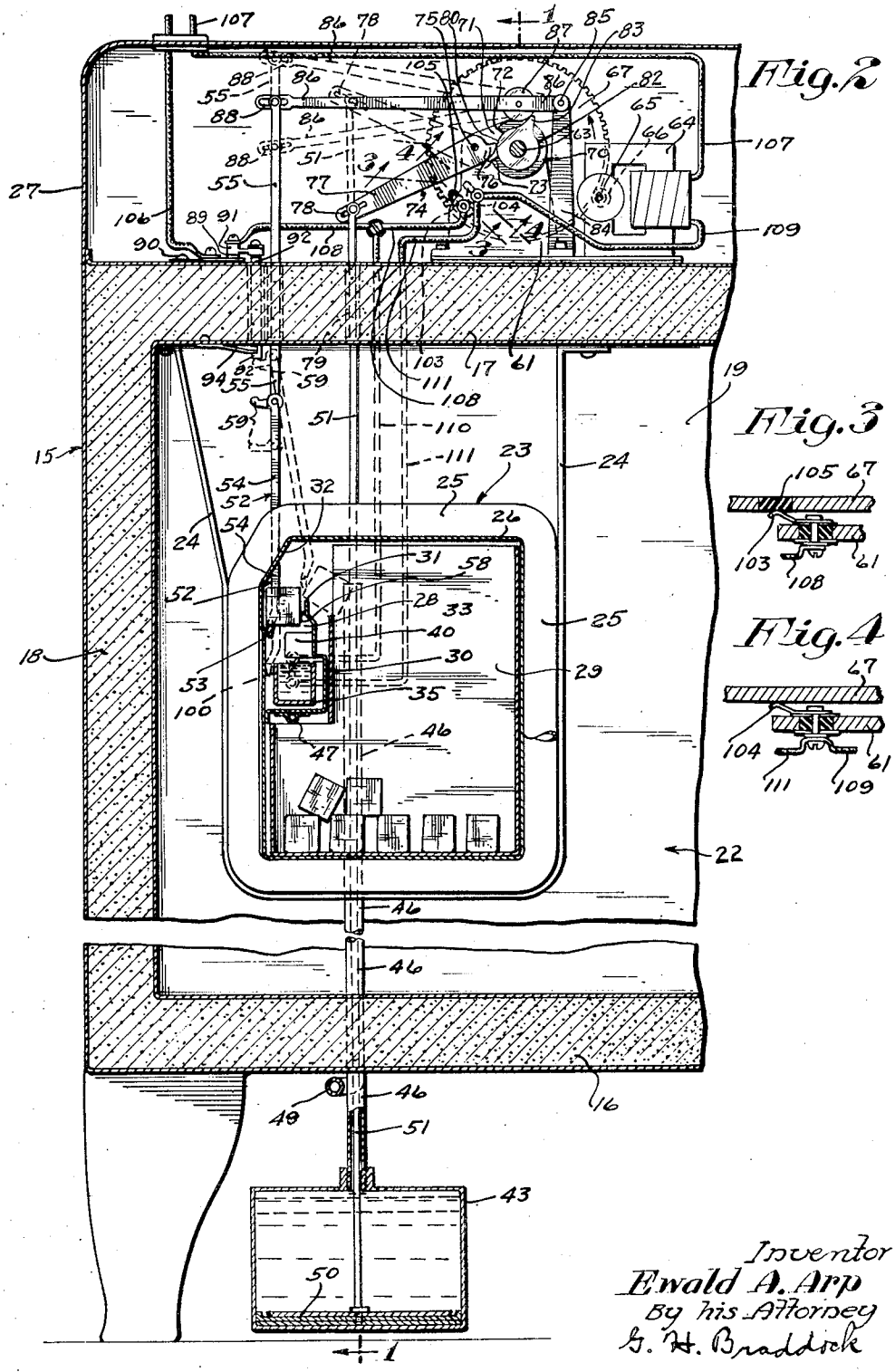


Fig. 2

Fig. 3

Fig. 4

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Fig. 5

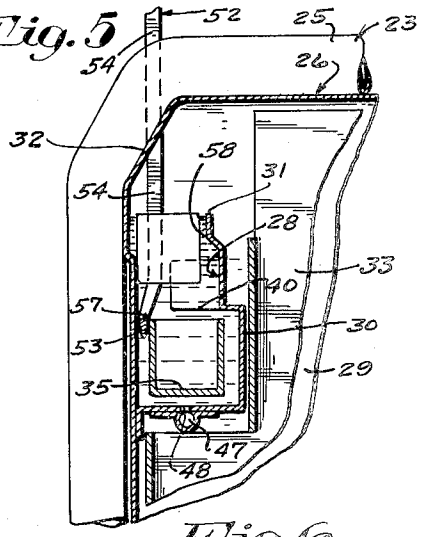


Fig. 8

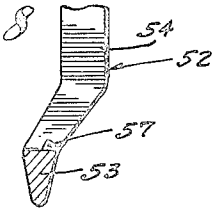


Fig. 7

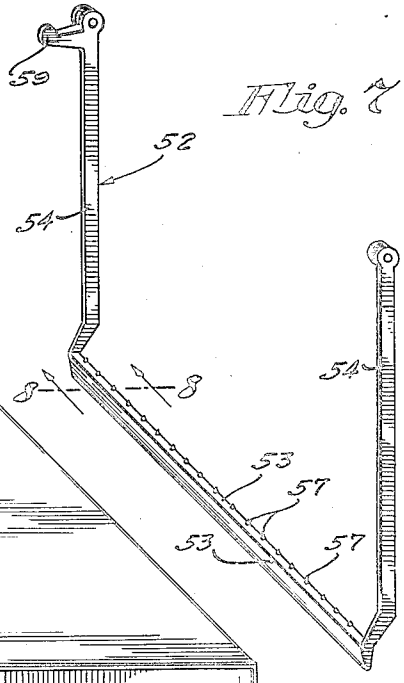


Fig. 6

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Fig. 9

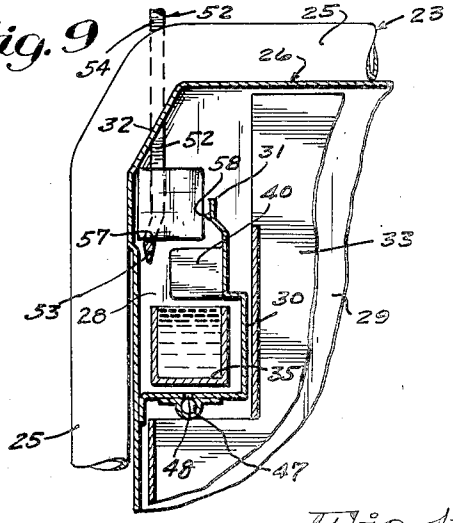


