Dec. 3, 1963 D. L. BOLLEFER 3,112,622

MACHINE FOR MAKING CHIPPED ICE

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FIG. 1

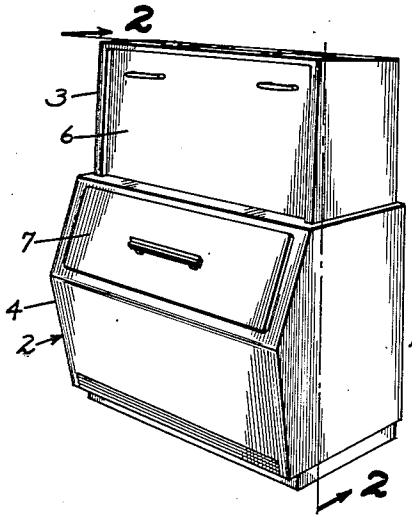


FIG. 2

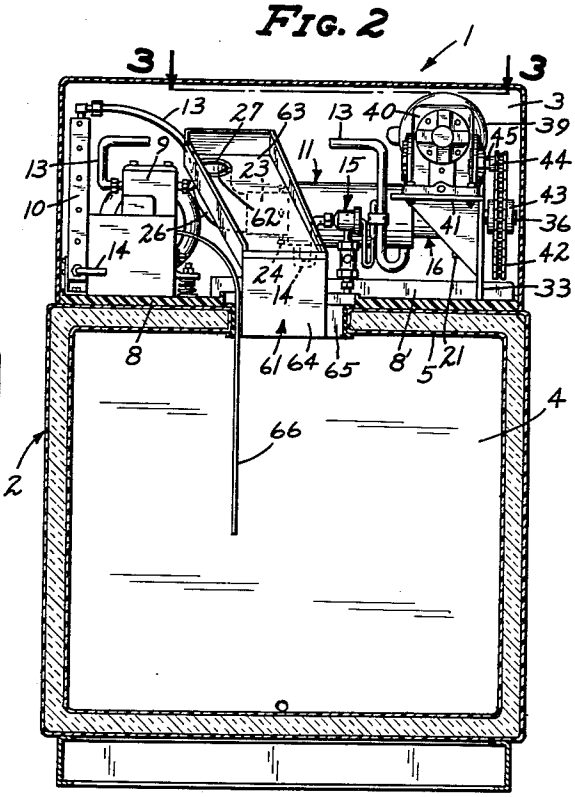


FIG. 4

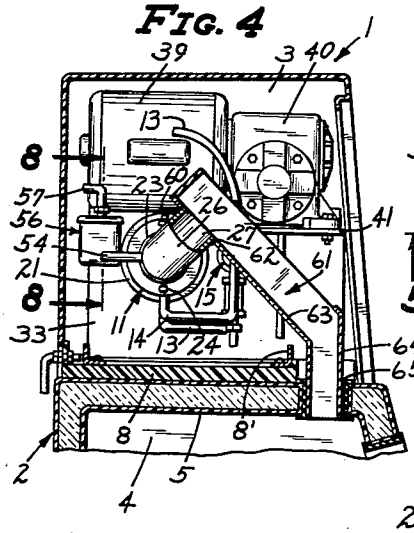
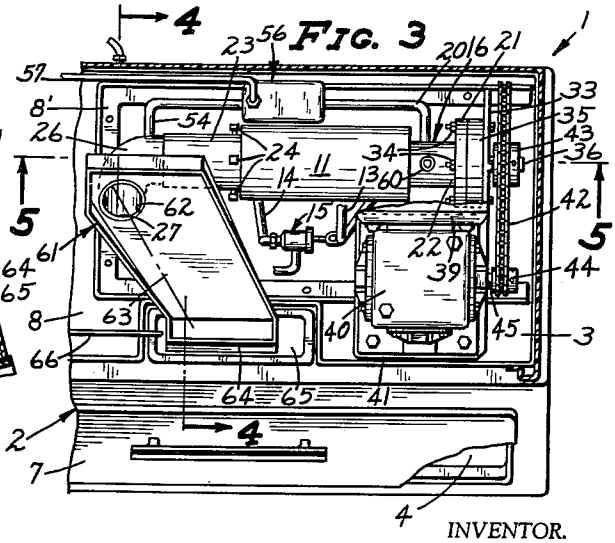


FIG. 3



INVENTOR.

