United States Patent

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[54] **ICE-FLAKE-MAKING MACHINE**
7 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **62/354,** 100/147
[51] **Int. Cl.** **F25c 1/14**
[50] **Field of Search** 62/320, 354; 100/147, 148

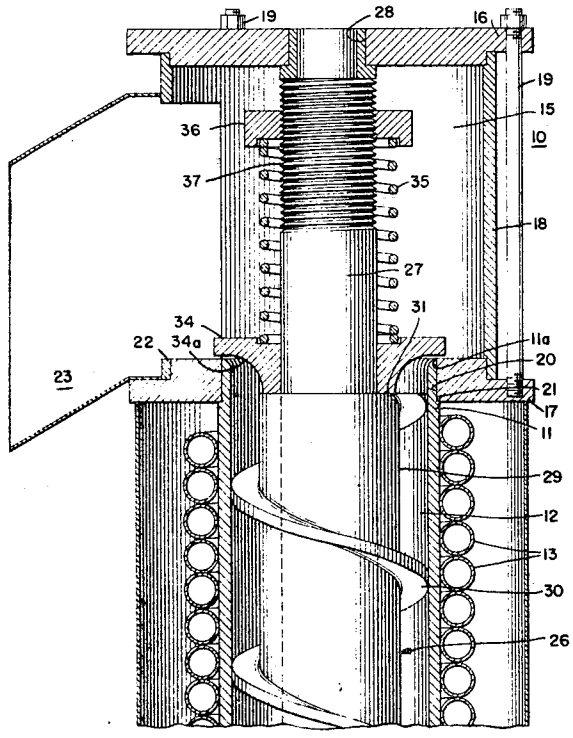
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ABSTRACT: There is provided an improvement in an icemaking machine of the type wherein there is a cylindrical vertical chamber including a chamber sidewall having a discharge opening at its upper end. Means are provided for supplying water to the lower end of the chamber. Refrigeration means are provided for freezing the water on the inside surface of the chamber wall. A screw conveyor is rotatably mounted within the chamber and includes a helical screw in close proximity to the inside surface of the chamber to scrape off ice therefrom as the conveyor rotates and delivers a column of ice toward the opening. A generally annular breaker member is provided around the upper portion of the screw conveyor in the path of the column of ice moving toward the opening. Means are provided for biasing the breaker member downwardly.



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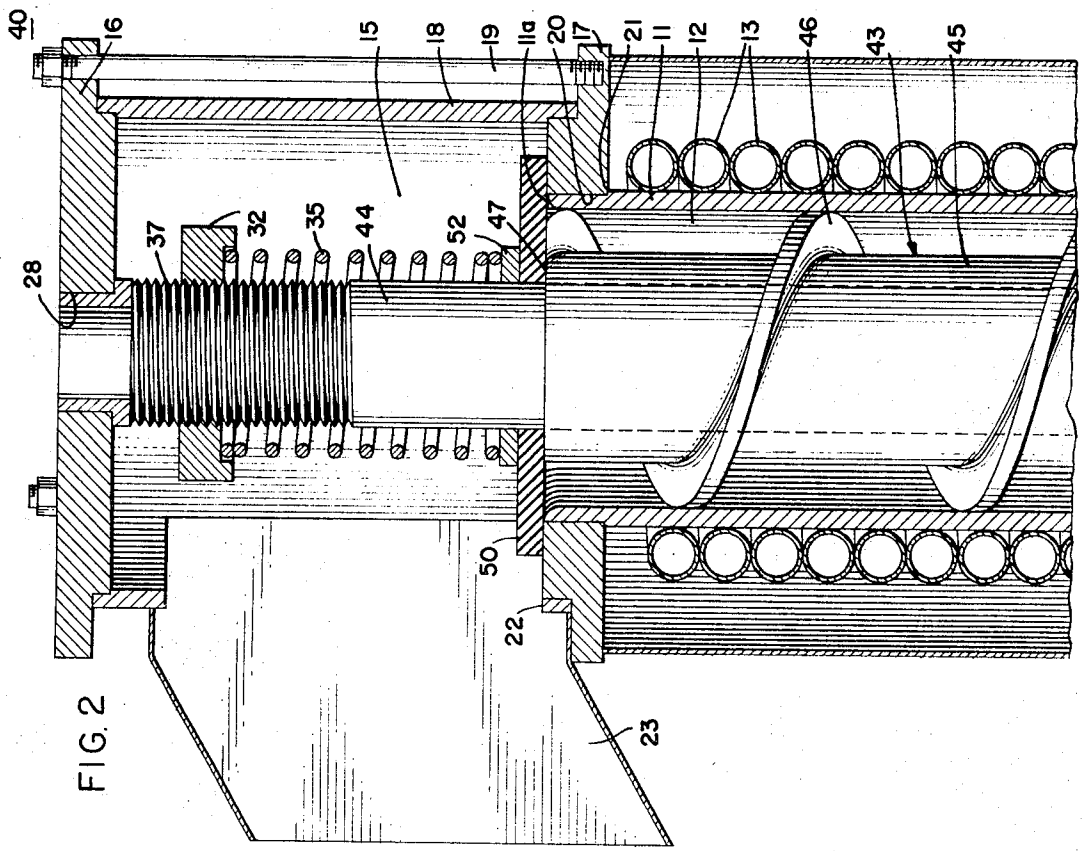