Fig. 10

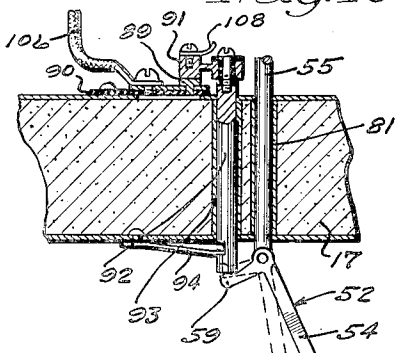
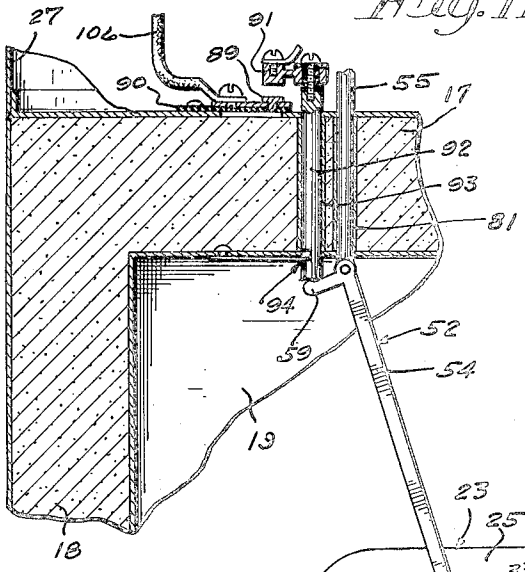
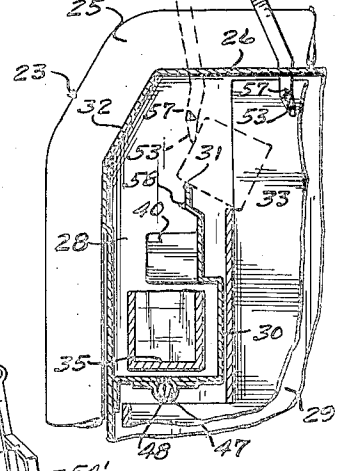


Fig. 11





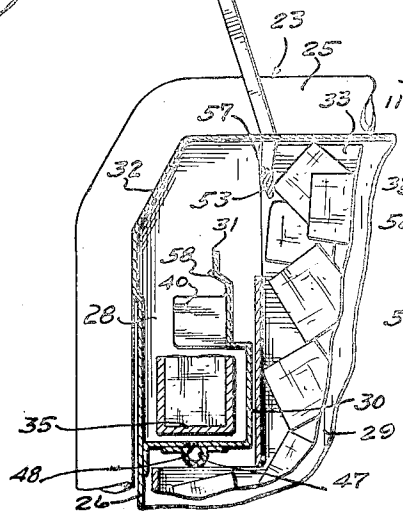
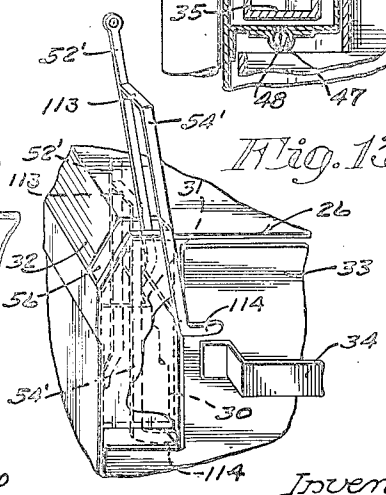


Fig. 13



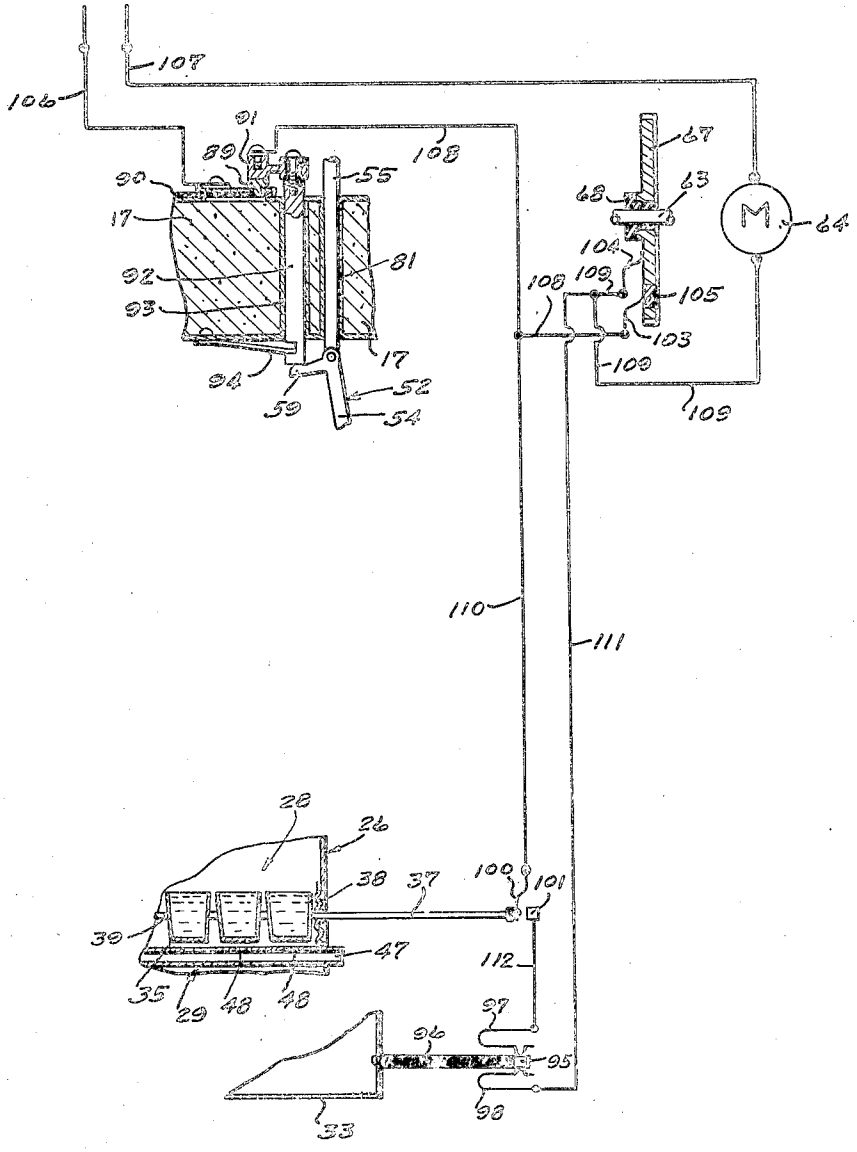
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REFRIGERATING METHOD AND APPARATUS