DWIGHT L. BOLLEFER

BY

Merchant & Merchant

ATTORNEYS

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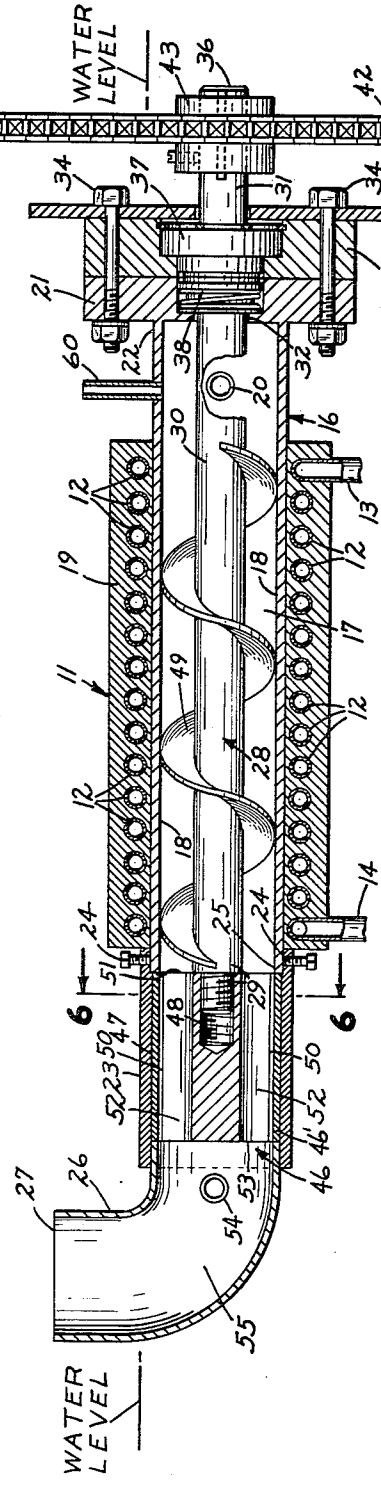


FIG. 5

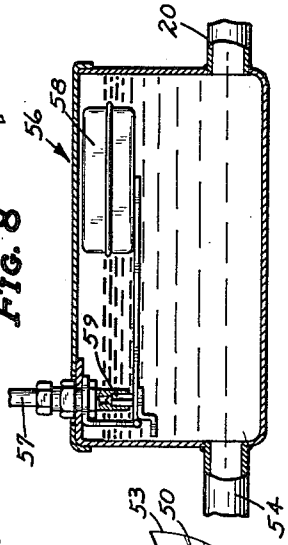


FIG. 8

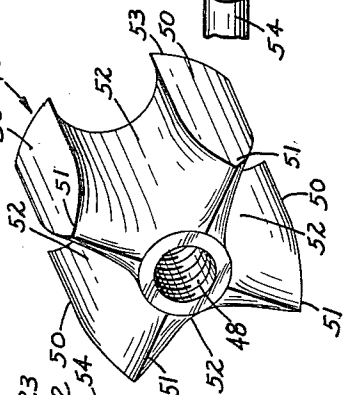


FIG. 7

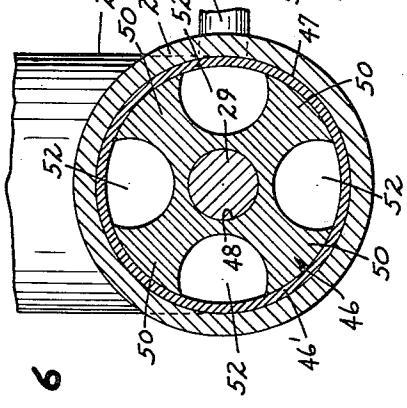


FIG. 6

INVENTOR.
DWIGHT L. BOLLEFER
BY
Merchant & Merchant
ATTORNEYS

United States Patent Office

3,112,622

Patented Dec. 3, 1963

3,112,622

MACHINE FOR MAKING CHIPPED ICE

Dwight L. Bollefer, Minneapolis, Minn., assignor to Kodiak Inc., St. Paul, Minn., a corporation of Minnesota

