April 13, 1943. W. C. PFEIL 2,316,282

APPARATUS FOR CUTTING ICE

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Fig. 1.

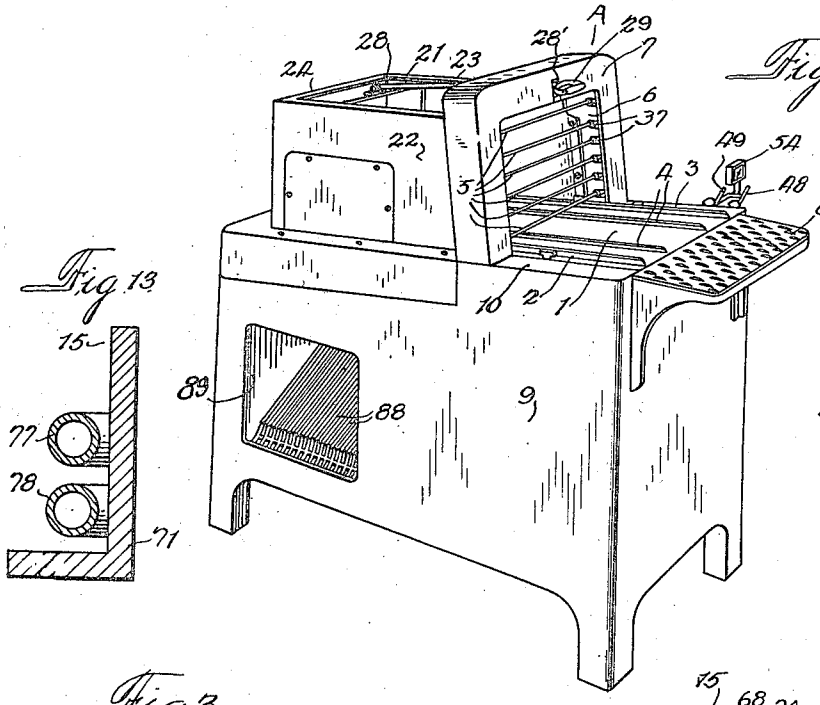


Fig. 13.

Fig. 2.

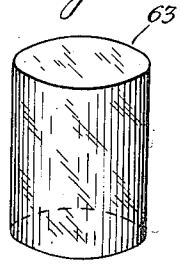
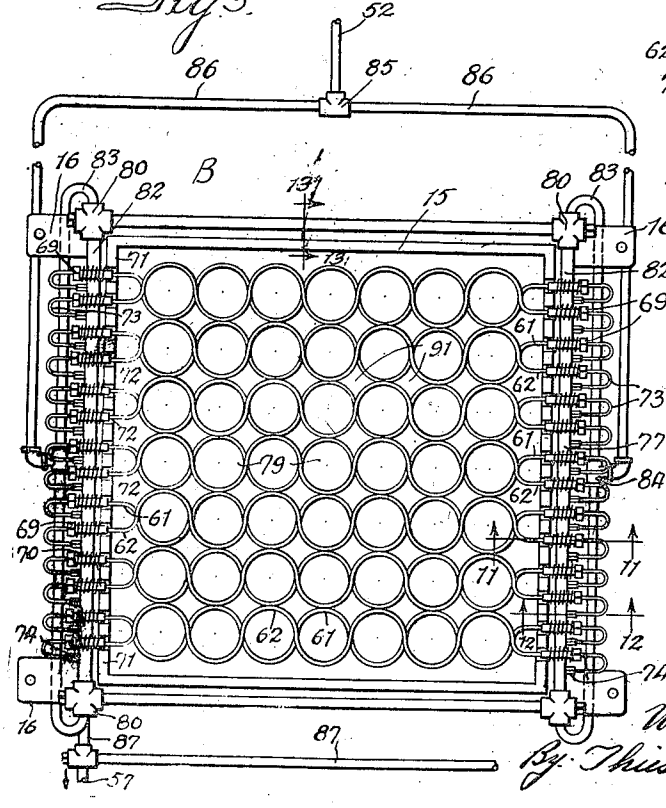


Fig. 3.



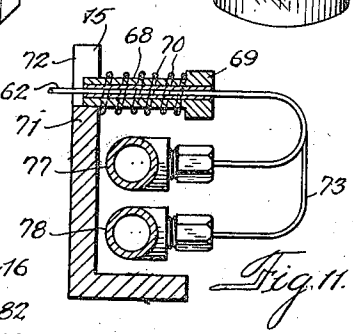


Fig. 11.

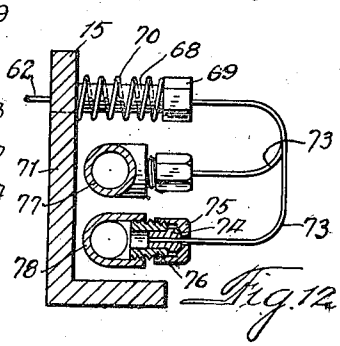


Fig. 12.

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Fig. 4.

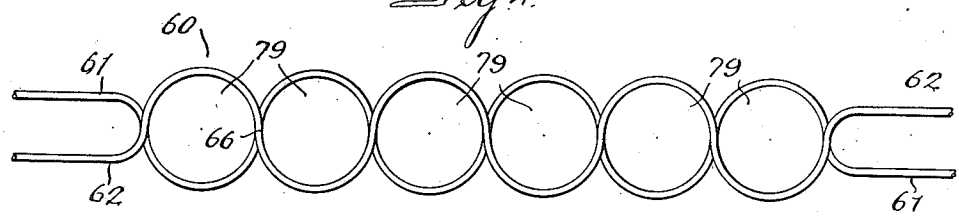


Fig. 5.

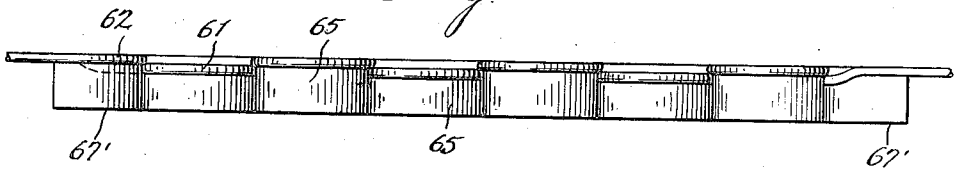


Fig. 6.