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Fig. 12



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UNITED STATES PATENT OFFICE

2,077,820

REFRIGERATING METHOD AND APPARATUS

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Application October 23, 1933, Serial No. 694,781

18 Claims. (Cl. 62—105)

This invention relates to a refrigerating method and apparatus, and has more particular relation to a method of and an apparatus for freezing water in receptacles to provide separate blocks or cubes of ice, and removing the blocks or cubes of ice from the receptacles in which frozen and depositing the blocks or cubes into a storage container therefor.

It is the general object of the invention to provide a novel and improved refrigerating method and apparatus adapted to the purpose of carrying out related operations to the production of free or unconfined ice blocks or cubes, as, for example, for ordinary household use, which operations will contemplate the placing of water to be frozen into separate receptacles therefor, freezing the water to make ice blocks or cubes, and removing the ice blocks or cubes from the receptacles in which manufactured to a suitable storage chamber for said ice blocks or cubes; or, the general object of the invention may be stated to be to provide a novel and improved method and apparatus for producing free or unconfined ice blocks or cubes stored in bulk at accessible location within a refrigerating medium, which method and apparatus have the purpose in view of dispensing with manual operations, now necessary in the instance of commercial types of household refrigerators, required both to place water to be frozen in usual receptacles therefor, and to remove the frozen blocks or cubes of ice from the receptacles.

More explicitly, it is an object of the invention to provide a refrigerating method and apparatus which will contemplate the making of free or unconfined ice blocks or cubes by the performance of continuous, or uninterrupted, and related refrigerating, receptacle loading, receptacle emptying, and ice storing operations.

A further object is to provide a refrigerating method and apparatus which will contemplate the separate delivery of each manufactured ice block or cube in completely frozen and moisture free condition to a storage container for the blocks or cubes kept at temperature sufficiently low to insure that the ice blocks or cubes will not become stuck or frozen together while in storage.

A further object is to provide a novel and improved method and apparatus for producing free or unconfined ice blocks or cubes stored in bulk as set forth, which method and apparatus will contemplate the manufacture of the ice blocks or cubes by their successive production in groups and successive delivery of the groups to a storage container therefor as an uninterrupted procedure.

A further object is to provide a refrigerating method and apparatus as stated in the preceding paragraph, which will contemplate effective-interruption of the ice block or cube making and delivering operations whenever the storage container may become fully loaded with ice blocks or cubes.

And a further object is to provide a refrigerating apparatus of the character as briefly stated, wherein will be incorporated various improved features and characteristics of construction novel both as individual entities of the refrigerating apparatus and in combination.

With the above objects in view, as well as others which will appear as the specification proceeds, the invention comprises the novel steps of the method and the construction, arrangement and combination of parts of the apparatus as now to be fully described and as hereinafter to be specifically claimed, it being understood that the disclosure herein is merely illustrative and intended in no way in a limiting sense, changes in the sequence of the steps of the method, and in the details of construction and arrangement of parts of the apparatus, being permissible so long as within the spirit of the invention and the scope of the claims which follow.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a vertical sectional view, taken as on line 1—1 in Fig. 2, of a refrigerating apparatus made according to the principles of the invention;

Fig. 2 is a fragmentary vertical sectional view, taken as on line 2—2 in Fig. 1;

Fig. 3 is a detail sectional view, taken on line 3—3 in Fig. 2;

Fig. 4 is a detail sectional view, taken on line 4—4 in Fig. 2;

Fig. 5 is a detail view of certain parts of the apparatus, the present view corresponding generally with the disclosure of Fig. 2, but showing the parts differently positioned;

Fig. 6 is an enlarged perspective view of the refrigerating and ice storing unit removed from the apparatus, the coils and storing container being omitted and parts being broken away and in section;

Fig. 7 is an enlarged perspective view of the delivery element removed from the apparatus;

Fig. 8 is a detail sectional view, taken on line 8—8 in Fig. 7;

Fig. 9 is a view corresponding with the dis-

closure of Fig. 5, but with the parts positioned as in full lines in Fig. 2;

Fig. 10 is a detail view disclosing the ice block or cube delivery element as when operated to deliver a group of ice blocks or cubes;

Fig. 11 is a detail view disclosing the ice block or cube delivery element as when operated by ice blocks or cubes in a full storage container to interrupt the operations of the apparatus;

Fig. 12 is a diagrammatic view of a wiring system which can be employed in the refrigerating apparatus; and

Fig. 13 is a detail view disclosing a modified form of delivery element as when operated by ice blocks or cubes, in a full storage container to interrupt the operations of the apparatus.

A description of the novel and improved refrigerating apparatus and its manner of operating will suffice to fully disclose as well the features and characteristics of the novel and improved refrigerating method.

With respect to the drawings and numerals of reference thereon, an ordinary or preferred type of refrigerator cabinet 15 desirably includes insulated walls comprising lower wall 16, upper wall 17, side walls 18, rear wall 19, and front wall having a usual insulated door 20 hinged thereon as at 21. The interior of the refrigerator cabinet 15, naturally, constitutes a refrigerating and food storing space or chamber 22.

A refrigerating and ice storing unit 23 is conveniently mounted in the space or chamber 22, in spaced relation to the walls of the refrigerator cabinet 15 as shown, as by straps 24 riveted to the inner surface of the upper wall 17. The unit 23, speaking broadly, consists of usual freezing coils 25 which are cooled in any well known manner by means (not shown) forming no part of the invention, and a box-like member 26, of construction to be fully set forth, about which the freezing coils 25 are situated.

The refrigerating apparatus includes operating mechanism the major portion of which may rest upon the upper surface of the upper wall 17 of the refrigerator cabinet, and a preferably removable cover 27 may house the mechanism. See Figs. 1 and 2.

