Nov. 21, 1939. J. J. SHIVELY 2,181,000

ICE CHIPPING DEVICE

Filed July 30, 1936 3 Sheets-Sheet 1

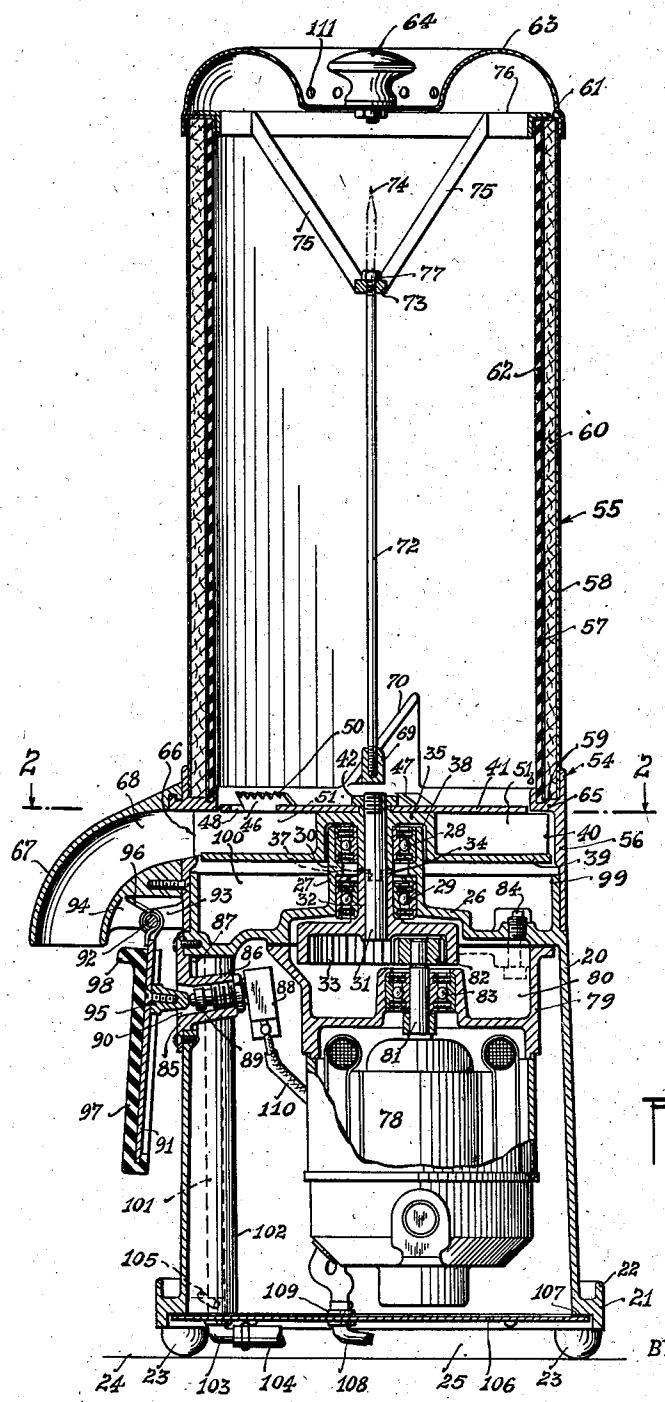

Fig. 1

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Fig. 2

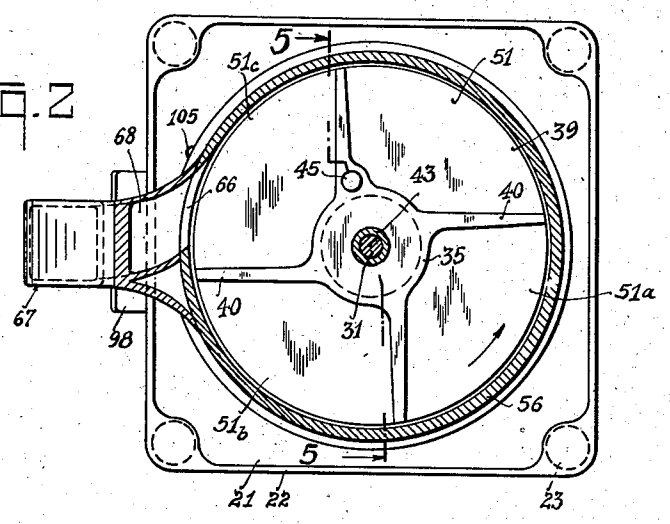