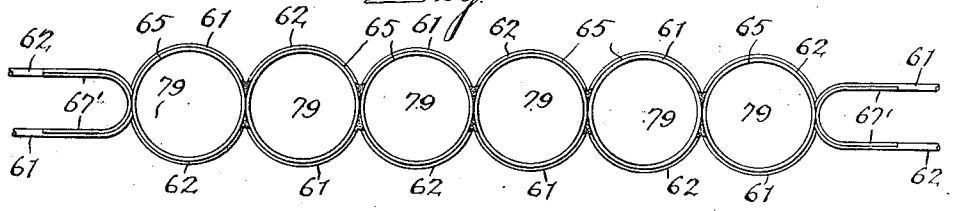


Fig. 7.

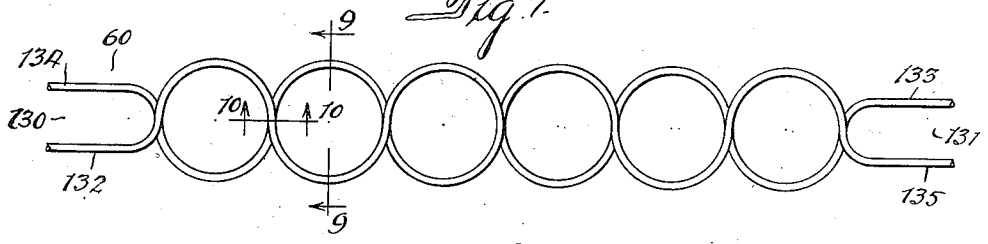


Fig. 8.

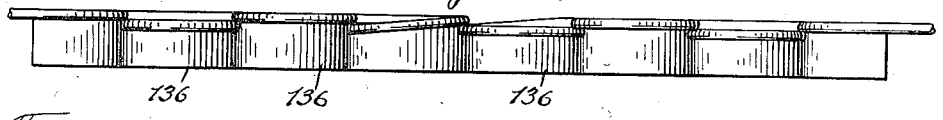


Fig. 9.

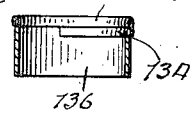
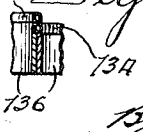


Fig. 10.



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Fig. 14

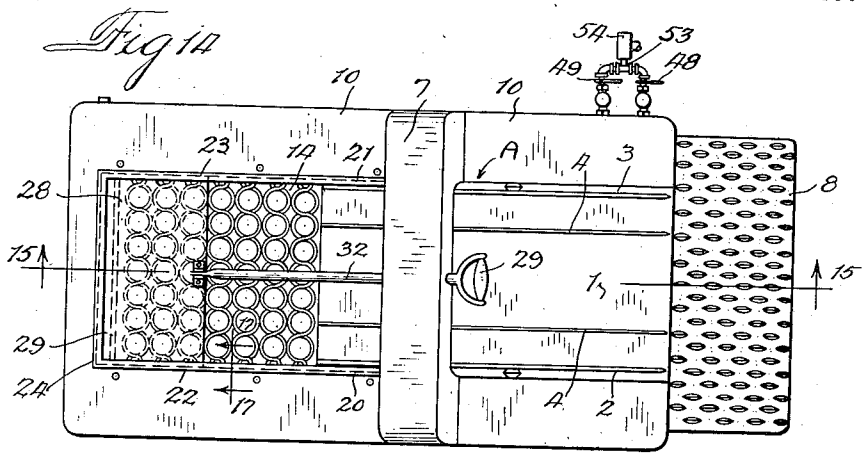
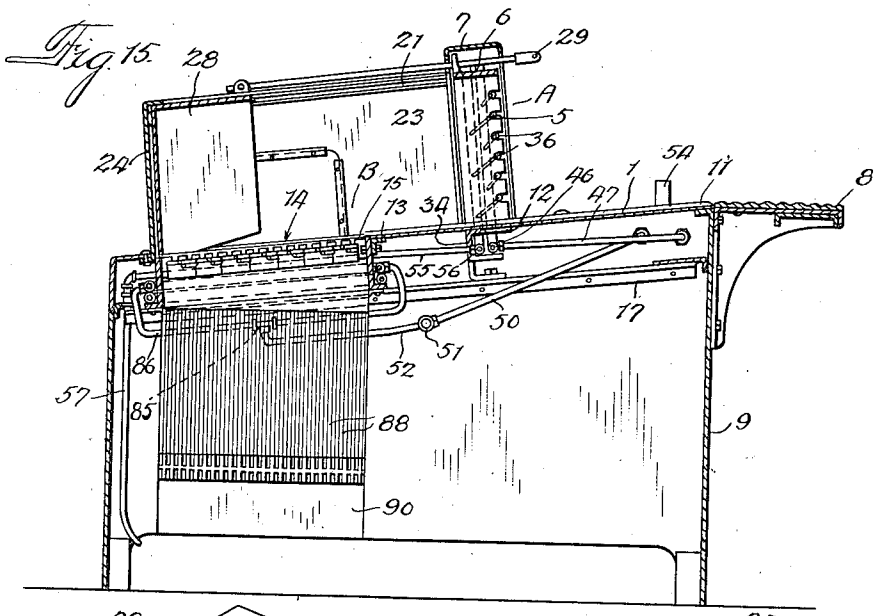


Fig. 15.



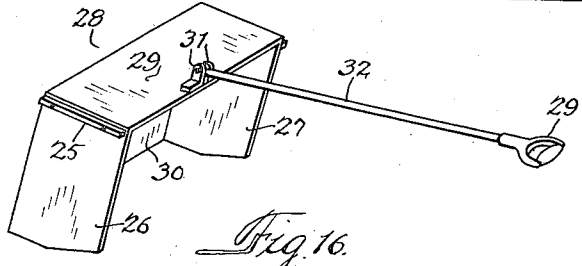


Fig. 16.

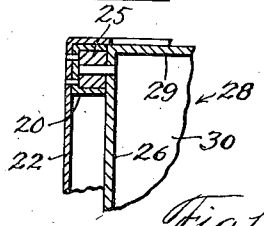


Fig. 17.

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Fig. 18.

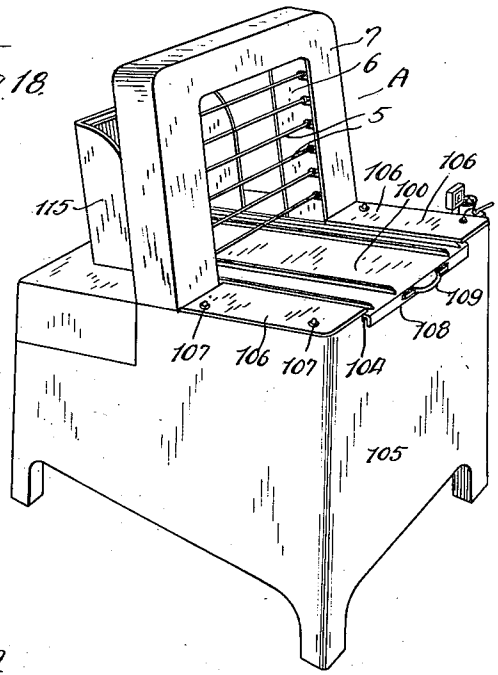


Fig. 19.