The box-like member 26 includes, in its upper portion and at one of its sides, a refrigerating compartment 28, and also includes, adjacent and below said compartment 28, a storage compartment 29 for blocks or cubes of ice. The compartment 28 is defined by a shaped member 30 and adjacent walls of the box-like member, said compartment being an oblong, water-tight vessel, the bottom, side and end walls of which are composed of portions of the members 26 and 30, and the upper portion or mouth of which opens, as at 31, to the storage compartment 29. The opening 31 is between the upper edge of the shaped member 30 and the top wall of the box-like member 26, and said top wall desirably includes an oblique portion 32 directly above the compartment or vessel 28. See Figs. 2, 5, 6, 9, 10 and 11.

The storage compartment 29 slidably houses a suitable container 33 in which the ice blocks or cubes are actually delivered for storage, and said container 33 has a manipulating handle 34 arranged to be accessible for withdrawal of the container from the compartment 29 and the cabinet 15 when the door 20 is opened. Normally, the container 33 remains in the compartment 29 in the manner as shown in Figs. 1, 2, 5, 9, 10 and 11.

The compartment or vessel 28 suitably houses receptacles 35 in which water to be turned into ice is placed, in a manner to be made clear. As disclosed, there are a plurality of receptacles 35 arranged in alinement. Outermost receptacles 35 are mounted, as by studs denoted 36 and 37, respectively, on front and rear walls of the compartment or vessel 28. As shown, the stud 36 is fixed in the front wall of said compartment or vessel 28 and the stud 37 is arranged in water-tight fashion in a diaphragm 38 in the rear wall of said compartment or vessel. The stud 37 is adapted to have longitudinal movement, and extends beyond the confines of the compartment or vessel 28 to perform a service as to be set forth. While the stud 37 is fixed to the diaphragm 38 as disclosed, and the diaphragm is adapted to swing inwardly and outwardly in response to longitudinal reciprocations of said stud, the stud could be simply slidable through the rear wall of the compartment or vessel 28 provided there is a water-proof seal between the stud and the wall through which it passes. The arrangement as illustrated is probably preferable. The receptacles 35 are in spaced apart relation, and each intermediate receptacle is attached to the receptacle next adjacent it through the instrumentality of lugs or pins 39, including a lug or pin 39 at each side, that is, front and rear, of each receptacle and integral with the next adjacent receptacle. The lugs or pins 39 are attached to the, desirably relatively light, upstanding walls of the receptacles, and all of said lugs or pins 39 are desirably in alinement with each other and with the studs 36 and 37. It may be here stated that the receptacles are mounted in the peculiar manner as set forth to cause the stud 37 to have considerable and positive outward movement caused by the freezing of water in the receptacles, it being apparent that with the stud 36 mounted in fixed position, the spreading apart of the walls of the several receptacles caused by freezing of water in said receptacles will be totally or cumulatively imparted to the stud 37. Upon removal of the ice from the receptacles, in the manner to be explained, the side walls of the receptacles return, naturally, to their normal, non-spread-apart condition, to as a result impart inward movement to the stud 37. It is thus that said stud is reciprocated.

The apparatus includes means for from time to time delivering water to the compartment or vessel 28, and it is the function of the water as carried to said compartment or vessel to float previously formed ice blocks or cubes from the receptacles 35. Upon thus removing the blocks or cubes of ice from said receptacles, the water which is present itself fills the receptacles. The ice blocks or cubes which have been in the receptacles may remain floating for a short period of time in the open mouth of the compartment or vessel 28, about as shown in Fig. 5. Spaced apart webs 40, above and between the receptacles 35, insure that each floated block or cube of ice will be separated from every other block or cube.

A tank for water to be frozen is denoted 41. As disclosed, said tank 41 is conveniently supported at the bottom surface of the lower wall of the refrigerator cabinet. A filling opening for the tank includes a removable closure cap 42. Clearly, the tank 41 could be fed by employment of an ordinary float valve controlled by the water level in the tank. A cylinder 43, below the level of water in the tank, is closed at all of its walls in water-tight fashion. A side wall of the cyl-

inder includes a port 44 at its lower portion receiving a pipe 45 leading from the base of the tank, so that said cylinder is always full of water, as will be understood. A vertical pipe 46 leads upwardly from the cylinder to about, or a little above, the elevation of the upper edge of the shaped member 30, as shown very clearly in Figs. 1 and 2. A branch pipe 47 leads horizontally from the pipe 46 and communicates with the compartment or vessel 28 through perforations 48 in the bottom wall of said compartment or vessel. An overflow pipe 49 leads from the upper portion of the vertical pipe 46 at location just below the upper edge of the member 30 to the upper portion of the tank 41. The pipes 46 and 49 pass through the lower wall 16 of the refrigerator cabinet.

A piston 50 snugly fits the cylinder 43, and is reciprocable vertically in the cylinder by a piston rod 51 which passes upwardly and freely through the vertical pipe 46 to position above said pipe. The piston is actuated in a manner to be made clear. The port 44 is passed by the piston at the commencement of its upward stroke, as will be evident from Fig. 1, and the arrangement is such that when the piston is elevated to reach the limit of its upward movement, sufficient water is carried to the compartment or vessel 28 through the pipes 46 and 47 and the perforations 48 to almost completely fill said compartment or vessel, about as shown in Fig. 5, provided the receptacles 35 are at the time loaded with ice blocks or cubes. It should be here remarked that after the first group of ice blocks or cubes are frozen, the receptacles will be loaded with the ice blocks or cubes whenever water is subsequently fed to the compartment or vessel 28. When the piston 50 is initially elevated, to start off the apparatus, while the receptacles 35 are empty, the water will immediately fill the receptacles upon passing the elevation of their upper edges.

Evidently, so long as the piston is held in elevated position, the water will remain at the elevation in the compartment or vessel 28 to which raised, as previously stated, and the arrangement is such that the water so remains in said compartment or vessel until it has caused the ice blocks or cubes to be floated. Thereafter, the piston is caused to descend. In the meantime, each receptacle 35 has, naturally, become filled with water.

Means for retaining the ice blocks or cubes at the position to which floated, when the piston descends to allow the water to flow out of the compartment or vessel 28 by gravity through the perforations 48 and the pipes 47 and 46, consists of an ice block or cube delivery element 52. This element is very clearly disclosed in the drawings. It consists of an ice retaining base or bar 53 of length slightly less than the length of the compartment or vessel 28, and arms 54 extending upwardly at right-angles from the opposite ends of said base or bar. The upper ends of the arms 54 are pivotally supported by vertical links 55, which links are supported and reciprocated in a manner to be hereinafter set forth. Suffice it to say at this time, that whenever water is fed to the compartment or vessel 28, the delivery element is situated as in Fig. 5. That is, the base or bar 53 is situated along the forward wall of the compartment or vessel 28 between the receptacles and said forward wall at about the elevation of the upper edges of said receptacles, at position to allow the ice blocks or cubes to freely pass upwardly to location above said base or bar 53. It will be noted by reference to Fig. 5, that the upper portion of the member 30 is offset toward the delivery element, and when the ice blocks or cubes are floated, side portions thereof, opposite the member 30, are directly above the base or bar 53.