Filed June 21, 1960, Ser. No. 37,686
9 Claims. (Cl. 62—320)

This invention relates generally to ice making machines, and more particularly it relates to a machine for making chipped ice.

Previous machines for making chipped ice have generally not produced optimum satisfaction since they have not been successful in producing ice chips of a substantially uniform size, it being well recognized in the art that one of the most important criteria for judging the quality of a machine for making chipped ice is its ability to produce ice chips of a substantially uniform size. Previous machines for making chipped ice have also not been satisfactory in a commercial sense because of their inability to produce individual ice chips which are not characterized by the presence of weakening cracks and fissures. A further problem inherent in previous designs for machines for making chipped ice has been the difficulty in preventing the individual chips from coagulating and freezing together after they have been produced and transported to a storage bin. In light of the above, an important object of this invention is the provision of a machine for making chipped ice which, in addition to other improvements, overcomes the above enumerated specific problems and faults inherent in previous designs of machines for making chipped ice.

More specifically, an important object of this invention is the provision of a generally horizontally disposed machine for making chipped ice which is automatic and continuous in its operation.

Another object of this invention is the provision of a machine for making chipped ice which is provided with a water bath for tempering the continuous flow of chipped ice from the machine and preventing coagulation of the particles of chipped ice.

Another object of this invention is the provision of a machine for making chipped ice which is provided with a novel die member for compacting the ice which is removed from the generally cylindrical freezing surface of my machine.

Still another object of my invention is the provision of a machine for making chipped ice which is provided at its outlet end with an upturned spout which cooperates with a rotating die member for breaking the continuous flow of ice and aiding in the production of ice chips of a substantially uniform size.

Still another object of this invention is the provision of a machine for making chipped ice which is capable of producing large quantities of chipped ice, and which is continuous in operation and does not require the attention of an operator.

Further objects of this invention reside in the provision of a machine for making chipped ice which is extremely simple in construction, comprised of a minimum of parts, extremely strong and durable throughout continuous and prolonged operation, and highly efficient in the vindication of its purpose.

The above and still further objects of this invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, wherein like reference characters indicate like parts or elements throughout the several views:

FIG. 1 is a view in perspective of the cabinet portion of my ice making machine;

FIG. 2 is an enlarged view in vertical section taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged view in horizontal section taken on the line 3—3 of FIG. 2, some parts being broken away;

FIG. 4 is a view in vertical section taken on the line 4—4 of FIG. 3, some parts being broken away;

FIG. 5 is a greatly enlarged view in vertical section taken on the line 5—5 of FIG. 3, some parts being broken away;

FIG. 6 is a further enlarged view in transverse vertical section taken on the line 6—6 of FIG. 5;

FIG. 7 is a view in perspective of the die member of my invention; and

FIG. 8 is a further enlarged view in vertical section taken on the line 8—8 of FIG. 4, some parts being broken away.

Referring with greater particularity to the drawings, the reference numeral 1 represents my machine for making chipped ice in its entirety, and the reference numeral 2 represents in general the cabinet portion of my invention. The cabinet 2 defines an upper compartment 3, which contains the main apparatus of my invention as will hereinafter be set forth, and a lower storage bin 4 for storing the chipped ice after it is produced. The upper compartment 3 and the lower storage bin 4 are separated by an intermediate wall 5, and the upper compartment 3 is provided with a door 6 and the lower storage bin 4 is provided with a door 7, the doors 6, 7 being disposed in the conventional manner.