FIG. 2

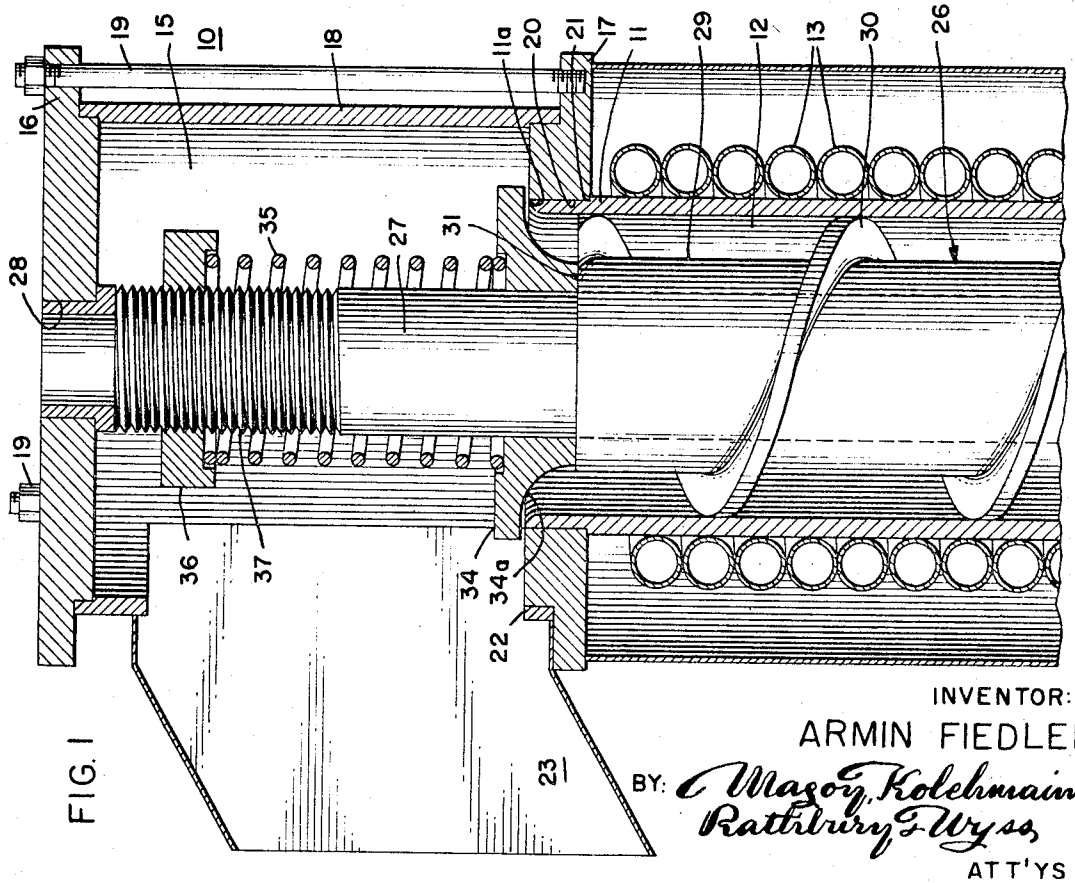


FIG. 1