The arms 54 pass upwardly through slots 56 in the upper wall of the member 26 and its oblique portion 32. The base or bar 53 desirably includes spaced apart lugs 57 upon its upper surface, and there are preferably a plurality of lugs 57 for engaging each block or cube of ice, to insure that the blocks or cubes cannot turn or twist to be released from the base or bar, as will be understood.

The restricted or confined mouth of the compartment or vessel 28 desirably includes spaced apart lugs 58 which are on the adjacent surface of the member 30. At about the time that the piston 50 descends, or is ready to descend, the links 55 are elevated slightly to raise the base or bar 53 from the position as in Fig. 5 to about the position as in Fig. 9, and thus the ice blocks or cubes which were before floated, are held by said base or bar, and against the lugs 58, during the freezing of the water which was just before placed in the receptacles 35. Preferably, each block or cub of ice is at this time supported by the lugs 57 and 58 alone, being otherwise not contacted. At about the time the piston 50 again ascends, or is ready to ascend, the links 55 are further elevated, and the ice blocks or cubes are delivered to the storing compartment 29. When the blocks or cubes are so delivered, they are, obviously, completely frozen and free from moisture. Attention is called to the fact that the lugs 58, in addition to serving as means for readily allowing easy sliding of the ice blocks or cubes, preclude the possibility of accumulation of moisture upon the mouth of the compartment or vessel 28, which might upon freezing cause obstruction. Attention is also called to the fact that, desirably, the level to which water is raised in the compartment or vessel 28 each time ice blocks or cubes are to be floated, is just below the open, upper end of said compartment or vessel, whereby to preclude the formation of ice at any location except in the receptacles by floating the blocks or cubes to the highest possible elevation and leaving them here to freeze dry, with a minimum of contacting surface.

One of the arms 54 includes an integral protuberance 59 at location adjacent its pivotal support on a link 55, which protuberance 59 is adapted to contact with an obstruction, in a manner to be set forth, to swing the delivery element 52 and its base or bar 53 inwardly of the box-like member 26 as said delivery element is elevated.

Spaced apart supporting brackets, designated 60 and 61, are suitably mounted upon the upper wall 17 of the refrigerator cabinet and beneath the cover 27. Said brackets 60 and 61 include bearings 62 in which a horizontal shaft 63 is rotatably mounted. The shaft 63 may extend from front to rear of the refrigerator cabinet, as it is disclosed in the drawings. An electric motor 64, also conveniently mounted upon the wall 17 beneath the cover 27, includes a relatively slowly driven motor shaft 65 having a pinion 66 fixed thereon, said pinion desirably being composed of insulating material, as, for instance, fiber. The pinion 66 meshes with a gear 67 fixed upon the shaft 63, and thus said shaft is driven at relatively low speed from the motor 64. The gear 67 is insulatively mounted upon the shaft 63, as in-

dicated at 68 in Figs. 1 and 12. The electric motor illustrated is of a well known synchronous type. It is to be understood, however, that any type of motor can be employed with a suitable arrangement adapted to cause the shaft 63 to be driven at the speed desired.

A cam 69 upon the shaft 63 is for actuating the piston rod 51. Said cam 69 has an external surface 70 concentric with the axis of the shaft 63 and extending the major portion of the distance about said shaft. At 71 the circumferential surface 70 is cut away to provide a lifting shoulder 72 and a drop-off shoulder 73, which shoulders are adjacent each other. A lever 74, pivoted upon the bracket 61 as at 75, includes a shorter arm 76 adapted to ride upon the surface 70 and to lie in the cut-away portion 71, and a longer arm 77 having an elongated slot 78 in which the piston rod 51 is slidably pivoted. Said piston rod passes upwardly through a guideway 79 therefor in the wall 17. See Figs. 1 and 2.

In Fig. 2, the gear rotates in the direction shown by the arrow thereon, to turn the cam 69 in the same direction. During the major portion of a complete revolution of said cam 69, the shorter arm 76 of the lever 74 rides the surface 70. When the drop-off shoulder 73 reaches the location of said shorter arm, as shown in dotted lines in said Fig. 2, said shorter arm is released as shown in full lines, and the piston 50 descends under the weight of the head of raised water. Then when the lifting shoulder reaches said shorter arm, it is depressed as in dotted lines in Fig. 2, and held in depressed condition by engagement with the surface 70 until the drop-off is again reached. It is thus that the longer arm 77 is raised to elevate the piston and hold it in elevated position.

The shaft 63 also fixedly supports a pair of spaced apart cams 80, one for each of the links 55, which links pass upwardly through guideways 81 therefor in the wall 17. As disclosed, each cam 80 includes an external surface 82 extending the major portion of the distance about the shaft 63. At 83 each surface 82 includes a smooth hump or protuberance which is of general curvilinear conformation. A bracket 84 adjacent one of the cams 80, and desirably supported upon the wall 17 beneath the cover 27, and the bracket 60, pivotally support, as at 85, levers 86. Each lever 86 has a roller 87 mounted thereon in relatively close relation to the corresponding bracket, and said rollers are adapted to ride the cams 80. The outer end of each lever 86 includes an elongated slot 88 in which the upper end of a link 55 is pivotally supported. Evidently, during the major portion of a complete revolution of the shaft 63, the rollers 87 ride the surfaces 82, and once during each revolution of said shaft, the humps or protuberances 83 ride under said rollers. The humps or protuberances 83 are at the same angular relation to the shaft 63 so that the rollers are caused to rise and fall concurrently and in equal degree. It will be seen that the delivery element 52 remains at its lowest position, as in Fig. 5, during the major portion of the rotation of the shaft 63, and is quickly raised when the humps or protuberances 83 reach the location of the rollers 87. It might be here remarked that during the operations of freezing ice blocks or cubes, the rollers 87 stationarily rest upon the advancing surfaces of the humps or protuberances 83 to retain the delivery element 52 at elevation as in full lines in said Fig. 2, and as in Fig. 9, where said delivery element cooperates with the lugs 58 to hold the ice blocks or cubes previously removed from the receptacles 35 in the mouth of the compartment or vessel 28, as already described.