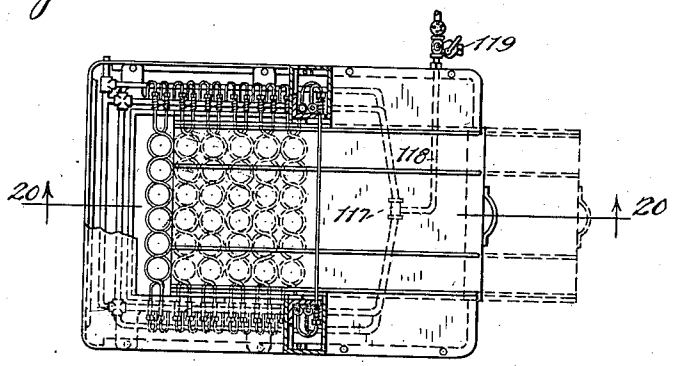
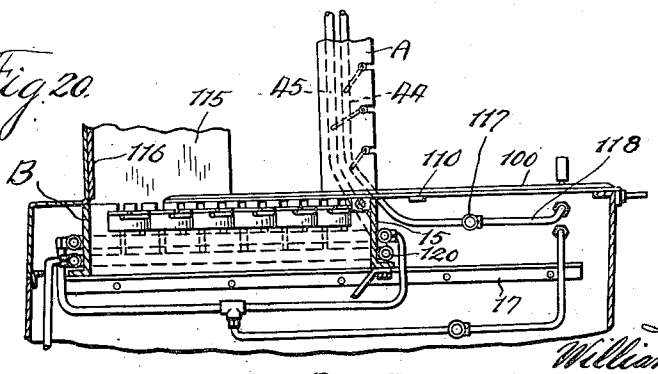


Fig. 20.



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Fig. 21.

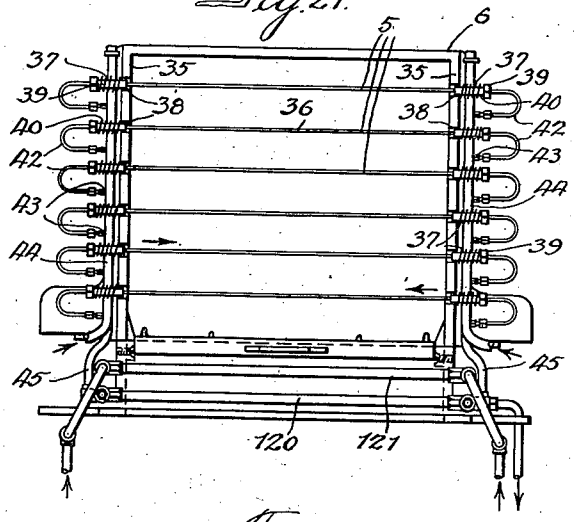


Fig. 22.

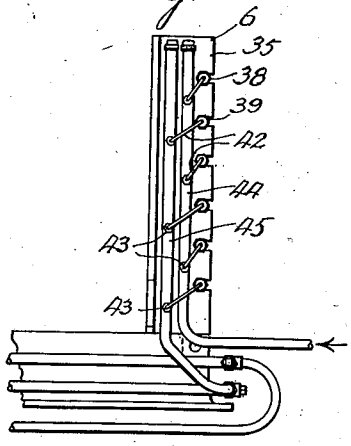


Fig. 23.

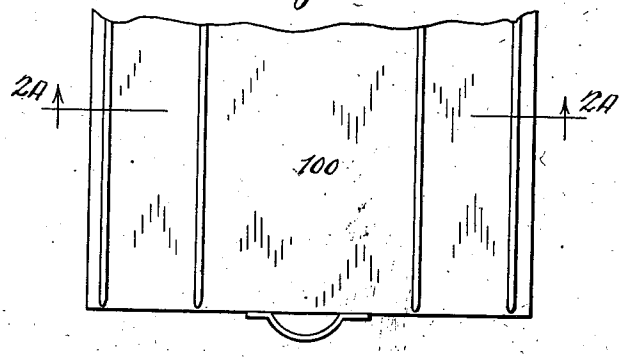
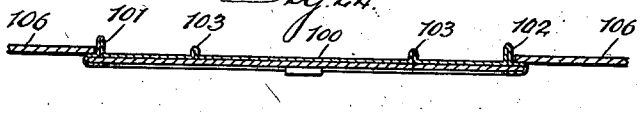


Fig. 24.



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Patented Apr. 13, 1943 2,316,282

UNITED STATES PATENT OFFICE

2,316,282

APPARATUS FOR CUTTING ICE

William Carl Pfeil, Chicago, Ill.

Application September 13, 1940, Serial No. 356,615

16 Claims. (Cl. 62—112)

This invention relates to a new and novel method of and apparatus for cutting ice.

The invention is particularly directed to certain valuable improvements providing a practical and commercial machine capable of cutting large quantities of ice into small cylindrical pieces of service size with minimum waste.

Machines for cubing ice are well known. A machine of this type is disclosed and claimed in my prior Patent No. 2,165,573, granted July 11, 1939. In this machine, a cake or block of ice is first slabbed and then subjected to a second cutting operation to cause the slabs to be cut into cubes. The cutting elements are adapted to be heated preferably by steam or hot water. This operation is rapid and economical. There is a demand, however, for cylindrically cut pieces of ice in lieu of cubes. Numerous attempts have bene made to provide ice in small cylindrical pieces. They better fit in water or beverage glasses, make a neater appearance and are in demand if they can be produced at reasonable cost. Freezing trays have been successful only to the extent that cylindrical pieces can be produced. Labor and time used in freezing the ice in trays and then removing the same make the use of trays expensive and impractical. Moreover, the production is extremely limited and cannot meet the requirements of even the smallest user. The present invention is directed to cutting ice in cylindrically shaped pieces. Due to the successful and efficient operation of my earlier machine for cubing ice, certain features thereof are used herein in connection with cutting the ice into cylindrical pieces. Certain new and useful improvements are also employed that assure a uniform cutting operation and a perfectly shaped cylindrical product.