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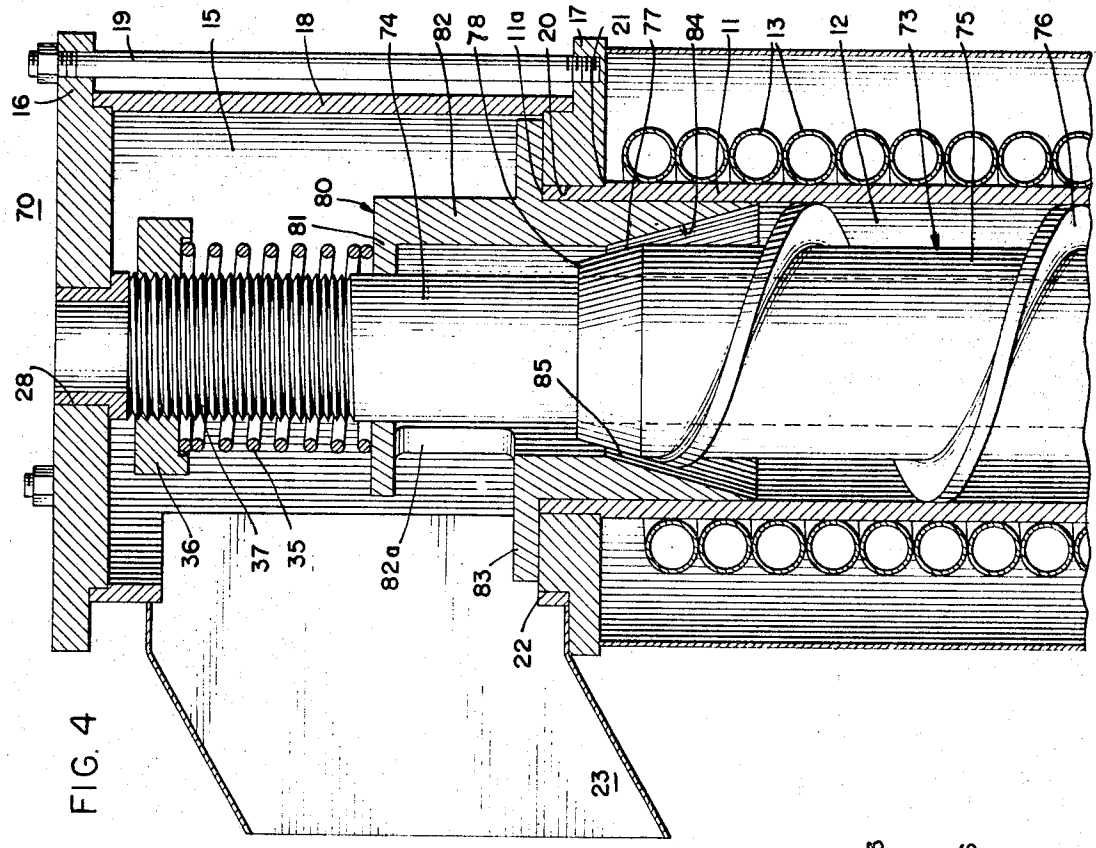