Also during the actual freezing operations, the shorter arm 76 of the lever 74 is stationarily positioned in the cut-away portion 71 of the cam 69, and the piston is completely depressed to uncover the port 44, as these parts are disclosed in Figs. 1 and 2.

The wiring system of the apparatus includes a fixed contact member 89 insulatively mounted upon the top surface of the wall 17, as indicated at 90. A movable contact member 91, which normally engages the fixed contact member 89, is insulatively supported upon a stop bar or rod 92 vertically slidable in a guide way 93 in the wall 17. The lower portion of the stop bar or rod 92 extends below said wall 17, and constitutes the obstruction, before referred to, adapted to be engaged by the protuberance 59 upon an arm 54 during the upward movement of the delivery element 52. A flat spring 94, on the inner surface of the wall 17 and engaged in a slot of the stop bar or rod 92, normally holds the bar or rod in depressed condition and the movable contact member 91 in engagement with the fixed contact member 89. The flat spring is of sufficient strength to cause the delivery element to be swung, as already set forth, to deliver the ice blocks or cubes in normal operation, as in Fig. 10, but when the storage container is full of blocks or cubes of ice, the protuberance 59 acts against the stop bar or rod 92 and overcomes the flat spring 94 to remove the movable contact member 91 from the fixed contact member 89, as in Fig. 11. Suffice it to say at this time, that separation of the contact members 89 and 91 interrupts the operations of the apparatus. Evidently, upon clearing the passage for ice blocks or cubes to the storage container, the flat spring 94 acts to return the movable contact member 91 into engagement with the fixed contact member 89, and to deliver the blocks or cubes which had been obstructed.

The wiring system of the apparatus also includes an electric switch controlled by the storage container 33, and adapted to be closed when said storage container is in its normal position in the storage compartment 29, but to be opened to interrupt the operation of the apparatus whenever the storage container is even partially withdrawn from said storage compartment. A movable contact member, designated 95, of the electric switch just mentioned, is insulatively supported by a post 96 extending rearwardly from the rearward wall of the storage container 33, and is adapted to be engaged between a pair of fixed contact members 97 and 98 suitably and insulatively supported upon the rearward wall 19 of the refrigerator cabinet. The post 96 extends through the back wall of the box-like member 26 and through a suitable guideway 99 in said wall 19. Evidently, when the storage container is positioned as in Fig. 1, the switch including the contact members 97, 95, 98 is closed, and when said container is withdrawn even a small amount, said switch is opened. The purpose of the electric switch just described is to preclude delivery of ice blocks or cubes to the storage compartment 29 when the storage container is temporarily withdrawn, as to extract ice blocks or cubes. The members 97 and 98 are of springy nature, and the electric switch consisting of said members 97, 95, 98 is a modified form of knife switch.

The wiring system of the apparatus likewise includes an electric switch controlled by the stud 37. A movable contact member, designated 100, of the present electric switch is insulatively mounted upon the wall 19 to be engaged by an insulating button on the stud 37 and to engage a fixed contact member 101, also insulatively mounted upon said wall 19, the arrangement being such that normally, when the stud 37 is in receded position, the movable contact member 100 is, by reason of its resiliency, clear of the fixed contact member 101, but when said stud 37 is in extended position, it forces said movable contact member, against the tendency of its natural resiliency, into engagement with said fixed contact member, as will be understood. A guide way in the wall 19 for the stud 37 is denoted 102.

The wiring system of the apparatus additionally includes a pair of contact members, represented 103 and 104, insulatively mounted upon the bracket 61 and adapted to wipe over the insulatively supported gear 67 as this rotates, and an insulating block 105 of relatively small dimension is associated with said gear 67 to be engaged by the contact member 103 once during each revolution of the gear.

Numerals 106 and 107 denote lead wires from a suitable source (not shown) of electrical energy. The lead wire 106 extends to the fixed contact member 89. The lead wire 107 extends to the motor 64.

A lead wire 108 connects the movable contact member 91 with the contact member 103, and a lead wire 109 connects the motor 64 with the contact element 104.

A lead wire 110 connects the lead wire 108 with the spring contact member 100, a lead wire 111 connects the lead wire 109 with the contact member 98, and a lead wire 112 connects the contact members 97 and 101 with each other.

Assume that the parts of the apparatus are disposed as in Figs. 1, 2 and 12 when water is being frozen in the receptacles 35. Ice blocks or cubes are held by the delivery element 52 in the mouth of the compartment or vessel 28 as in said Fig. 2, the rollers 87 being upon higher parts of the cams 80. The motor current is held broken by reason of the fact that the contact member 103 is engaged with the insulating block 105, clear of the gear 67, and the control members 100 and 101 are out of engagement, as in said Figs. 1 and 12. The shorter arm 76 of the lever 74 is in the cutaway portion 71 of the cam 69, and the piston 50 is depressed, as in said Figs. 1 and 2. Upon the water in said receptacles becoming frozen, the stud 37 is extended to cause the movable contact member 100 to engage the fixed contact member 101. Thus a circuit is made through the motor 64, said circuit being traced from the lead wire 106 through the fixed contact member 89 to the movable contact member 91, thence through the lead wires 108 and 110 to the spring contact member 100, thence through the contact member 101 and the lead wire 112 to the contact member 97, thence through the contact members 95 and 98 to the lead wire 111, and thence through the lead wire 109 and the motor 64 back to the lead wire 107. Thus the motor will be energized to rotate the gear 67 at a relatively slow and predetermined rate of speed. Almost immediately, and while the contact members 100 and 101 are in engagement, the insulating block 105 will move from beneath the contact member 103, and the gear 67 will make one complete revolution, until said insulating block 105 again engages said contact member 103. During this revolution of the gear 67, the stud 37 will recede by reason of the removal of the ice blocks or cubes from the receptacles 35. The circuit through the motor 64 is traced, when the contact member 103, as well as the contact member 104, conductively engages said gear 67, from the lead wire 106 through the fixed contact member 89 to the movable contact member 91, thence through the lead wire 108 and the contact member 103 to the gear 67, and thence through the contact member 104, the lead wire 109 and the motor 64 back to the lead wire 107. Upon commencement of rotation of the gear 67, and consequent rotation of the shaft 63, the humps or protuberances 83 of the cams 80 will quickly elevate the delivery element 52 to deliver the ice blocks or cubes from the mouth of the compartment or vessel 28 to the storage container 33, the protuberance 59 and the stop bar or rod 92 interacting and cooperating in the manner as set forth. Immediately thereafter, the rollers 87 will quickly slide down the succeeding sides of the humps or protuberances 83 to allow the delivery element 52 to be positioned as in Fig. 5 until said humps or protuberances again engage the rollers near the end of the complete rotation of the shaft 63. Desirably just before the delivery element has moved to position as in Fig. 5, the lifting shoulder 72 engages the short arm 76 of the lever 74, elevates the piston 50, and holds said piston in elevated position during almost a complete revolution of the cam 69; that is, until the shorter arm 76 reaches the drop-off shoulder 73. It is while the rollers 87 are riding the circumferential surfaces 82 and the shorter arm 76 is riding the circumferential surface 70, with the base or bar 53 depressed, and the piston 50 elevated, that the water in the compartment or vessel 28 is floating the ice blocks or cubes out of the receptacles, and thus replacing said blocks or cubes. Naturally, the shaft 63 is rotated sufficiently slowly to insure that the ice blocks or cubes will be floated in the interval of time allotted.