Fig. 3

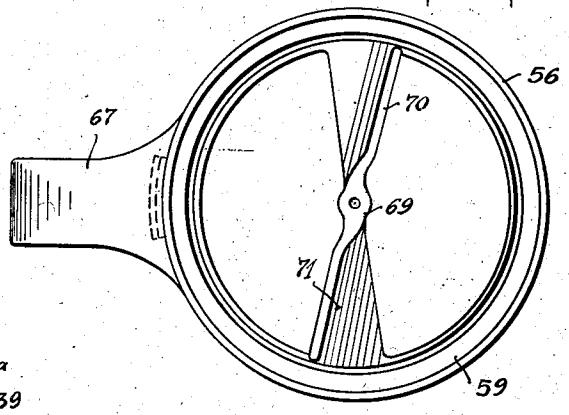
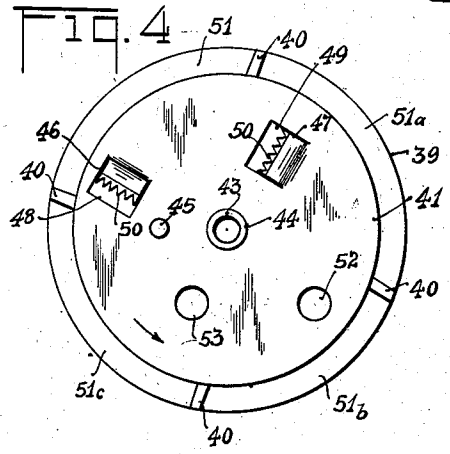


Fig. 4



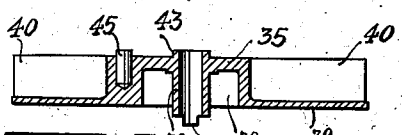


Fig. 5

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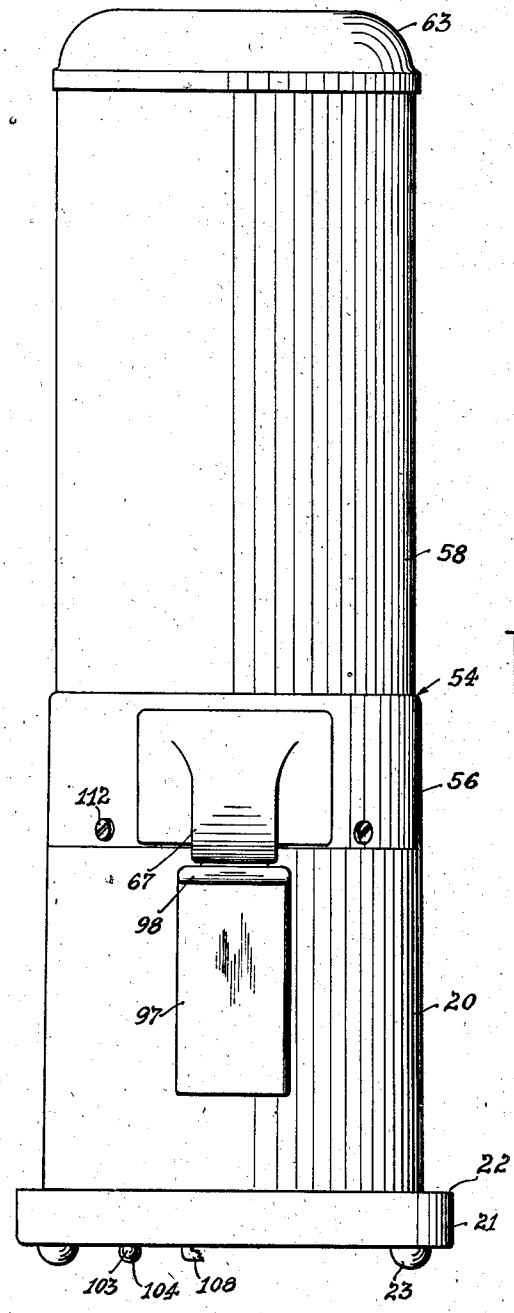