FIG. 4

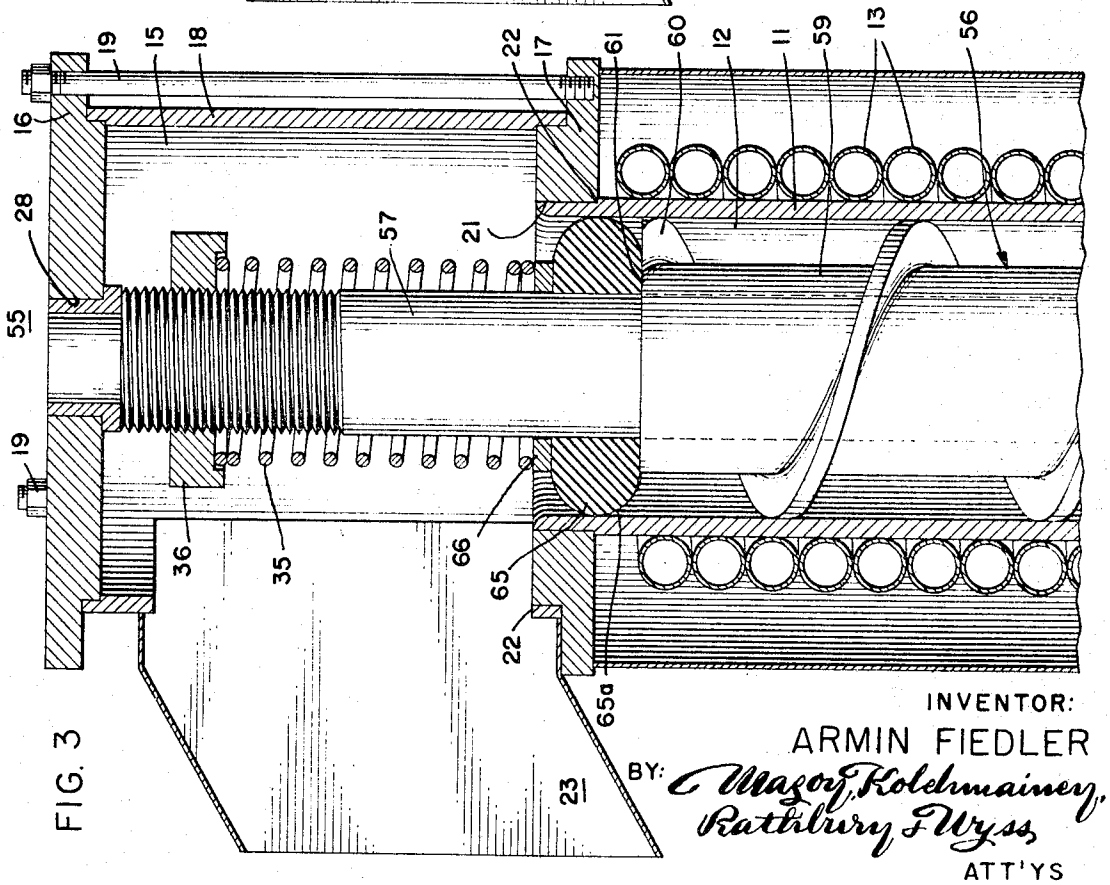


FIG. 3

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ICE-FLAKE-MAKING MACHINE

This invention relates generally to icemaking and more particularly to improvements in machines for making small pieces or flakes of ice suitable for use in drinks or the like.

It is commercially known in the art to make ice by freezing water on the inside wall of a vertical cylinder and continuously scraping the ice from the inside vertical wall by means of a rotating screw conveyor or auger that has an outside diameter almost equal to the diameter of the cylinder.

The rotating screw conveyor raises the ice in the shape of a hollow cylindrical column that has a helical cut or slot therethrough where the thread of the helix extends. This thread or cut in the vertically moving column of ice facilitates breaking of the column of ice into small pieces. One such icemaking machine is illustrated and described in my U.S. Pat. No. 3,326,014 granted June 20, 1967. The present invention may be considered as an improvement over the icemaking machine disclosed therein. In all the various designs of flake ice mechanisms that employ a screw to eject the ice, the temperature and density of the ejected ice is dependent upon a number of fixed and variable factors or conditions. Fixed factors include the screw design (pitch and depth of thread) and screw speed. Variable factors are water and air temperatures that affect the refrigerating capacity and the heat load. To compensate for these variable factors, according to the present invention, a spring-loaded or resilient member is used to automatically open the path for an increased flow of ice, keeping a uniform load on the drive and motor and providing an ice of uniform temperature and density. Setting the tensions of the spring or resilient member makes it possible to adjust for the type of ice desired.

