Dec. 23, 1958 G. D. FERDON 2,865,571

ICE CRUSHER

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Fig. 1.

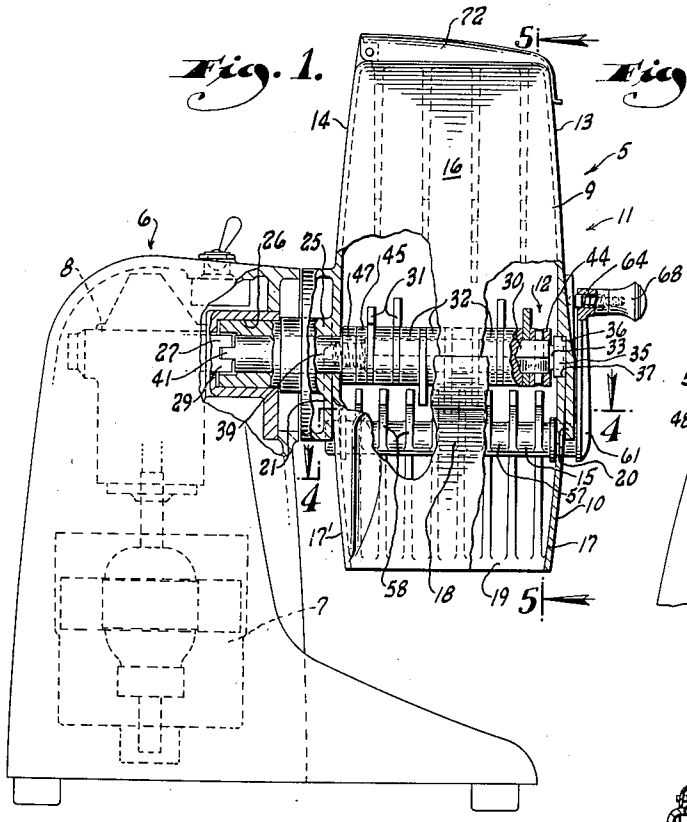


Fig. 2.

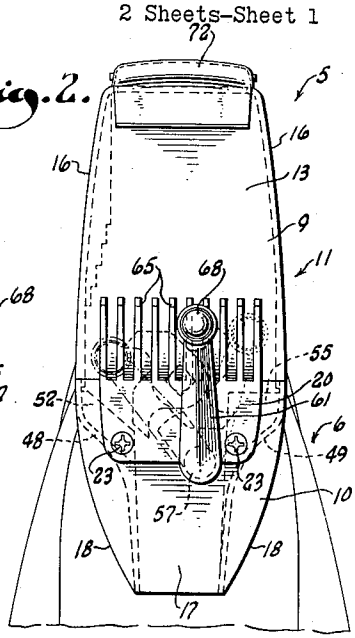


Fig. 3.

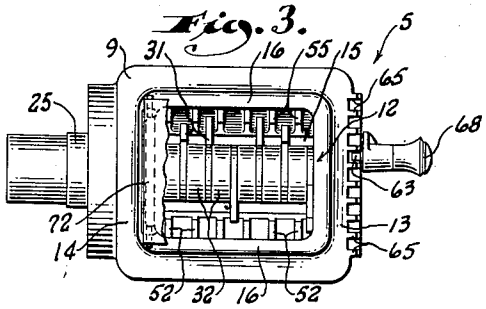


Fig. 4.

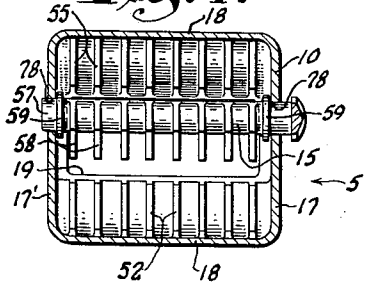
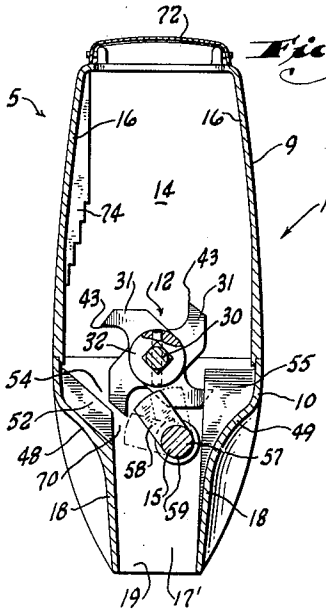


Fig. 5.