Fig. 8

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2,181,000

ICE CHIPPING DEVICE

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Application July 30, 1936, Serial No. 93,344

8 Claims. (Cl. 83—62)

This invention relates to improvements in ice chipping devices.

An object of the invention is to provide a device of the above nature adapted to reduce pieces of ice of various sizes to chips by picking action.

Another object is to provide a device of the above character operable by electricity.

A further object is to provide improved speed reducing means in the driving mechanism of the device.

Still another object is to provide a device of the above character adaptable to produce chips of any desired size.

Still a further object is to provide a unitary pick-plate readily removable from the machine.

Another object is to provide a device of the above type including means to prevent injury to the operator.

A further object is to provide improved means to bring the ice into engagement with the picks.

Still another object is to provide a device of the above character which may be quiet in operation.

A further object is to provide a device of the above character which is compact, simple, and which may be cheaply manufactured.

Other objects and advantages of the invention will become apparent during the course of the following description in connection with the accompanying drawings, in which:

Figure 1 is a vertical sectional view of a preferred form of the device;

Figure 2 is a cross sectional view of the same on the lines 2—2, Figure 1;

Figure 3 is a detail plan view of the hopper drum;

Figure 4 is a detail plan view of the pick plate and rotor;

Figure 5 is a vertical sectional view of the rotor on the lines 5—5, Figure 2; and

Figure 6 is a front elevation of the machine shown in Figure 1.

Referring to Figure 1, the numeral 20 indicates a substantially drum-shaped base having a squared lower portion 21, Figures 1 and 2, provided with an upturned rim 22 to form a pan. Feet 23, preferably of rubber, are attached to the bottoms of the four corners of the squared pan 21 and are adapted to support the device on any surface 24 such as a bar, counter, or soda-fountain top, the legs being of sufficient height to provide a space 25 between the bottom of the pan 21 and the supporting surface.

The upper end of the base 20 comprises a head 26 having an upwardly extending central sleeve 27 in which two ball bearings 28 and 29, preferably of the sealed grease-packed type, are disposed respectively above and below an internal flange 30.

A vertical shaft 31 has secured on its lower half a sleeve 32 forming the hub of a downwardly directed internal gear 33. The sleeve 32 is supported in the lower ball bearing 29 and has on its upper end dog teeth 34.

A rotor 35, shown in detail in Figure 5, has a downwardly projecting hub 36 fitting on the shaft 31 and formed with dog teeth 37 meshing with the teeth 34 on the gear hub 32. The rotor hub 36 is supported in the upper ball bearing 28, the sleeve 27 projecting upward into a cylindrical recess 38 in the rotor 35 as shown in Figure 1.

The rotor 35 comprises a lower circular disk 39 carrying a plurality of spokes or impeller vanes 40, Figures 1, 2 and 5. The vanes 40 preferably are disposed with a rearward tangential inclination with respect to the rotational direction of the rotor 35 as indicated by the arrow in Figure 2.

A circular plate 41, Figures 1 and 4, hereinafter referred to as the pick plate, is secured to the top of the rotor 35 by means of a nut 42 on the end of the shaft 31, a short upper hub 43 on the top of the rotor engaging a central hole 44 in the pick-plate to act as a centering pilot for the latter.

A pin 45, Figures 2, 4 and 5, is secured in the rotor 35 and extends through the pick-plate, providing a positive driving means for the plate.