Accordingly it is an object of the present invention to provide an arrangement for facilitating the breaking up of the upward-moving column of ice at the top of the vertical cylinder.

A further object of the present invention is to provide an arrangement for controlling the temperature and density of the ice as it is broken off at the top of a moving column of ice.

Yet a further object of the present invention is to provide means for adjustably selecting the ice condition of the ice leaving the icemaking machine.

A further object of the present invention is to provide an improved ice-flake-making machine.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with these and other objects of the present invention, there is provided means for discharging ice particles from the upper end of a vertical ice-flake-making cylinder, the cylinder being formed with a recessed area or cutaway section to which is connected a discharge chute. A generally annular breaker member is positioned around the upper portion of the screw conveyor in the icemaking machine such that it extends into the path of the column of ice moving toward the opening. In a preferred embodiment the breaker member is biased toward the screw conveyor. According to yet another feature, the bias of the breaker member may be selectively adjustable to provide for varying the characteristics of the ice produced by the icemaking machine.

For a better understanding of the present invention, reference may be had to the accompanying drawings wherein:

FIG. 1 is a fragmentary sectional view of an icemaking machine constructed in accordance with and embodying the present invention;

FIG. 2 is a fragmentary sectional view of another embodiment of an icemaking machine constructed in accordance with an embodiment of the present invention;

FIG. 3 is a cross-sectional view of yet another embodiment of the present invention; and

FIG. 4 is a fragmentary sectional view of still another embodiment of the present invention.

Referring now to the drawings, and particularly to FIG. 1, there is fragmentarily illustrated an ice-flake-making machine **10** comprising a vertical cylinder or tube **11** that forms the sidewall of a vertically extending cylindrical freezing chamber **12**. Surrounding the central portion of the tube **11** are evaporator coils **13** which extend over a substantial portion of the length of the tube **11** and are connected to a conventional refrigeration compressor and condenser (not shown).

A discharge chamber **15** is defined at the top of the tube **11** by a pair of end walls **16** and **17** interconnected by a cylindrical sidewall **18** and held together by suitable tie members **19**. The lower end wall **17** is provided with a central opening **20** so that the discharge chamber **15** may be positioned against a shoulder **21** formed on the outer wall of the tube **11**. The cylindrical sidewall **18** is cut away to form an ice discharge opening **22** opening into an ice discharge chute **23**.

Rotatably mounted within the tube **11** and coaxial therewith is a screw conveyor assembly **26** including an upper portion **27** journaled in an opening **28** in the upper end wall **16** of the discharge chamber **15**. The screw conveyor **26** also includes a lower portion **29** having a helical screw thread **30** defined thereon. The upper and lower portions **27** and **29** form a shoulder **31** at their juncture. The screw conveyor **26** may be driven in a conventional manner.

It will be understood that in use water is maintained at a desirable level just below the top of the evaporator coils **13**. The water freezes against the inner surface of the tube **11**. The screw conveyor assembly **26** is rotated so that the helical threads **30** thereon scrape the ice from the tube wall and convey it in a column of ice upwardly toward the upper end of the tube **11**.

For breaking up the column of ice, there is provided a generally annular breaker member **34** around the upper portion **27** of the screw conveyor assembly **26** and positioned in the path of the column of ice moving toward the discharge opening **23**. In the illustrated embodiment the breaker member **34** comprises an annular member normally seated against the shoulder **31** and having an arcuate lower surface **34*a*** directed upwardly and outwardly from the freezing chamber **12**. The breaker member **34** may be biased downwardly against the seat **31** by a suitable spring **35** and the biasing force may be selectively adjusted by an adjusting nut **36** threaded on threads **37** contained on the upper outer surface of the upper portion **27** of the screw conveyor assembly. Thus the characteristics of the ice flake formed by the ice-flake-making machine **10** may be varied and controlled by the selective adjustment of the biasing load so as to provide the desired temperature and density of ice flakes.