A generally rectangular drain tray 8 is secured to the intermediate wall 5, the drain tray 8 supporting conventional refrigeration apparatus including a motor driven compressor 9 and a water cooled condenser 10. The refrigeration system further includes an evaporator 11 comprising a plurality of evaporator coils 12 that are suitably connected to the compressor 9 and the condenser 10 by means of conduits 13 and 14 respectively, a throttle control element, represented in general by the reference numeral 15, interposed in the conduit 14, and other well-known control elements, not shown. The refrigeration apparatus may be of any well-known and readily available type, and it in itself does not comprise the instant invention. Therefore, for the sake of brevity, further showing and description of the refrigeration apparatus is omitted.

Referring in particular to FIG. 5, it will be seen that my ice making machine 1 comprises a generally horizontally disposed freezing cylinder, represented in general by the reference numeral 16. The freezing cylinder 16 defines a chamber 17 bounded by an inner generally cylindrical freezing surface 18. The greater intermediate portion of the freezing cylinder 16 defines an enlarged portion 19, which is formed, preferably by casting, with the evaporator coils 12 imbedded in axially spaced relationship within the enlarged portion 19. A primary water inlet pipe 20 is connected to the freezing cylinder 16 for maintaining the chamber 17 full of water, the water pipe 20 being preferably connected to an ordinary water supply source, not shown. The refrigeration apparatus, and particularly the evaporator coils 12, is operated so as to refrigerate the inner surface 18 of the freezing cylinder 16 so as to cool water received within the chamber 17 and freeze a layer of ice, not shown, on said surface 18.

In further reference to FIG. 5, it will be noted that an annular closure plate 21 is rigidly secured to the rearward end 22 of the cylinder 16. A cylinder extension sleeve 23 is secured, preferably by the circumferentially spaced cap screws 24, to the forward end 25 of the cylinder 16. Also, an upturned generally tubular outlet spout 26 having a closed imperforate bottom portion is rigidly secured to the extension sleeve 23, the outlet spout 26 being disposed with its upper end 27 at a higher elevation than the upper extremity of the chamber 17 so as to

prevent the escape of water contained within the chamber 17. The chamber 17, the extension sleeve 23 and the outlet spout 26 are all formed so that a constant inner diameter is maintained throughout the machine 1 so as to permit the easy passage of the particles of chipped ice, not shown, throughout the machine 1.

In accordance with my invention, a helical auger, represented in general by the reference numeral 28, is received within the freezing cylinder 16 and mounted for rotation therein. The auger 28 defines a forward end 29 disposed adjacent the extension sleeve 23 and a rearward end 30 disposed adjacent the closure plate 21. The auger 28 defines an integrally formed driving shaft 31 at its rearward end 30 which projects generally centrally through a centrally disposed aperture 32 defined in the closure plate 21. For the purpose of rigidly securing the freezing cylinder 16 to the cabinet 2, a U-shaped frame section 8' is provided with an upstanding mounting bracket 33 which is rigidly secured, as by welding, to the frame section 8'. The closure plate 21 is rigidly secured to the mounting bracket 33 by means of a plurality of circumferentially spaced bolts 34, the annular bearing block 35 being interposed between the closure plate 21 and the mounting bracket 33, as seen particularly in FIG. 5. It will be noted that the driving shaft 31 projects through the closure plate 21, the bearing block 35 and the mounting bracket 33, and is journalled within the bearing block 35 by means of a conventional ball bearing assembly 37. For the purpose of preventing leakage of water contained within the chamber 17, a seal assembly 38 is disposed between the ball bearing assembly 37 and the closure plate 21.