An object of the invention resides therefore in the provision of an ice cutting machine adapted to cut large blocks of ice into cylindrical pieces of service size by a simple and efficient form of apparatus employing cutting grids adapted first to slab the ice and then cut the same into cylindrical pieces with minimum waste.

A further object of the invention resides in an improved form of cutting grid adapted to be so designed that a heating medium will flow through the cutting elements in a manner permitting a block of ice to be readily and rapidly cut into cylindrical pieces.

A still further object of the invention resides in an improved form of cutting element whereby the same may be arranged to form cutting units having cutting edges defining circular cutting areas adapted to produce pieces of ice of cylindrical shape, a further feature residing in the arrangement of the cutting element so that a cut of no greater size than the width of the cutting element will be made.

A still further object of the invention is to provide an improved construction of grid adapted to removably mount and carry these cutting units so that not only may the grid be readily removable but also the cutting units to permit repair or replacement thereof in minimum time.

A still further object of the invention is to provide an improved construction of cutting element whereby the same may be formed in units having cutting edges defining circular cutting areas and may be provided with means that guide the pieces as they are being cut to assure uniformly shaped cylindrical pieces and thereby prevent waste resulting from irregular cutting.

A still further object of the invention is to provide in a machine having a slabbing grid, as well as a second grid that cuts the slabs into smaller pieces of final size, a conveyor or like means capable of embracing the block of ice as it is being cut and moved through the slabbing grid whereby to prevent the slabs from separating, as the result of the slippery condition produced from melting the ice to effect the cutting operation, and to thereby place an uneven strain upon the end of the cube that is still uncut and being fed to the slabbing grid, which strain is found to crack and split the cake before the cutting operation can be completed.

A still further object of the invention is to provide, in a machine employing two grids, means for providing a compact arrangement of parts and for preventing the ice after being slabbed by the first grid from passing through the second grid until a device, which in the preferred form may be a tray, is removed, this device also permitting minimum spacing of the grids to secure said compactness of parts without experiencing a tendency of the forward end of the cake being cut to drop upon and pass through the second grid before the cake has been completely cut by the first grid.

Other objects and advantages of the invention will be apparent from the following detail description when taken in connection with the accompanying drawings, which form a part hereof.

In the drawings:

Figure 1 is a perspective view of one form of machine embodying the invention;

Fig. 2 is a similar view of a piece of ice cut by this machine;

Fig. 3 is a top plan view of a grid embodying the cutting elements adapted to cut the piece of ice shown in Fig. 2;

Fig. 4 is an enlarged top plan view of one of the cutting units employed in the grid shown in Fig. 3;

Fig. 5 is a side view of the cutting unit shown in Fig. 4;

Fig. 6 is a bottom view of the same;

Fig. 7 is a view similar to Fig. 4 but illustrating another form of unit;

Fig. 8 is a side plan view of the same;

Fig. 9 is a cross-sectional view taken along line 9—9 of Fig. 7;

Fig. 10 is a cross-sectional view taken along line 10—10 of Fig. 7;

Fig. 11 is a detail sectional view taken along line 11—11 of Fig. 3;

Fig. 12 is a similar view taken along line 12—12 of Fig. 3;

Fig. 13 is likewise a similar view but taken along line 13—13 of Fig. 3;

Fig. 14 is a top plan view of the machine shown in Fig. 1;

Fig. 15 is a longitudinal sectional view taken along line 15—15 of Fig. 14;

Fig. 16 is a detail view of a conveyor for transferring the ice slabs from the first grid to the second grid;

Fig. 17 is an enlarged sectional detail view illustrating a track and roller mechanism for this conveyor;

Fig. 18 is a perspective view of another form of machine embodying the invention;

Fig. 19 is a top plan view of the same with parts being broken away;

Fig. 20 is a longitudinal sectional view with portions omitted, taken along line 20—20 of Fig. 19;

Fig. 21 is an enlarged front elevation of the first cutting or slabbing grid, the construction of the same being substantially the same in both forms of the machine herein illustrated, except for the fluid connections which are, however, the same in principle, the fluid connections shown in this view being substantially those employed in the form of the machine illustrated in Figs. 18 to 20, inclusive;

Fig. 22 is a side view of this first cutting grid;

Fig. 23 is a detail view of the removable tray employed in the form shown in Figs. 18 to 20, inclusive, a portion thereof being broken away; and

Fig. 24 is a cross-sectional view taken along line 24—24 of Fig. 23.

Although there are illustrated substantially two sets or grids of cutting elements in the machines illustrated in the drawings for effecting two cutting operations, one for first slicing a cake of ice substantially in horizontal slabs and the other for cutting the slabs into cylindrical pieces, which, for the purpose of this disclosure, might be called "cylindrical cubes," it will be understood that the showing is merely illustrative of a preferred arrangement of parts that make up a very efficient form of ice cutting machine. In so far as certain features of the invention are concerned, the grids may be differently arranged to effect different cutting operations, or one may be eliminated without departing from certain features of the invention.

As illustrated in the drawings, any suitable frame or housing comprising a base may be used to support a table 1 that slopes slightly to the rear and supports a track adapted to guide a cake of ice as it is fed to the machine at the forward end. This track may comprise opposed upstanding ribs 2 and 3 suitably provided upon table 1. Also, a number of smaller upstanding ribs 4 may be provided upon table 1 upon which the ice will rest and move rearwardly toward a plurality of horizontally-disposed cutting elements 5 mounted upon a frame member 6 that may be suitably enclosed about its sides by a hood 7. Cutting elements 5 and frame 6 constitute a grid designated broadly as A for effecting the first cutting operation. An extension platform 8 may be suitably supported upon the machine at the forward end. The weight of the ice after moved from extension platform 8 upon ribs 4 between track members 2 and 3 tends to force the cake into cutting elements 5 so as to allow these cutting elements to perform their work rapidly of slicing the cake into horizontal slabs.

The frame of the machine described above as the base used to support table 1 may be of any desirable design and construction. It may include body 9 formed of any suitable material having the proper strength. The top of body 9 includes a top plate 10 cut as a U to receive table 1 at the forward end adjacent platform 8. Forward end of table 1 may rest upon a flange 11 bent over along the upper edge of the front face of body 9 and upon lateral ears 12 extending inwardly a short distance from the vertical sides of frame 6 of grid A (see Fig. 15). The rearward end of table 1 may then rest upon an angle member 13 disposed crosswise of the machine and bolted to a frame of a second cutting grid designated broadly as B.