FIG. 2 illustrates an embodiment of an ice-flake-making machine **40** similar to that of FIG. 1, but having a modified breaker member. More specifically the ice-flake-making machine **40** comprises the vertical cylinder or tube **11** forming the sidewall of the vertically extending cylindrical freezing chamber **12**. Surrounding the central portion of the tube **11** are the evaporator coils **13**. Connected to the upper end of the tube **11** is a discharge chamber **15** formed of the end walls **16** and **17** and the cylindrical sidewall **18** held together by the tie members **19**. The lower end wall **17** is formed with the central opening **20** fitting in the shoulder **21** of the tube **11**. Moreover the cylindrical sidewall **18** is provided with an ice discharge opening **22** opening into an ice discharge chute **23**.

Rotatably mounted within the tube **11** and coaxial therewith is an auger or screw conveyor assembly **43** having an upper portion **44** journaled within the opening **28** in the upper end wall **16**. A lower portion **45** is provided with helical threads **46** to provide for removing the ice which forms on the inner sidewall of the tube **11**. The upper and lower portions **44** and **45** define a shoulder **47** at their juncture substantially in line with the top **11*a*** of the tube **11**.

For breaking up the ice, there is provided a breaker member **50** in the form of a resilient disc or washer positioned on the upper portion **44** of the screw conveyor assembly **43** and seated on the shoulder **47** thereof. The breaker member **50**

moreover is normally seated against the top 11*a* of the cylindrical tube 11.

In the embodiment of FIG. 2 there is provided biasing means in the form of the spring 35 interposed between the adjusting nut 36 on the threads 37 of the screw conveyor assembly 43, and the resilient disc 50. A washer 52 may be provided as a bearing surface for the spring 35 against the resilient disc 50.

FIG. 3 illustrates an ice-flake-making machine 55 having yet another automatic form of breaker member. Specifically, as therein illustrated, the icemaking machine 55 comprises the vertical tube 11 forming the sidewall of the vertically extending cylindrical freezing chamber 12. Surrounding the central portion of the tube 11 are the evaporator coils 13. The discharge chamber 15 is secured to the top of the tube 11 and consists of the end walls 16 and 17 and the cylindrical sidewall 18 held together by the tie members 19. The lower end wall 17 is provided with the central opening 21 fitted over a shoulder 22 of the tube 11. The cylindrical sidewall 18 is provided with the ice discharge opening 22 aligned with the ice discharge chute 23.

Rotatably mounted within the tube 11 and coaxial therewith is a screw conveyor assembly 56 having an upper portion 57 journaled within the opening 28 in the upper end wall 16. The screw conveyor assembly 56 also includes a lower portion 59 having helical screw threads 60 thereon. The upper and lower portions 57 and 59 form a shoulder 61 at their juncture.

In accordance with the embodiment of FIG. 3, there is provided a breaker member 65 in the form of a resilient torus or doughnut of generally D-shape cross section with the outermost edge 65*a* thereof in close proximity to the inside surface of the cylindrical cylinder 11. The torus 65 is biased against the shoulder 61 by the spring 35 positioned between the adjusting nut 36 and the torus 65. A washer 66 may be positioned between the spring 35 and the torus 65 to form a wear surface.

In operation the torus 65 will squeeze together and deflect under the force of the upwardly moving column of ice so that the outermost edge 65*a* thereof will be squeezed closer or further from the inner sidewall of the tube 11, thereby regulating the characteristics and condition of the ice flakes discharged from the device.

FIG. 4 illustrates yet another embodiment of an icemaking machine 70 having another embodiment of a breaker member. As therein illustrated the icemaking machine 70 includes the vertical cylinder or tube 11 forming the sidewall of the vertically extending cylindrical freezing chamber 12. Surrounding the central portion of the tube 11 are the evaporator coils 13. The upper end of the tube 11 defines the shoulder or seat 11*a*. Secured to the top of the tube 11 is the discharge chamber 15 formed of the end walls 16 and 17 and the cylindrical sidewall 18 held together by the tie members 19. The lower end wall 17 is provided with the central opening 20 fitted over the shoulder 21 on the outer wall of the tube 11. The cylindrical sidewall 18 is provided with an opening 22 defining an ice discharge and connecting to the ice discharge chute 23.