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Fig. 6.

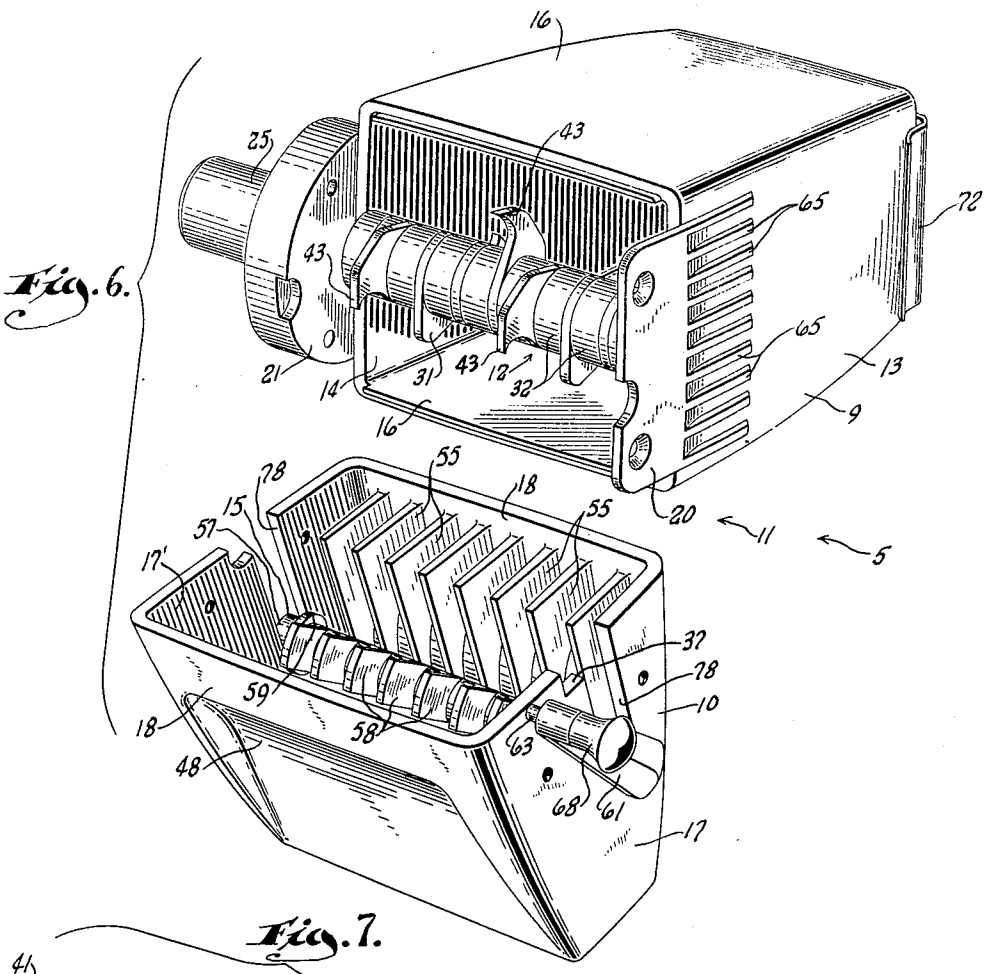
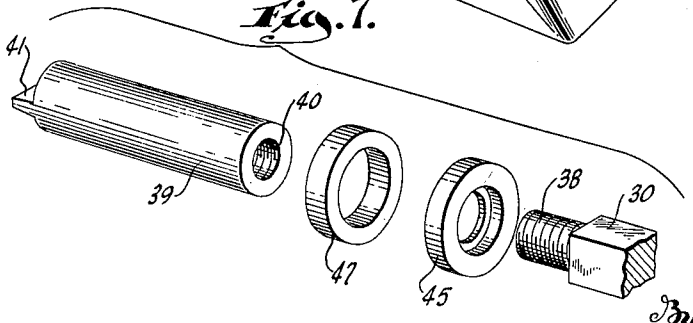


Fig. 7.