The pick-plate 41 carries one or more upwardly inclined pick members such as 46 and 47, Figures 1 and 4, partly overlying openings 48 and 49 in the plate 41. The pick members may be formed integrally with the plate 41 in the shape of flaps having forwardly directed sharp points 50 along their upper edges. Each pick member may have any desired number of points according to the grade and fineness of chip which it is desired to produce, and the height of the pick members and size of the openings 48 and 49 may also be varied for the same reason, as hereinafter explained.

It will be seen that the pick-plate structure is well adapted to easy and uniform manufacture, the normal sequence of operations being to stamp out the plate complete with its various openings and pick-angles, then bend the pick members upward and bring their points to sharpness by grinding off the upper corners. It is also obvious that the one-piece construction makes it impossible for the pick members 46 and

47 to be improperly installed or to work loose in service.

The pick-plate 41 is so disposed on the rotor 35 that the openings 48 and 49 overlie the cavities 51 and 51*a* between adjacent vanes 40, Figures 1 and 2. In the structure shown, wherein the plate carries two pick members as noted, holes 52 and 53, Figure 4, may be provided leading through the plate 41 into the underlying cavities 51*b* and 51*c* diametrically opposite the cavities 51 and 51*a* respectively. These holes permit balancing of the plate 41 and provide for the admission of air to the cavities 51*b* and 51*c* for a purpose hereinafter explained.

The diameter of the pick-plate 41 is smaller than that of the rotor 35, the vanes 40 and lower disk 39 projecting outward beyond the circumference of the plate for reasons hereinafter explained in the description of the machines's operation.

Surmounting the base 20 is a hopper generally denoted by the numeral 54 and comprising an upper shell 55 secured to a lower drum 56. The shell 55 comprises inner and outer cylinders 57 and 58 fitting into an annular recess 59 in the top of the drum 56. The space between the inner and outer cylinders 57 and 58 may be filled with any suitable heat insulating material 60 such as ground cork, rock wool or the like, and a channel ring 61 is secured to the top of the cylinders to bind the upper edges thereof in concentric relation and to protect the insulation 60 against the entry of moisture. If desired, the inner cylinder 57 may have a lining 62 of rubber or other resilient material. A cover 63 provided with a central knob 64 is removably mounted on the top of the hopper 54.

The cylindrical inner surface of the drum 56 surrounds the circumference of the rotor 35 with a small running clearance as shown in Figures 1 and 2. A shoulder 65 in the drum closely overlies the projecting ends of the fins 40. An opening 66 in one side of the drum 56 leads into the interior of a downwardly curved spout 67 secured to or formed on the exterior of the drum. The opening 66 and interior of the spout 67 form an exit passage 68 leading tangentially from the interior of the drum and curving downward through the spout, the cross sectional area of the passage increasing in the outward direction.

A cross member 69 on the drum 56, Figures 1 and 3, spans the plate 41 above the tops of the pick members 46 and 47 and is formed with two fins 70 and 71 inclined downwardly in the direction of rotation of the rotor. A vertical rod 72, secured in the middle of the cross member 69, extends upward through the central axis of the hoper 54 and through the hub or center of a spider 73 and may terminate in a sharp point 74. The spider 73 has three or more upwardly inclined legs 75 extending to a rim 76 which overlies the channel ring 61, a nut 77 on the rod 72 holding the spider clamped downward in position as noted.

A motor 78 enclosed in the base 20, has an upper end plate 79 bolted to the bottom of the head 26 and forming therewith a lubricant chamber 80.

The vertical shaft 81 of the motor 78 carries on its upper end a pinion 82 meshing with the internal gear 33. The upper bearing 83 of the motor is preferably of the grease-packed ball type adapted to operate for long periods of time without attention while at the same time acting as a seal to retain lubricant in the chamber 80. A plug 84 is provided in the head 26 to permit charging the chamber with lubricant.

A plate member 85 fastened to the front of the base 20, has a projection 86 reaching inwardly through an opening 87 in the base and having secured thereto a suitable switch 88. The switch is of the well known type adapted to open when released and has a plunger 89 directed outwardly in a bore 90 through the plate member 85. A switch lever 91 is swung on a horizontal pivot pin 92 supported in lugs 93 formed on the barrel 56. Side walls 94 on the spout 67, Figure 1, serve to retain the pin 92 longitudinally in the lugs 93.