For the purpose of imparting normally continuous rotation of approximately 5–10 r.p.m. to the auger 28, an electric motor 39 and a gear reducer 40 are provided, the latter of which is rigidly secured to a horizontal portion 41 of the mounting bracket 33. It will be noted by referring to FIGS. 3 and 4, that the motor 39 is rigidly coupled directly to the gear reducer 40. The gear reducer 40 is connected to the driving shaft 31 of the auger 28 by means of the drive chain 42 which couples the relatively large sprocket wheel 43, which is secured to the projecting end 36 of the driving shaft 31, to the relatively small sprocket wheel 44, which is rigidly secured to the output shaft 45 of the gear reducer 40.

With reference to FIGS. 5, 6, and 7, it will be noted that an elongated die member, represented in general by the reference numeral 46, is received within the cylinder extension sleeve 23, the clearance between the outer surface 47 of the die member 46 and the extension sleeve 23 being sufficient to permit rotation of said die member 46 within the extension sleeve 23. It will also be noted that the die member 46 defines in axially opening screw threaded aperture 48 which is adapted to receive the screw threaded forward end 29 of the auger 28 so as to rigidly secure the die member 46 to the auger 28 and thereby impart rotation to the die member 46 according to the rotation of the auger 28. It will be noted that the helical flight 49 of the auger 28 engages ice, not shown, formed on the inner freezing surface 18 of the cylinder 16 so as to remove the ice from said surface 18, and propel the particles of ice toward and into the die member 46. The die member 46 is provided with a generally cylindrical bearing sleeve 46', which is fitted tightly about the die member 46 and rotates therewith. In accordance with my invention, the outer surface 47 of the bearing sleeve 46' bears against the inner surface of the cylinder extension sleeve 23 whereby the bearing sleeve 46' of the die member 46 acts as a journal for the forward end 29 of the auger 28.

The die member 46 is formed to define a plurality of circumferentially spaced axially extending radially outwardly projecting lugs 50 which are tapered toward their rearward ends 51 so as to define axially extending passageways 52 circumferentially spaced intermediate the lugs 50, the cross-sectional area of the passageways 52 decreasing toward the forward end 53 of the die member 46 whereby to provide means for compacting the ice removed from the freezing surface 18. The die member 46 also serves to expel the particles of chipped ice into the upturned spout 26.

For the purpose of tempering the continuous flow of chipped ice from the die member 46, and also for preventing coagulation of the particles of chipped ice after they are transferred to the storage bin 4, a secondary water inlet pipe 54 is connected to the upturned spout 26 so as to maintain a secondary water reservoir 55 for bathing the particles of chipped ice, not shown, before they are transferred from the spout 26 to the storage bin 4, as will hereinafter be explained. FIG. 8 discloses a conventional float valve, represented in general by the reference numeral 56, which is interposed between the primary and secondary water inlet pipes 20, 54 and the water supply pipe, shown at 57. The float valve 56 comprises a conventional float 58 and a needle valve 59, as seen particularly in FIG. 8. It should be noted that the float valve 56 is disposed at such an elevation as to maintain the water level within the chamber 17 and the upturned spout 26 at an elevation approximating that shown by the water level line in FIG. 5. Preferably, and as shown, the disposition of the float valve 56 in the approximate position shown in FIG. 4 will maintain the chamber 17 full of water so that the entire cylindrical freezing surface 18 is utilized. It should be noted that the freezing cylinder 16 is provided with an upstanding air vent 60 so as to permit the escape of air that might be trapped within the cylinder 16.

It will be noted by referring to FIGS. 3 and 4, that the outlet spout 26 is preferably, and as shown, upwardly and forwardly angularly disposed so as to eject the particles of chipped ice, not shown, into an upwardly and rearwardly inclined transfer chute, represented in general by the reference numeral 61. The upper end 27 of the outlet spout is received within an aperture 62 defined in the bottom wall 63 of the transfer chute 61, the bottom portion 64 of the transfer chute extending through an aperture 65 defined in the intermediate wall 5 of the cabinet 2 so as to transfer the particles of chipped ice into the storage bin 4. For the purpose of shutting off the auger driving motor 39 and the refrigeration apparatue when the storage bin 4 is filled to a predetermined height with the chipped ice, the sensor tube 66 is provided, the same being operatively connected to suitable and conventional control mechanism, the further showing and description thereof being omitted for the sake of brevity.