Rotatably mounted within the tube 11 is a screw conveyor assembly 73 having an upper portion 74 journaled within the opening 28 in the upper end wall 16, and a lower portion 75 containing helical screw threads 76. The upper edge of the lower portion 75 and helical threads 76 is tapered upwardly and inwardly, as illustrated at 77, terminating in a shoulder 78 defined between the taper 77 and the upper portion 74 of the screw conveyor assembly 73.

In accordance with the present invention there is provided a breaker member 80 of generally inverted cup shape having a bottom wall 81 and a generally cylindrical sidewall 82 and an annular upwardly extending flange 83 is formed integrally with the sidewall 82 intermediate its length and rests upon the upper end 11*a* of the tube 11. The lower inner surface of the sidewall 82 is generally cone shaped having a downward and outward taper 84 complementary with the taper 77 on the screw conveyor assembly 73. The sidewall 82 is provided with a discharge opening 82*a* remote from the taper 84 thereof and adjacent to the bottom wall, aligned with the ice discharge opening 22 and ice discharge chute 23 to provide for the discharge of the ice through the breaker member 80.

It has been found that the upwardly moving column of ice will be deflected inwardly to pass through the annular space 85 formed between the tapers 77 and 84, and will pass therebetween to provide the desired characteristics to the ice flakes.

In the illustrated embodiment the breaker member 80 is biased downwardly so as to rest upon the upper end 11 *of the tube 11 by means of the spring 35 bearing against the upper surface of the breaker member 80 and the adjusting nut 36 adjustably held on the threads 37 of the screw conveyor assembly 73.*

From the above-detailed descriptions of the invention, it will be understood that the upwardly moving column of ice will strike the breaker members which assist in providing ice with a desired temperature and density. Moreover the desired characteristics of ice may be varied by adjusting the position or tensioning of the breaker members. By the use of resilient breaker members, the icemaking machine will readily adjust for various rates and feeds of the column of ice.

Although the present invention has been described by reference to several embodiments thereof, it will be apparent that numerous other modifications and embodiments may be devised by those skilled in the art and it is intended by the appended claims to cover all modifications and embodiments which fall within the true spirit and scope of the present invention.

What I claim as new and desire to be secured by Letters Patent of the United States is:

1. In an icemaking machine, means forming a vertical cylindrical freezing chamber having a discharge opening at its upper end defined by the chamber sidewall at the upper end thereof, means forming a water supply inlet to the chamber adjacent the lower end thereof, refrigeration means for freezing the water on the inside surface of said wall, a screw conveyor rotatably mounted within the chamber including an upper portion and a lower portion having a helical thread in sufficiently close proximity to said inside surface of said chamber to scrape off ice therefrom as the conveyor rotates and delivers a column of ice toward said opening, a generally annular breaker member around said upper portion in the path of the column of ice moving toward said opening for closing the same, and biasing means for biasing said member toward a closed position against said upper end of said chamber sidewall whereby said ice is extruded radially outward under resilient pressure exerted thereon between said breaker member and said upper end of said chamber sidewall.

2. An icemaking machine as set forth in claim 1 wherein said upper and lower portions form a shoulder at their juncture defining a seat, and said member rests on said seat.

3. An icemaking machine as set forth in claim 2 wherein said breaker member has an upwardly and outwardly directed arcuate lower surface.

4. An icemaking machine as set forth in claim 2 wherein said breaker member is a resilient disc normally seated against the top of said cylindrical chamber.

5. An icemaking machine as set forth in claim 2 wherein said breaker member is a resilient torus having its outermost edge in close proximity to the inside surface of said cylindrical chamber.

6. An icemaking machine as set froth in claim 1 wherein said breaker member includes an inverted cup-shaped member having a cone-shaped lower inner surface and a discharge opening in its sidewall remote from said lower inner surface, said lower portion and said helical thread having a complementary taper.

7. An icemaking machine as set forth in claim 1 including means for selectively adjusting the biasing force exerted by said biasing means.