The relative arrangement is such that the contact member 103 rides upon the insulating block 105 and clear of the gear 67, just after the shorter arm 76 of the lever 74 rides over the drop-off shoulder 73, and just when the rollers 87 ride up along the advancing surfaces of the humps or protuberances 83, so that the disclosure as in Fig. 2 properly represents the arrangement of the various parts of the apparatus when the freezing operation on the water in the receptacles is actually being accomplished. When the piston 50 lowers, the water recedes from the compartment or vessel 28, and leaves the receptacles 35 loaded with water to be frozen.

To originally start off the apparatus, it is only necessary to place water in the receptacles 35, as will be evident. Upon freezing of the water into blocks or cubes, the operations as described will commence, provided the parts are positioned as in Fig. 2 of the drawings.

The electric switch including the fixed contact member 89 and the movable contact member 91 being in the motor circuit as made at both the gear 67 and switch 100, 101 will obviously cause the motor 64 to be deenergized whenever the member 91 becomes removed from the member 89, as before set forth. Also, the motor 64 cannot be energized by engagement of the switch members 100 and 101 if the switch 97, 95, 98 is open. Whenever the switch 89, 91 is open, the whole apparatus is dead, and upon closing of this switch

by clearing a way for the ice blocks or cubes being delivered, the apparatus commences exactly where it left off. Whenever the switch 97, 95, 98 is open, there can be no operation of the motor unless through the gear circuit. It is immediately after the gear circuit is made that ice blocks or cubes are delivered to the storage container, so the breaking of said switch 97, 95, 98 is effective to preclude the passage of ice blocks or cubes to the storage compartment 29 when the storage container is withdrawn, unless withdrawn at the very short interval between the closing of the switch 100, 101 and delivery of the manufactured and dry ice blocks or cubes. Attention is called to the fact, however, that were the switch 97, 95, 98 also in the gear circuit, as well as in the circuit including the switch 100, 101, as, for example, in the lead wire 108, no movement of the motor 64 could occur with said switch 97, 95, 98 in open position, as will be evident.

In any instance when the electric safety switch 97, 95, 98 is not employed, the contact member 101 will be directly connected to the lead wire 111.

It will be evident that the ice blocks or cubes, which are delivered to the storage container in completely frozen, moisture free condition, are stored in close enough proximity to the freezing coils to insure a low temperature precluding sticking or freezing together of the blocks or cubes in storage.

By reference to Fig. 11, it will be seen that the delivery element 52 when operated by the ice blocks or cubes in a full storage container will, or might, lie in said storage container to preclude its withdrawal from the storage compartment 29. In Fifi. 13 I have disclosed a modified form of delivery element, denoted 52', which is like the delivery element 52 in all respects, except that an arm 54', equivalent to an arm 54, integrally supports an offset stop member 113 including an extension piece 114 adapted to lie just in front of the forward wall of the storage container 33 when the delivery element 52' is operated by the ice blocks or cubes to interrupt the operations of the apparatus, as shown in full lines in said Fig. 13. The stop member 113 and its extension piece 114 are in proper spaced relation to the adjacent arm 54' to clear the box-like member 26 when the delivery element is swung, as will be understood. By grasping the extension piece 114 and swinging it to the left in Fig. 13 to position clear of the storage container, the delivery element 52' is also swung clear of said container to allow its withdrawal. When the container is partially withdrawn, the extension piece can be released to engage the adjacent side wall of said container, as will be evident. Thus, the delivery element will be held inactive and the motor operating circuit will be held open at the switch 89, 91 whenever the storage container is partially withdrawn, and the necessity for a switch such as 97, 95, 98 will not exist. When the storage container is slid in and out, the extension piece 114 will slide over the wall of said container which said extension piece engages.

What I claim is:

1. The method of making blocks of ice, which consists in freezing water in each of several receptacles to provide separate blocks of ice, floating said blocks of ice from the receptacles while concurrently loading the receptacles with water, withdrawing the water from said blocks of ice, subjecting said blocks of ice while in spaced apart relation to the influence of freezing medium and concurrently freezing said water loaded into said receptacles, and delivering the resulting dry blocks of ice to a storage container therefor also subjected to the influence of freezing medium.

2. The method of making blocks of ice, which consists in placing water in each of a plurality of receptacles, freezing said water, floating the resulting blocks of ice from the receptacles while concurrently loading the receptacles with water for providing additional blocks of ice, running off the water from said blocks of ice while leaving the receptacles loaded with water, drying said blocks of ice by subjecting each block while in spaced apart relation to every other block to freezing medium, freezing said water loaded into said receptacles concurrently with the drying of the blocks of ice, and delivering the dry blocks of ice to a storage compartment therefor kept below freezing temperature.

3. An apparatus of the character described, comprising a medium for freezing water in a receptacle, means for removing the resulting block of ice from said receptacle while concurrently loading said receptacle with water to be frozen into an additional block of ice, and means for delivering said removed block of ice while subjected to the influence of freezing medium to a cooled storage chamber therefor.

4. An apparatus of the character described, comprising a receptacle, means for freezing water therein, means for removing the resulting block of ice from said receptacle and loading the receptacle with water for providing an additional block of ice, and means for retaining said removed block of ice at location subjected to the influence of freezing medium and for later delivering said removed block of ice from said location to a cooled storage chamber.