Having specifically described my invention, the following statements are offered for the purpose of teaching the operative simplicity of my invention. When the machine 1 is put into operation by starting the refrigeration apparatus and energizing the auger drive motor 39, the evaporator coils 12 serve to refrigerate the inner freezing surface 18 of the freezing cylinder 16 so as to cool the water disposed within the chamber 17 and continuously freeze a layer of ice on the surface 18. The flight 49 of the continuously rotating auger 28 engages the ice formed on the freezing surface 18 and cuttingly removes the same from said surface 18. When the ice particles, not shown, are first removed from the freezing surface 16, they are generally in the form of generally elongated strips of ice, not shown. However, the continuous rotation of the auger 28 serves to propel the particles of chipped ice toward and into the die member 46, and in doing so, the strips of ice are further divided and broken by the continuous revolution of the auger 28. When the particles of chipped ice enter the die member 46 they are then compacted and expelled into the water reservoir 55, defined by the upturned spout 26. At this point, the action of the revolving die member 46, coupled with the stationary upturned spout 26 serves to mix or churn the particles of ice before they are expelled by the

outlet spout 26. It is this mixing function of the die member 46 and the spout 26 which helps to produce substantially uniform chips of ice.

Since the bathing function of the secondary water reservoir 55 is an important part of this invention, the purpose and operative function thereof will be set forth in detail. It should be noted that the water introduced into the machine 1 by both the primary and secondary water inlet pipes 20, 54, is of a temperature of and consists of ordinary tap water. It has been determined that after the machine 1 has been producing ice chips for a short period of time, approximately the forward one-half of the freezing cylinder 16 contains particles of ice which are removed from approximately the rearward one-half of the freezing surface 18 of the freezing cylinder 16. Accordingly, this mass of ice chips contained in the forward portion of the chamber 17 and the die member 46 prevents the water contained in the chamber 17 from passing into the upturned spout 26, and therefore requires the connection of the secondary water pipe 54 to the spout 26 in order to provide the water reservoir 55 within the spout 26. It has also been determined that the temperature of the ice chips when they are passed into the die member 46 is considerably less than 32 degrees F., and is approximately 10–15 degrees F. Therefore, when the ice chips, not shown, pass from the die member 46 into the water reservoir 55 defined by the outlet spout 26, the temperature of the water in the water reservoir 55 being that of ordinary tap water or, that is, water of a temperature considerably above the temperature of the water in the freezing chamber and the temperature of the ice flowing from said freezing chamber the individual ice chips take on more water in the bathing reservoir 55 so as to substantially fill the cracks and fissures contained in the individual chips wherby to form a more solid and desirable ice chip. Further, while the ice chips are taking on more water, so as to form more solid chips, the temperature thereof is raised to approximately 32 degrees F. It is this last fact which prevents the coagulation of the ice chips after they are transferred to the storage bin 4 since the fact that their temperature approximates 32 degrees F., the possibility of the ice chips freezing together is practically eliminated. It should be emphasized that the operation of my machine 1 for making ice chips is automatic and continuous, the ice chips being transferred from the outlet spout 26 to the storage bin 4 by means of the transfer chute 61.

This invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the above objects; and while I have shown a preferred embodiment thereof, I wish it to be specifically understood that the same may be modified without departure from the scope and spirit of the appended claims.