An opening 14 is provided in top plate 10 at the rear of table 1 by reason of the fact that table 1 does not cover the entire area of the inner cutaway portion of top plate 10, as illustrated in Figs. 14 and 15. Table 1 terminates at cross bar 13. A frame 15 adapted to support a plurality of cutting elements of the second grid B is suitably disposed below opening 14. Fig. 3 illustrates grid B in detail and its frame 15 with laterally extending feet 16 at its corners. Feet 16 are adapted to rest upon and be secured to longitudinal irons 17 secured to the inside of the side walls of body 9. It is desirable to make grid B readily removable, which may be accomplished in this instance by bolting these feet to the longitudinal irons 17.

It will be apparent that the slabs of ice formed by the cutting operation of cutting elements 5 will tend to continue moving rearwardly upon ribs 4 and between track members 2 and 3 as the cake passes through grid A. Inasmuch as the cutting operation is performed by heat and the melting of the ice, the slabs will be somewhat slippery and tend to separate to the extent of placing a rather excessive strain upon the cake and cause it to fracture or split before the slabbing operation is completed. The slope of table 1 will determine the rate of feeding a cake against cutting elements 5. A reasonable slope for table 1 is desirable in order to expedite the slabbing operation and reduce the waste by melting. If the slabs fail to move uniformly over and upon the cutting elements of grid B, irregular pieces of ice will be cut. This is particularly true when "cylindrical cubes" are to be produced. Moreover, melting causes the ice to be slippery and tends to further cause the upper slabs to slip forwardly ahead of the others and drop or tilt vertically downward behind these other slabs and thereby prevent these other slabs from moving completely over and upon

the second cutting grid B. To eliminate this undesirable feature, means are provided to hold or keep the slabs of ice one upon the other after the slabbing operation is completed and to move the slabs in this stacked relation upon the cutting elements of grid B. This means preferably includes a pair of track members 20 and 21 that are disposed along the upper inside edge of side plates 22 and 23 that, together with the rear wall 24, form an enclosure at the rear of hood 7 of grid A. Track members 20 and 21 are adapted to receive bars 25 secured along the upper edges of sides 26 and 27 of a slab holding and conveyor member designated broadly as 28. Conveyor 28 is preferably formed as a channel having a top 29, as illustrated in detail in Fig. 16, and a back plate 30. Upstanding lugs 31 pivotally receive the rear end of a rod 32, which extends forwardly through an opening 28' in hood 7 and has a handle 29. During the slabbing operation performed by cutting elements 5 of grid A, the operator pulls handle 29 forwardly to move conveyor 28 forwardly to receive and embrace the advancing cut end of the block of ice as it moves through cutting elements 5 of grid B. As the slabbing operation continues, conveyor 28 is allowed to move rearwardly and hold this advancing end of the ice cake nested therein so as to keep the slabs of ice one upon the other in stacked relation. As conveyor 28 is moved rearwardly to the position shown in Figs. 14 and 15, the operator preferably keeps handle 29 gripped so as to guidingly control the rearward movement of conveyor 28 and the slabs of ice nested therein at one end until the slabs of ice are disposed over and upon the cutting elements of grid B. The slabs are then passed vertically in perfect stacked relation downwardly through the cutting elements of this grid B.

First describing grid A in detail, it will be noted that frame 6 is provided with lateral feet 12 upon which table 1 rests, as previously described, and is adapted to be carried by an angle iron 34 secured crosswise of body 9. As previously explained, slabbing grid A is practically of the same construction in both forms in the machine disclosed herein. Although it embodies the same fundamental principles in both forms, specific differences reside as shown in the fluid connections leading to the cutting elements and the mechanical structure provided to mount the same upon body 9. Figs. 21 and 22 illustrate one form of construction of grid A. Frame 6 is suitably shaped to have a flange 35 at each side across which cutting elements 5 are suspended to provide means for supporting the mountings of cutting elements 5. Cutting elements 5 preferably comprise tubes or pipes 36 substantially of small diameter through which hot water or steam (superheated if desired) is passed. The thin-walled tubes will allow rapid heat transfer and an efficient and rapid cutting action. They are somewhat flexible but sufficiently strong to resist undue bending. The small diameter will effect a very definite cut with a minimum loss of material. Each tube is flexibly secured within a bushing 37, lying in a slot 38 provided in flanges 35 on opposite sides and having an enlarged head 39 at the outer end to form a shoulder at this end to confine a spring 40 between the same and flange 35. The tube of each cutting element continues beyond bushing 37 and is coiled at 42, the end of the tube being fixedly secured within a sleeve 43 communicating either with the inlet or outlet headers 44 and 45, respectively. These headers 44 and 45 are carried on opposite sides along flanges 35. Inlet headers 44 join at their lower ends by a coupling 46 to a pipe 47 (Fig. 15), which is controlled at the right-hand end of the machine by a hand valve 48. A second hand valve 49 may be furnished to control the flow of the heating medium through a pipe 50 connecting at 51 to a connection leading to the inlet header of grid B. Both valves 48 and 49 control the flow from a common supply line 53 to which a pressure gauge 54 may be connected to indicate the pressure in the line. As will be later apparent, the operator at the front of the machine will have valves 48 and 49 conveniently accessible to control the flow of the heating medium, first through grid A and then through grid B. Outlet headers 45 of grid A connect as illustrated in Fig. 15 to a pipe 55 at connection 56, which pipe 55 leads rearwardly to connect with a vertical drain pipe 57.

Springs 40 compensate for any tendency of cutting elements 5 to flex or bow during the slabbing operation. Bushings 37 and springs 40, together with coils 42, form resilient mountings for the cutting elements which prevent permanent distortion and permit each tube to readily return to its original position when flexed during the cutting operation. Also, these resilient mountings compensate for any expansion that may occur during heating.

Grid B, illustrated more specifically in Figs. 3 to 13, inclusive, comprises a plurality of units of cutting elements resiliently supported upon frame 15 at opposite sides substantially in the same manner as cutting elements 5. Each unit 60 includes two cutting elements 61 and 62, also in the form of thin-walled tubes of small diameter through which a heating medium may flow, such as hot water or steam (superheated if desired). Tubes 61 and 62 of each unit 60 are adapted to form substantially circular cutting edges that cut the slabs of ice into "cylindrical cubes", illustrated as 62 in Fig. 2. Tubes 61 may first be bent into a plurality of reversed arcuate portions. Tubes 62 may then be bent in practically the same manner but with its arcuate portions opposing the arcuate portions of tube 61 to form substantially circular cutting areas 79 whereby there will be provided a substantially continuous cutting edge from end to end of unit 60, these cutting edges forming a plurality of circular cutting edges each adapted to produce cylindrical pieces of ice 63, as shown in Fig. 2, with minimum waste during the cutting operation. As noted in Fig. 5, the respective loops of each pipe 61 and 62 lie in a common plane. The loops of tube 61 lie in a plane below the plane of the loops of tube 62.