5. An apparatus of the character described, comprising a plurality of receptacles, means for freezing water in each of said receptacles, means for floating blocks of ice from said receptacles while concurrently loading the receptacles with water and for running off the water from said floated blocks of ice while leaving the receptacles loaded with water, and means for retaining each removed block of ice in spaced apart relation to every other block and at location subjected to the influence of freezing medium while freezing water in said receptacles, to thus dry said blocks, and for depositing the dry blocks of ice into a cooled storage chamber therefor.

6. The combination as specified in claim 5, and means for interrupting the operation of the ice block depositing means when said storage chamber is loaded with blocks of ice.

7. An apparatus for making blocks of ice, comprising a compartment for receiving water, receptacles in said compartment and adapted to receive water therefrom, means for freezing water in said receptacles, means for conveying water to said compartment and about ice blocks in said receptacles and holding said water in said compartment for a period requisite to float said ice blocks from said receptacles and itself fill the receptacles, said last mentioned means being actuatable to allow water to be run off from the floated ice blocks while leaving the receptacles loaded with water, and means for retaining each removed ice block in spaced apart relation to all others of the ice blocks while subjected to the influence of freezing medium adapted to dry the ice blocks and for delivering the ice blocks when dry to a cooled storage container therefor.

8. An apparatus of the character described, comprising a vessel having receptacles therein,

means for freezing water in said receptacles, an electric motor, a starting circuit for said motor, means actuated by said motor for conveying water to said vessel and about blocks of ice in said receptacles and holding said water in said vessel until said blocks of ice are floated from the receptacles and water is replaced therein, means responsive to the freezing of water in said receptacles for closing said motor starting circuit, said last mentioned means being adapted to break said motor starting circuit upon the removal of blocks of ice from said receptacles, an operating circuit for said motor, means responsive to initial actuation of said motor for making said operating circuit before said starting circuit is broken and responsive to later actuation of said motor for breaking said operating circuit, said means actuated by said motor for conveying water to and holding water in said vessel being actuatable after said blocks of ice are floated to run all water off from said vessel except water retained by said receptacles, whereby to drain water off of said floated blocks of ice, and means controlled by said motor for retaining each block of ice which was floated in said vessel in spaced relation to all others of said blocks of ice while subjected to the influence of freezing medium for an interval of time, whereby to dry the blocks of ice, and for delivering the dry blocks of ice to a cooled storage container therefor.

9. The combination as specified in claim 8, wherein said means responsive to the freezing of water in said receptacles for closing said motor starting circuit includes a switch actuating element, and means for cumulatively imparting expansion of each receptacle caused by freezing of water therein to said actuating element.

10. The method of making blocks of ice, which comprises the continuous operations of freezing water in receptacles, removing the resulting blocks of ice from the receptacles by partial melting of said blocks of ice, continuously subjecting the receptacles to freezing medium, retaining removed blocks of ice at location subjected to freezing medium, depositing the retained blocks of ice in a cooled storage chamber, and placing water in said receptacles concurrently with the removal of blocks of ice therefrom.

11. The method of making a block of ice, which consists in freezing water in a receptacle to provide a block of ice, floating the block of ice from the receptacle while concurrently loading the receptacle with water, withdrawing the water from the block of ice, subjecting the block of ice to the influence of freezing medium and concurrently freezing the water loaded into the receptacle, and delivering the resulting dry block of ice to a storage container therefor.

12. The method of making a block of ice, which consists in placing water in a receptacle, freezing the water, floating the resulting block of ice from the receptacle while concurrently loading the receptacle with water for providing an additional block of ice, running off the water from a block of ice while leaving the receptacle loaded with water, drying the block of ice by subjecting it to freezing medium, freezing the water loaded into the receptacle concurrently with the drying of a block of ice, and delivering the dry block of ice to a storage compartment therefor.

13. An apparatus of the character described, comprising medium for freezing water in a receptacle, means for floating the resultant block of ice from said receptacle while concurrently loading the receptacle with water to be frozen into an additional block of ice, means for retaining the floated block of ice clear of water and subjected to freezing medium during at least a portion of the interval while water is being frozen in said receptacle, whereby to make the block of ice dry, and means for delivering the block of ice when dry to a storage chamber.

14. An apparatus of the character described, comprising a receptacle, means for freezing water in said receptacle, means for floating a block of ice from said receptacle while concurrently loading the receptacle with water and for running off the water from the floated block of ice while leaving the receptacle loaded with water, said last mentioned means being adapted to float said block of ice to a predetermined location and means for retaining the removed block of ice at said location and subjected to the influence of freezing medium during at least a portion of the interval while freezing water in said receptacle, to thus dry the block, and for depositing the dried block of ice into a cooled storage chamber.

15. An apparatus for making blocks of ice, comprising a compartment for receiving water, a receptacle in said compartment and adapted to receive water therefrom, means for freezing water in said receptacle, means for conveying water to said compartment and about an ice block in said receptacle and for holding said water in said compartment for a period requisite to float said ice block from said receptacle and itself fill the receptacle, said last mentioned means being adapted to float said block of ice to a predetermined location and being actuatable to allow water to be run off from the floated ice block while leaving the receptacle loaded with water, and means for retaining the removed ice block clear of water at said location and subjected to the influence of freezing medium adapted to dry said ice block and for delivering the ice block when dry to a cooled storage chamber.

16. An apparatus of the character described, comprising a receptacle, means for placing water therein, continuously operative freezing medium for said water, means for floating a block of ice from said receptacle while placing water in the receptacle, said last mentioned means being adapted to float said block of ice to a location, means for retaining said block of ice at said location while water is removed from said block of ice, whereby to dry the block of ice, and means for delivering the block of ice when dry to a storage space therefor.

17. An apparatus of the character described, comprising a receptacle, means for freezing water in said receptacle, means for floating a block of ice from said receptacle while concurrently loading the receptacle with water and for floating said block to an intended location and for running off the water from the floated block of ice while leaving the receptacle loaded with water, and means for retaining the removed and floated block of ice at said intended location while running water off of the ice block, whereby to dry the block of ice, and for depositing the dried block to a chamber therefor.

18. An apparatus of the character described, comprising a compartment for receiving water, a receptacle in said compartment and adapted to receive water therefrom, means for freezing water in said receptacle, means for conveying water to said compartment and about an ice block in said receptacle and for holding the water in said com-

partment for a period requisite to float said ice block from said receptacle and itself fill the receptacle and to also float the ice block to an intended location in the apparatus, said last mentioned means being actuatable to allow water to run off from the floated ice block while leaving the receptacle loaded with water, and means for retaining the removed block of ice at the location to which floated while causing water to run off from the ice block and for thereafter delivering the block of ice to a chamber therefor.

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