An extension 95 on the rear side of the lever 91 is adapted to engage the switch plunger 89. A torsion spring 96 disposed on the pivot pin 92 and engaging the spout 67 and lever 91, serves to hold the extension 95 against the switch plunger 89 and to partly counter-balance the strength of the latter's internal releasing spring (not shown). The lever 91 is provided with an external pad 97 of rubber or other suitable resilient material and having an outwardly projecting lip 98 at the upper end thereof adjacent the spout 67, Figures 1 and 6.

The upper rim 99 of the base 20, which fits inside the lower part of the hopper drum 56, forms with the head 26 a sump 100 to collect water due to melting of ice above or in the rotor 35. A drain passage 101 in a tunnel ridge 102 in the base 20, leads from the sump 100 to an outlet elbow 103 extending into the space 25. A suitable hose 104 may be attached to the elbow 103 to conduct water therefrom to any adjacent sink or other disposal means. An inclined hole 105, Figures 1 and 2, leads from the interior of the pan 21 into the drain passage 101.

A closure plate 106, Figure 1, which may be provided with a gasket 107, is secured to the bottom of the base 20. A current supply cord 108, which may have any suitable type of attachment plug (not shown) extends through a grommet 109 in the plate 106 and to the motor 78, the switch 88 being connected in series therewith by means of leads 110.

The operation of the device is as follows:

Broken ice is placed in the hopper shell 55, the lowermost pieces resting on the pick-plate 41. The spider 73 serves to prevent the entry of unduly large ice chunks, and if desired the sharp point 74 may be provided on the rod 72 to provide a pick for breaking such chunks.

When it is desired to chip ice into a receptacle such as a glass, the operator places the receptacle under the spout 67 and presses the pad 97 and lever 91 inward either with the fingers or with the receptacle itself. The extension 95 presses inward the plunger 89, closing the switch 88 and starting the motor 78. The motor acting through the described reduction gearing, rotates the rotor 35 and pick-plate 41 in the direction of the arrow, Figure 2. The sharp pick-points 50 engage the lowermost layer of ice chunks, separating chips therefrom. The chips glide down the unobstructed lower surfaces of the pick members 48 and 49 into the cavities 51 and 51*a*. Here the chips encounter the vanes 40. The vanes sweep the chips around the interior of the drum 56 and hurl them by centrifugal force through the passage 68, through the spout 67 and into the receptacle held under the latter. When the desired amount of chipped ice has been delivered the operator removes the receptacle, allowing the switch 88 to open, the plunger

89 forcing the lever 91 outward. The use of the compensating torsion spring 96 makes closing of the switch possible with comparatively lightly applied pressure and prevents flapping of the lever as the switch opens, at the same time permitting the use of a strong and positive contact-breaking spring in the switch itself.

During the chipping action the finned cross member 69 prevents rotation of the ice chunks, the inclined fins 70 and 71 guiding the chunks into position for engagement by the pick members and holding them wedged until they are reduced to chips. The device, therefore, does not depend on the weight of ice above to cause positive chipping engagement and is therefore effective until the last of the ice charge is expelled. Also, as the device operates with a positive picking action as opposed to shaving or cutting action, it may operate at much lower speed and with less power than would be necessary for shaving or cutting, while at the same time the increased diameter of the lower rotor and vane structure over that of the pick-plate provides sufficient centrifugal force even at comparatively slow rotative speeds to expel all chips through the spout. The above characteristics and the use of the described speed reducing means, permit the use of a comparatively small and light motor, preferably of the series-wound universal type applicable to either direct or alternating current. The use of this type motor, which has an inherently high starting torque, has the further advantage of eliminating any failure to start against a wedged load of ice.

The rubber lining 62, Figure 1, tends to cushion the engagement of ice chunks with the interior of the hopper as the ice moves into cutting position, thus promoting quietness of operation.