Each circular cutting edge formed is adapted to have an annular skirt or wall 65 depending therefrom and secured thereto in any suitable way, such as brazing, soldering, welding, or the like. Each skirt 65 may be circular, as shown in Fig. 6. The circular portions of tubes 61 and 62 are positioned to lie against the top edges of these skirts and to be secured thereto. The wall thickness of each skirt 65 should be sufficient to have the proper mechanical strength to give rigidity to tubes 61 and 62 as a unit so that they will maintain the circular cutting edges into which they are formed and to prevent any distortion that would distort the circular cutting areas 79.

Tubes 61 and 62 overlap where they cross each other at 66 in an amount preferably equal to that of the diameter of each tube thereby elimi-

nating any enlargement of the cutting edge, and hence, any unnecessary waste through melting. Accordingly, I find it desirable to make the wall thickness of each skirt 65 less than the diameter of tubes 61 and 62, this being illustrated in Figs. 5 and 6. This arrangement permits skirts 65 either to be cut away or reduced in thickness where they meet or of a thickness equal to one-half of the diameter of the tubes so that the combined thickness of adjacent skirts at these points is not greater than the diameter of either tube 61 or 62. The invention is not to be limited, however, to any specific wall thickness for skirts 65, because it is obvious that these skirts may be constructed in different ways so that the thickness will not interfere with the cutting action of tubes 61 and 62. It is merely preferable to have the wall thickness less than the diameter of tubes 61 and 62, because it assures minimum waste during the cutting operation, the inner surfaces of these skirts being substantially continuous with the inside wall of each circle formed to guide the cylindrical pieces of ice, as they are being moved downwardly through grid B, and thereby to assure cylindrical pieces of ice of uniform diameter. It is found that little, if any, heat is conducted to skirts 65 to affect any appreciable melting of the ice pieces as they contact the inner walls of these skirts in their movement downward through the same. In order to reenforce the ends of the tubes beyond the end circular cutting area, U-shaped skirts 67' are secured to the underside of tubes 61 and 62.

Cutting elements 61 and 62 are resiliently mounted upon frame 15 of grid B in substantially the same manner as cutting elements 5 of grid A. Bushings 68 similar to bushings 37 are fixedly secured to cutting elements 61 and 62 near their ends. Each bushing 68 is provided with an enlarged head 69 at the outer end to form a shoulder at this end to confine a spring 70 between the same and a vertical flange 71 of frame 15. The inner end of each bushing 69 is arranged to lie in a slot 72 formed in vertical flange 71. Tubes 61 and 62 are then looped at 73 so that the tips may be flexibly secured within a sleeve 74 that forms part of a detachable connection in the form of a nut 75 threaded upon one end of a nipple 76. Nipple 76 has the other end threaded into either the inlet pipe 77 or the outlet pipe 78, as the case may be. In other words, connection 74 may be the same for the end of the tube whether the end connects with inlet 77 or outlet 78.

A modified form of cutting unit 60 is shown in Figs. 7 and 8. Instead of pipes 61 and 62 extending crosswise of grid B, as previously explained in connection with Figs. 4 to 6, inclusive, each cutting unit comprises two pipes 130 and 131 bent into circular portions to provide circular cutting edges and their circular cutting areas 79, each pipe going only to the center of the unit and being returned to the outer end. Hence, end 132 of pipe 130 and end 133 of pipe 131 may connect with the inlet headers of grid A. End 134 of pipe 130 and end 135 of pipe 131 may then connect with the outlet header. Or, ends 132 and 135 of these pipes 130 and 131 may connect to the inlet headers and ends 133 and 134 may connect to the outlet headers. Either arrangement is desirable, the purpose being to obtain uniform heating and, therefore, uniform cutting. Circular skirts 136 may likewise be provided for each circular cutting area so as to guide the ice pieces as they are being cut and prevent any irregularity as the result of the ice not pasing perpendicularly over each circular cutting area. Consequently, skirts 136 may assume any shape or be constructed in any desirable way as long as it acts as a depending member capable of guiding the ice pieces being cut, and also, to a certain extent reenforce the cutting elements so as to hold them in their circular formation.

To secure uniform distribution of the heating fluid through cutting elements 61 and 62 of the various units 60, inlet header 77 is formed into a plurality of pipe sections that connect together at their ends by connections 80 so that this inlet header pipe will extend about the four sides of grid B. The heating fluid is fed into the header sections receiving the tips of the cutting tubes 61 and 62, the connection provided causing the heating fluid to enter these closed header sections at both ends so that it will flow uniformly toward the center, thereby eliminating a cold end which would occur if the heating fluid enters these header pipes from one end only. This is accomplished by sections 82 receiving the tips of alternate cutting tubes 61 and 62 lying on opposite sides of frame 15 so that the outer ends of two sections of pipe 83, connected together at 84, enter connections 80 directly opposite the ends of pipes 82. A source of fluid supply under control of valve 49 connects with pipe sections 83 on each side of grid B by pipes 50, 51 and 52 connecting at 85 to a pipe 86 which branches in opposite direction to connect with pipe sections 83 at 84, this being clearly illustrated in Fig. 3. When the heated fluid is fed to cutting pipes 61 and 62 in this manner, it is found that there will be equal distribution of the same throughout cutting tubes 61 and 62, so that ice will move uniformly through grid B. It will not be possible for the cutting elements 61 and 62 to cut one side of the ice cake faster than the other because both sides of these cutting elements will be substantially of the same temperature.

To further illustrate the manner in which uniform distribution of the heating medium through the cutting elements of grid B may be maintained, it is mentioned that the heating medium may now through cutting elements 61 in one direction and through cutting elements 62 in the opposite direction. Thus, adjacent cutting elements have the heated fluid flowing in opposite directions. By specific reference to Fig. 3, it will be noted that if the right-hand end of each cutting tube 62 is connected to section 82 of header 77, the right-hand end of cutting tube 61 of each unit will be connected to outlet header 78. This relation is reversed at the left-hand end where the end of cutting tube 62 will connect to outlet header 78 and the end of cutting tube 61 will connect to section 82 of header 77. Header 78 may comprise a plurality of sections of pipe connected together in a manner similar to that of inlet header 77, there being pipes 87 connecting to drain pipe 57, heretofore referred to in connection with the description of Fig. 15, and the outlet connection of grid A.