What I claim is:

1. A machine for making chipped ice comprising a generally horizontally disposed freezing cylinder which defines a chamber bounded by an inner generally cylindrical freezing surface, primary water inlet means associated with said chamber for maintaining a volume of water therewithin, refrigeration apparatus including an evaporator associated with said cylinder for refrigerating the inner surface of said cylinder so as to cool the water received within said chamber and freeze a layer of ice on said surface, closure means adjacent one end of said cylinder and water retaining means adjacent the other end thereof, an auger received within said cylinder and mounted for rotation therein, driving means for imparting rotation to said auger, the flight of said auger engaging ice formed on the inner freezing surface of said cylinder so as to remove the ice from said surface, an ice outlet defined by said water retaining means adjacent the ejecting end of said auger, said auger being adapted to propel the chipped ice toward said ice outlet, and secondary water inlet means connected to a water source the temperature of which is considerably above the temperature of the water in said freezing chamber and the temperature of the ice flowing from the said freezing chamber, said secondary water inlet means opening into said water retaining means, said water in said water retaining means adjacent said ice outlet tempering the flow of ice therefrom and preventing coagulation of the particles of ice.

2. A machine for making chipped ice comprising a generally horizontally disposed freezing cylinder which defines a chamber bounded by an inner generally cylindrical freezing surface, water inlet means associated with said chamber for maintaining a volume of water therewithin, refrigeration apparatus including an evaporator associated with said cylinder for refrigerating the inner surface of said cylinder so as to cool water received within said chamber and freeze a layer of ice on said surface, closure means adjacent one end of said cylinder and water retaining means adjacent the other end thereof, an auger received within said cylinder and mounted for rotation therein, said auger defining a forward end disposed adjacent said water retaining means and a rearward end disposed adjacent said closure means, driving means connected to said auger for imparting normally continuous rotation thereto, a die member received within said cylinder and disposed adjacent the forward end of said auger, the flight of said auger engaging ice formed on the inner freezing surface of said cylinder so as to remove particles of chipped ice from said surface, said die member being adapted to compact the ice removed from said freezing surface, an ice outlet defined by said water retaining means adjacent the forward end of said auger, said auger being adapted to propel the chipped ice toward said ice outlet, and a water bath adjacent the ice outlet for tempering the continuous flow of chipped ice therefrom and preventing coagulation of the particles of chipped ice.

3. A machine for making chipped ice comprising a generally horizontally disposed freezing cylinder which defines a chamber bounded by an inner generally cylindrical freezing surface, primary water inlet means associated with said chamber for maintaining a volume of water therewithin, refrigeration apparatus including an evaporator associated with said cylinder for refrigerating the inner surface thereof so as to cool water received within said chamber and freeze a layer of ice on said surface, closure means adjacent one end of said cylinder, an upturned generally tubular outlet spout secured to the other end of said cylinder, said outlet spout being disposed with its upper end at a higher elevation than the water level in said cylinder, an auger received within said cylinder and mounted for rotation therein, said auger defining a forward end disposed adjacent said outlet spout and a rearward end disposed adjacent said closure means, driving means connected to said rearward end of said auger for imparting normally continuous rotation thereto, a die member received within said cylinder and rigidly secured to said forward end of said auger for rotation therewith, the flight of said auger engaging ice formed on the inner freezing surface of said cylinder so as to remove particles of chipped ice from said surface, said die member being adapted to compact the ice removed from said freezing surface, said augur being adapted to propel the chipped ice toward said outlet spout, and secondary water inlet means associated with said spout so as to maintain a water bath within said spout for tempering the continuous flow of chipped ice therefrom and preventing coagulation of the particles of chipped ice.

4. A machine for making chipped ice comprising a generally horizontally disposed freezing cylinder which defines a chamber bounded by an inner generally cylindrical freezing surface, primary water inlet means associated with said chamber for maintaining said chamber full of water, refrigeration apparatus including an evaporator

extending to a higher elevation than the upper extremity of said chamber, means for rotating said auger in said chamber, said rotating auger in engagement with the layer of ice on said chamber surface removes ice therefrom and propels the same initially axially beyond said supporting member and then upwardly through said spout.

9. The machine as defined in claim 8, in which said supporting member comprises a die member secured to the adjacent end of said auger for rotation therewith, said die member being mounted in said chamber for rotation adjacent to the end of said chamber remote from closure member with said auger extending between said closure member and said die member, and said outlet spout having said one end portion thereof connected to said chamber adjacent to said die member.

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