The reason for the outwardly divergent shape of the exit passage 68 is to insure free and complete discharge of the ice, preventing any clogging of the spout such as is liable to occur in passages having parallel or converging walls.

It has been noted that holes 52 and 53 in the pick-plate 41 lead into the rotor cavities 51*b* and 51*c* which are not provided with pick members. During the chipping operation air is drawn through these holes, the adjacent vanes 40 acting as the vanes of a centrifugal blower to deliver the air in outward puffs or blasts through the passage 68. The blasts of air passing outward between deliveries of ice from the cavities 51 and 51*a* aid in maintaining complete discharge of the ice, particularly any small light particles formed in the chipping process. Air may readily pass to the holes 52 and 53 between the irregular chunks of ice in the hopper, and perforations 111 may be provided in the cover 63 to admit air to the hopper.

As previously pointed out, the pick-plate 41 with its pick members 50 is a unitary structure retained on the rotor 35 by means of the single nut 42, Figure 1. In commercial service the user may be furnished with a number of pick-plates having their pick members 46 and 47 set at various heights above the plate and with different numbers of points 50, to form different sizes of chips. When it is desired to change the grade of chips, the hopper assembly 54, which is normally secured to the base 20 by means of screws 112, Figure 6, may be removed bodily, the nut 42 screwed off the shaft 31, and the plate 41 removed and replaced by a plate having pick members adapted to produce the desired grade. During the time that the hopper assembly is removed from the base 20 it is important that there be effective means to prevent accidental starting of the motor which would set the exposed rotor 35 and pick-plate 41 in motion with the danger of injury to the operator. This means is provided by the attachment of the switch lever 91 to the barrel 56 which forms part of the hopper assembly 54. When the hopper is removed, therefore, it carries with it the switch lever 91, effectively disabling the switching means against accidental closing, since the plunger 89 is disposed deeply within the bore 90. In other words, the switching means comprises two elements attached to two major portions of the device, so that separation of the portions by disengaging these elements disables the switching means.

The legs 75 of the spider 73 further protect the operator by preventing careless insertion of his hand and arm into the hopper and into contact with the pick members 46 and 47.

Any water of condensation which may form on the outside of the base 20 or hopper 54 runs down and collects in the pan 21, from which the water runs through the hole 105 into the main drain passage 101 from the sump 100, Figure 1. The bottom plate 106, Figure 1, renders the interior of the base 20 substantially air-tight, eliminating condensation of moisture therein which might injure the motor 78, and due to the fact that the operation of the device is intermittent the motor does not run sufficiently to require outside ventilation. The opening 87 in the base 20 under the switch plate 85 is larger than the switch 87. By removing the plate 85, therefore, the switch may be pulled out bodily through the opening 87 for service or replacement, the interior leads 110 being made of sufficient length to permit the above operation. It is thus unnecessary to tip the machine or otherwise disturb its normal operating position in order to service the switch.

The use of the internal gear 33 and the pinion 82, running in grease or other suitable lubricant, provides a silent and efficient speed reducing means, while the grease packed ball bearings 28, 29 and 83 in addition to their bearing functions, effectively seal the chamber 80 against leakage, making replenishment of lubricant unnecessary throughout long periods of service. The upper bearing 28, which carries the downward thrust of the rotor, is protected against water by being disposed in the recess 38 in the rotor itself and high above the sump 100. The internal gear 33 is preferably a die casting with the shaft 31 cast therein as an insert. It should be noted that the main drive between the gear 33 and rotor 35 takes place directly through the dog teeth 34 and 37, the shaft 31 acting principally as a pilot spindle and without keys or the like.

The purpose of the lip 98 on the switch lever pad 97, Figures 1 and 6, is to catch the upper edge of glasses applied thereto in order to prevent their being jammed upward against the spout 67.

While the invention has been described in preferred form it is not limited to the exact structures illustrated, as various modifications may be made without departing from the scope of the appended claims.