It will be noted from the description thus far given in connection with grid B that this grid B is constructed as a unit capable of being readily mounted or removed from the machine by four connecting bolts at the corner mounting lugs 16. The pipe connections for the fluid supply may be easily and quickly made.

Moreover, the construction novelly provides the cutting elements of grid B in the form of sectional units, each consisting of a tube 61 and a

tube 62 that may be readily removed either for repairs or replacement, if necessary, without disturbing the mountings of the other cutting elements.

The cylindrical pieces of ice 63 that are cut will drop upon an inclined platform comprising a plurality of spaced rods 88 that deliver the cut ice through opening 89 at one side of the machine, as illustrated in Fig. 1. The water resulting from the melting during the cutting operation may drain into a pan 90, if so desired. The irregular pieces that will be cut at the areas 91 may be easily separated from the cylindrical pieces 63. Rods 88 may be spaced far enough to permit the irregular pieces of ice to drop therethrough. The cylindrical pieces will continue to roll forwardly and be discharged from the machine at opening 89. While there is some waste by reason of the irregular pieces cut at the areas designated 91 in Fig. 3, the resulting loss is small compared to the cost of cylindrical pieces of ice heretofore made by freezing trays and the advantages to be obtained from producing cylindrical pieces in sufficient quantities. I believe that I am the first to propose cutting ice into cylindrical pieces and shall claim the same broadly.

The present invention provides a machine that may cut ice into cylindrical pieces substantially at the same rate of production as ice cubes, the only added cost over the cutting of cubes being in the loss of the irregular pieces at areas 91, which is a relatively small loss in view of the great production that the present machine accomplishes.

A modified but very compact form of machine embodying the invention is disclosed in Figs. 18 to 24, inclusive. Aside from the feature of compactness, this machine is designed to produce less than the machine shown in Fig. 1. The use of a heated fluid medium, as well as equal distribution of heat over the entire cutting area of each grid, has increased the production of the machine shown in Fig. 1 to such an extent that many users desire a smaller machine of considerably less capacity. In my prior patent I pointed out that a machine of the type shown in Fig. 1 will cube a 200 pound cake of ice in three minutes compared to a period of fifteen minutes for a 50 pound cake of ice cubed by a machine having electrically heated resistance wires as the cutting elements. Consequently, the machine shown in Figs. 18 to 24, inclusive, has been designed to meet the desire of compactness and a reduced production.

This is accomplished by employing a slidably movable tray 100 and placing grid B close to grid A. Tray 100 functions to cover grid B so that the slabs of ice cut by grid A cannot drop down upon and move through grid B until tray 100 is manually removed by the operator.

As illustrated, tray 100 is a substantially flat sheet of metal formed with tracks 101 and 102 and a pair of ribs 103 upon which the ice rests and moves forwardly toward grid A. Slot 104 is provided along the upper edge of the front wall of body 105. Slot 104 is so formed as to extend under top plates 106, which plates are removably secured at 107 to the frame of body 105. The overlapping edges of top plates 106 thus cooperate with slot 104 to provide a track for the edges of tray 100. The front edge of tray 100 is formed into a downwardly turned flange 108 that serves to cover slot 104 when tray 100 is moved into closed position. This flange 108 also carries a handle 109 to permit tray 100 to be readily gripped and moved forwardly or backwardly in slot 104. A cross bar 110, or other like suitable means, may be provided as part of the frame structure for supporting tray 100 in slidable relation. Grid B is constructed in substantially the same manner as heretofore described. A further description thereof is, therefore, unnecessary except that it may be pointed out that its frame 15 is mounted upon side frame members 17 so that as the ice is completely slabbed by grid A and moved to the rear of this grid A, it will lie directly over the cutting elements of grid B. These ice slabs will not be able to move through grid B until tray 100 is moved outwardly, as illustrated by the dotted line position shown in Fig. 19. A housing 115 may be provided to receive the ice as it is slabbed by grid A. A rubber backing 116 is mounted inside the rear wall of housing 115 so as to prevent the slabs of ice from being chipped or broken by reason of striking against this rear wall of housing 115. Inlet headers 44 on opposite sides of grid A may connect to their source of fluid supply at connection 117 which continues as pipe 118 to a valve 119. Outlet headers 45 on opposite sides of grid A connect at their bottom to one of the side sections 120 of the outlet header extending about frame 15 of grid B. This is illustrated in Figs. 20 and 21. Pipe 121, disposed directly above pipe 120, is the corresponding inlet header section 121 on that side of grid B. The heated fluid medium is supplied to the inlet header of this form of machine in the same manner as described in connection with grid B shown in Fig. 3.

From the foregoing description, it will be obvious that cylindrical pieces of ice of service size may be economically produced and in practically the same quantities and at the same rate as ice cubes. The advantages of cylindrical pieces of service size are numerous and the demand therefor is rapidly increasing. The arrangement of the cutting units 60 permits a removably constructed grid to be provided, which, also, allows these cutting units to be individually removed for repair or replacement. Also, the fluid distribution uniquely provides for even distribution of the heating fluid so that uniform cutting is obtained and the ice cake is prevented from tending to travel faster through the grid at one side. The construction of each cutting unit assures retention of the circular cutting areas, as well as a minimum cutting edge, so that these circular cutting areas may be arranged closer together to reduce waste. In so far as the feature of cutting ice into cylindrical pieces is concerned, I do not wish to be limited to a heating medium of the fluid type because it is readily apparent that cutting elements shaped like members 61 and 62 may be heated by other forms of heating means, although these other forms may not be as efficient and rapid in action.

Without further elaboration, the foregoing will so fully explain the gist of my invention that others may, by applying current knowledge, readily adapt the same for use under varying conditions of service, without eliminating certain features, which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:

1. In an ice cutting machine, the combination of a grid comprising a plurality of pipes for cutting a cake of ice, connections for supplying a heating medium to said pipes, said connections including inlet and outlet headers at the ends

of said pipes, and means for arranging said cutting pipes in pairs, the pipes of each pair being carried by said means in looped relation to define a plurality of substantially circular cutting edges adapted to cut the cake of ice into a plurality of substantially cylindrical pieces.

2. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of cutting elements that form a plurality of substantially circular cutting edges adapted to cut a cake of ice into a plurality of substantially cylindrical pieces, and means for feeding a heating medium to said cutting elements so that said heating medium flows in opposite directions through opposite halves of each circular cutting edge.

3. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of pipes that form a plurality of substantially circular edges adapted to cut a cake of ice into a plurality of substantially cylindrical pieces, means for supplying a heating medium to said pipes, and depending skirt-like means attached to said pipes at one side.

4. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of cutting elements that form a plurality of substantially circular cutting edges adapted to cut a cake of ice into a plurality of substantially cylindrical pieces, means for heating said cutting elements, depending skirt-like means along said circular cutting edges, said skirt-like means being attached to said cutting elements at one side, and resilient mounting means for the ends of said cutting elements.

5. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of cutting elements defining one or more circular cutting areas adapted to cut a cake of ice into substantially cylindrical pieces, means upon said frame for removably supporting said cutting elements as units separable from each other, and a source of heat supply for said units.

6. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of cutting elements having cutting edges defining one or more circular cutting areas adapted to cut a cake of ice into substantially cylindrical pieces, means upon said frame for removably supporting said cutting elements as units separable from each other, and a source of heat supply to heat said cutting elements, said source including means for causing the heating medium to flow in opposite directions along the cutting edges of each unit to provide for a relative uniform cutting thereby.

7. In an ice cutting machine, the combination of a grid comprising a frame and a plurality of cutting elements supported by said frame, said cutting elements having cutting edges defining a plurality of substantially circular cutting areas, there being open spaces of irregular shape between the cutting edges of the respective circular cutting areas, means for heating said cutting elements, and means for placing a block of ice upon said cutting elements whereby to cut the block into a plurality of circular and irregular pieces corresponding to said circular and irregular cutting areas.

8. In an ice cutting machine, the combination of a grid comprising a plurality of pipes for cutting a cake of ice into a plurality of smaller pieces, said pipes being bent in a formation providing a plurality of substantially circular cutting areas, and connections for supplying a heating medium to said pipes, the formation of said pipes providing for a continuous flow of the heating medium from end to end through said pipes.

9. In an ice cutting machine, the combination of a grid comprising a plurality of pipes for cutting a cake of ice into a plurality of smaller pieces, means for mounting said pipes as units of at least two pipes each, said pipes of each unit being formed into circular portions that oppose each other to provide substantially circular cutting areas, and connections for supplying a heating medium to said pipes to provide a continuous flow of the heating medium through said pipes.

10. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of pipes for cutting a cake of ice into a plurality of smaller pieces, means for heating said pipes, and means for mounting said pipes as units upon said frame, the pipes of each unit being formed into circular portions that cross each other in opposing relation to provide a plurality of substantially circular cutting areas, said mounting means carrying said pipes of each unit where they cross each other so that a continuous cutting edge is provided from end to end of a width that is substantially no greater than the diameter of said pipes.

11. In an ice cutting machine, the combination of a grid comprising a frame, a plurality of pipes for cutting a cake of ice into a plurality of smaller pieces, means for mounting said pipes in pairs crosswise of said frame, the pipes of each pair being formed into circular portions that oppose each other to provide substantially circular cutting areas, inlet and outlet headers for a heated fluid medium along the sides of said frame supporting said pipes, and connections between said inlet and outlet headers and said pipes, said connections including a connection at opposite ends of each pipe of each pair with said inlet and said outlet headers whereby the heated fluid medium will flow in opposite directions through the pipes of each pair.

12. In an ice cubing machine, the combination of a frame, a table carried by said frame and arranged for feeding a cake of ice forwardly, a grid interposed in the normal path of travel of such cake of ice and substantially perpendicular to such path, said grid comprising a plurality of cutting elements to divide such cake into a set of superimposed slabs, a second grid of cutting elements arranged to receive said slabs from said table to convert said slabs into a plurality of smaller cut pieces, and conveying means for first holding said cake of ice upon said table until completely slabbed and thereafter to convey said slabs to said second grid.

13. In an ice cubing machine, the combination of a frame, a table carried by said frame and arranged for feeding a cake of ice forwardly, a grid interposed in the normal path of travel of such cake of ice and substantially perpendicular to such path, said grid comprising a plurality of cutting elements to divide such cake into a set of superimposed slabs, a second grid of cutting elements arranged to receive said slabs from said table to convert said slabs into a plurality of smaller cut pieces, and means for holding said cake of ice upon said table until completely slabbed whereby to prevent said slabs from moving upon said second grid until released by said means, said means comprising a retaining member substantially shaped to said cake of ice and slidably carried upon said frame.

14. In an ice cubing machine, the combination

of a frame, a table carried by said frame and arranged for feeding a cake of ice forwardly, a grid interposed in the normal path of travel of such cake of ice and substantially perpendicular to such path, said grid comprising a plurality of cutting elements to divide such cake into a set of superimposed slabs, a second grid of cutting elements arranged to receive said slabs from said table to convert said slabs into a plurality of smaller cut pieces, and means for holding said cake of ice upon said table until completely slabbed whereby to prevent said slabs from moving upon said second grid until released by said means, said means comprising a relatively channel-shaped member embracing three sides of said cake of ice as it is being slabbed, a track upon said frame along which said member is guided, and a manually releasable device for holding said member in a position to receive said slabs before they are moved to said second grid.

15. In an ice cubing machine, the combination of a frame, a table carried by said frame and arranged for feeding a cake of ice forwardly, a grid interposed in the normal path of travel of such cake of ice, said grid comprising a plurality of cutting elements to divide such cake into a set of superimposed slabs, a second grid of cutting elements arranged to receive said slabs from said table to convert said slabs into a plurality of smaller cut pieces, and means associated with said table for preventing the said slabs from engaging said second grid of cutting elements, said means being movable along said table to allow said slabs to engage said second grid of cutting elements.

16. In an ice cubing machine, the combination of a frame, a table carried by said frame and arranged for feeding a cake of ice forwardly, a grid interposed in the normal path of travel of such cake of ice, said grid comprising a plurality of cutting elements to divide such cake into a set of superimposed slabs, and a second grid of cutting elements arranged to receive said slabs from said table to convert said slabs into a plurality of smaller cut pieces, said table including a removable plate adapted to be withdrawn from under said slabs whereby to allow said slabs to engage said second grid of cutting elements.

WILLIAM CARL PFEIL.

CERTIFICATE OF CORRECTION.

Patent No. 2,316,282. April 13, 1943.

WILLIAM CARL PFEIL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 19, for "bene" read --been--; page 3, second column, line 42, for "as 62" read --as 63--; page 4, second column, line 1, for "pasing" read --passing--; line 47, for "now" read --flow--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of June, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)