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ICE CRUSHER

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6 Claims. (Cl. 241—157)

This invention relates to ice crushers, and refers more particularly to a device wherein ice cubes or ice chunks may be reduced to small particles of regulatable size.

It is thus an object of the present invention to provide an ice crusher which will produce ice particles of any of a range of sizes, so that the ice crusher of this invention may be employed to reduce ice cubes or ice chunks to ice particles or granules of substantially any desired size or coarseness.

Another object of this invention resides in the provision of an ice crusher which may be driven by a mechanical drive means such as an electric motor, wherein a readily adjustable member may be set to any of a number of positions, each providing crushed ice of a different particle size, and wherein adjustment of said member may be effected while the machine is in operation.

Still another object of this invention is to provide an ice crusher of the character described which may be readily assembled from a few simple and inexpensive parts, the principle ones of which may be formed as die castings.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side elevational view of an ice crusher of this invention mounted on a drive mechanism, portions of the ice crusher being shown broken away to illustrate details;

Figure 2 is a front elevational view of the ice crusher of this invention;

Figure 3 is a top view of the ice crusher, with the cover broken away;

Figure 4 is a horizontal sectional view taken along the line 4—4 in Figure 1;

Figure 5 is a vertical sectional view taken along the line 5—5 in Figure 1;

Figure 6 is a disassembled perspective view of the ice crusher, the upper and lower body members being separated from one another; and

Figure 7 is a disassembled perspective view of the rear end portion of the crushing arbor.

Referring now more particularly to the accompanying drawings, in which like numerals designate like parts throughout the several views, the numeral 5 designates generally an ice crusher embodying the principles of this invention, and which is adapted to be installed upon a power stand designated generally by 6. The power stand, upon which other applianecs such as a meat grinder or

the like may also be interchangeably mounted, provides a support for the ice crusher and incorporates an electric motor 7 by which the ice crusher or other appliance is driven through a gear box 8.

In general the ice crusher comprises an upper body member 9 and a lower body member 10 which cooperate to provide a housing 11, a crushing rotor 12, extending across the upper body member, and a gate 15 cooperable with the crushing rotor to produce ice particles of substantially any desired size.

The upper body member 9 comprises opposite front and rear walls 13 and 14, respectively, and side walls 16, and it is open at its top and bottom. The crushing rotor 12 is rotatably supported by the front and rear walls of the upper body member, near the bottom thereof, and the upper body member provides a hopper in which ice cubes or chunks of ice may be received to be fed to a crushing mechanism which includes the crushing rotor. The lower body member likewise comprises opposite front and rear walls 17 and 17', respectively, and side walls 18, and it provides an outlet 19 through which crushed ice particles may issue from the device.

Downwardly projecting outwardly offset wall portions 20 and 21 on the front and rear walls, respectively, of the upper body member overlie the upper portions of the front and rear walls of the lower body member and provide for securing the two body members together in superimposed relationship with their respective front, rear and side walls in effect continuous with one another. The two body members are secured together to form the housing 11 by means of screws 23 which extend through said downwardly projecting wall portions on the upper body member and into the underlying portions of the front and rear walls of the lower body member.

On the rear wall of the upper body member is a bored boss 25 which serves as a rear bearing for the crushing rotor and which is axially insertable into a socket or well 26 in the power stand to mount the ice crusher thereon. A drive shaft 27 in the power stand, coaxial with the socket 26, has a readily detachable driving connection 29 with the crushing rotor, established by insertion of the boss 25 into the socket 26. The boss 25 and the socket 26 are so located as to mount the ice crusher with the bottom of its housing spaced a substantial distance above the bottom of the power stand so that a bowl or other receptacle may be placed under the ice crusher to receive crushed ice as it issues downwardly therefrom.