What is claimed is:

1. In a device of the character described, in combination, a base, a hopper on said base adapted to contain ice, a depressed spider in the upper part of said hopper adapted to initially receive said ice and to guide into the lower part of said

hopper pieces of said ice smaller than a predetermined size, a rotary pick-plate in said hopper and having openings therein, picks on said plate adjacent certain but not all of said openings and adapted to engage said ice whereby chips may be picked from said ice and guided through said certain openings, stationary means in said hopper to hold said ice in engagement with said picks, a spout on said hopper having an outwardly divergent passage therethrough, a centrifugal impeller underlying said plate and adapted to expel said chips through said pasage, and means to rotate said plate and impeller.

2. A device as claimed in claim 1 wherein said impeller is of substantially greater diameter than said pick-plate and wherein said divergent passage has a tangentially directed inner opening closely adjacent the periphery of said impeller and a downwardly directed exterior outlet.

3. In an ice chipper, in combination, a base, a motor in said base, a container for ice, said container having a tangential outlet opening, means rotatable to chip said ice, a stationary totally inclined member adjacent said chipping means and adapted to hold said ice in wedging engagement therewith, centrifugal means rotatable with said chipping means to discharge said chipped ice through said outlet, and speed reducing means operatively connecting said motor to said chipping means and said centrifugal means, said centrifugal means being of substantially greater diameter than said chipping means whereby said centrifugal means may have a high peripheral velocity relative to the velocity of said chipping means.

4. An ice chipper as claimed in claim 3, including a spout comprising walls having smooth inner surfaces defining an unobstructed divergent discharge passage leading outward from said tangential opening.

5. In an ice chipper including a container for ice, in combination, a rotary chipper plate having picks adapted to engage said ice to produce chips therefrom, a centrifugal impeller secured to said plate and adapted to receive said chips, the diameter of said impeller being substantially greater than the outer diameter of said plate, and a downwardly curved spout associated with said container, said spout comprising walls having smooth interior surfaces defining a discharge passage leading tangentially from an opening closely adjacent the periphery of said impeller and diverging outwardly for unobstructed discharge of said chips.

6. In a device of the character described, in combination, a base, a hopper removably secured thereon and adapted to contain chunks of ice, means in the upper part of said hopper to limit the chunks which may descend within said hopper to a size substantially smaller than the interior of said hopper, said means including a spider having a central portion depressed to a point substantially below the rim of said hopper, a centrifugal impeller supported by said base and comprising a plurality of discharge cavities, a motor in said base, gear means operatively connecting said motor to said impeller, a plate detachably secured on said impeller and adapted to support said ice in said hopper, a pin secured in said impeller extending through said plate to drive the same, said plate having openings leading to certain but not all of said discharge cavities, picks on said plate partly overlying said openings and adapted to engage said ice to chip the same through said openings, rearwardly inclined stationary fins in the lower part of said hopper above said picks and coperative therewith to wedge said ice into engagement with said plate and picks, and a spout on said hopper having a divergent passage therethrough in line with and closely adjacent the periphery of said impeller, said impeller being adapted to discharge said chipped ice through said passage.

7. A device as claimed in claim 6 wherein said plate comprises air openings into said other impeller cavities whereby said impeller may discharge air through said exit passage to facilitate the discharge of said chipped ice therethrough.

8. In an ice chipping device, in combination, a base, a hopper on said base and adapted to contain ice, said hopper comprising a lower drum and a shell attached thereto, rotary means within said drum to chip said ice, a spout on said drum adjacent said chipping means and having smooth inner surfaces defining an outwardly divergent outlet passage, centrifugal means associated with said chipping means in line with said passage and operable to eject said chipped ice through said passage, a stationary fin in said drum and closely overlying said chipping means, the lower side of said fin being rearwardly inclined to guide said ice into wedging engagement with said rotary chipping means, means in said shell to guard said chipping means and to limit the size of ice chunks which may be fed thereto, said means comprising a spider engaging the top of said shell and having its middle portion depressed within said hopper, and a pick-point supported in said middle portion and adapted to break up masses of ice thrust thereon.

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