The crushing rotor comprises an arbor 30 having a square cross section along most of its length and having a plurality of claws or crushing teeth 31 non-rotatably secured thereon, axially spaced from one another by collar-like spacers 32. The front end portion 33 of the arbor has a round cross section and is journaled in a bearing 35 of nylon or the like seated in recesses 36 and 37 in the front walls of the upper and lower body members, respectively. The rear end portion of the arbor is threaded, as at 38 and screws into a spindle 39 having a threaded well 40 opening to its front end and which projects rearwardly through the bore in the boss 25 to provide a journal for the rear of the rotor. A transverse tongue 41 on the rear end of the spindle is received in a slot in the outer end of the drive shaft 27 in the power stand to provide the driving connection 29 between said shaft 27 and the crushing rotor.

Each of the claws is substantially flat, preferably formed as a stamping having a central hub portion and a hook-shaped tooth 43 projecting therefrom. The hub portion of each claw has a square hole therein, corresponding to the cross section of the arbor, to constrain the claw to rotate with the arbor, the direction of rotation being that in which the hook-shaped tooth portions

of the claws are curved. The claws are, of course, disposed normal to the arbor axis, and preferably each is angularly displaced 90° from each of its adjacent claws.

Directly behind the rounded front journal portion 33 of the arbor a collar 44 is anchored to the arbor, and behind it the claws and spacers 32 alternate along the length of the arbor. Behind the rearmost claw is a clamping spacer 45, against the rear face of which the front end of the spindle 39 abuts, and as the spindle is screwed onto the arbor it thus clamps the row of spacers and claws against the fixed collar, confining them against axial movement relative to the arbor. A washer 47 of nylon or similar material is interposed between the clamping spacer and the rear wall of the housing, and prevents rearward axial displacement of the rotor; while the collar 44 is cooperable with the inner face of the bearing 35 to prevent forward displacement of the rotor.

It will be observed that the arbor, with the claws, spacers and front bearing in place thereon, may be inserted into the upper body member from the bottom thereof, and then the spindle may be axially inserted through the bearing bore in the boss 25 and screwed onto the rear of the arbor to complete the assembly of the crushing rotor into the upper body member.

The lower body member has slanting side wall portions 48 and 49, spaced below the top thereof, which converge inwardly downwardly, and below these slanting portions the side walls extend substantially straight down to define the outlet 19 at the bottom of the housing.

At that side of the rotor at which its claws are moving downwardly during its normal rotation, the slanting side wall portion 48 is provided with fixed fins 52 which project upwardly and inwardly from said wall portion and which are disposed normal to the rotor axis. These fins are laterally spaced apart by distances substantially equal to the axial spacing between claws on the rotor, and they are disposed intermediate the claws. The upper edges of the fins 52 lie in an inclined plane substantially parallel to the slanting side wall portion 48 and substantially tangent to the orbits of the tips of the claws on the rotor, and the inner edge portions of the fins cooperate with the rotor to define a first ice crushing zone 54, spaced below the rotor axis and to one side thereof, in which ice that has been fed into the hopper is crushed into coarse particles.

The other inwardly convergent or slanting side wall portion 49 on the lower body member is also provided with fixed fins 55, each of which is substantially vertically coplanar with one of the fins 52. The upper edges of the fins 55 are substantially horizontal, lying in a plane near the axis of the rotor, and their inner edge portions are inside the orbits of the tips of the claws, all as best seen in Figure 5. Cubes or chunks of ice dropped into the upper body member and falling onto the upper edges of the fins 55 will be picked up by the rotor and carried around to the other side of the body, into the first ice crushing zone.

It will be observed from the foregoing description of the upper and lower body members that both of these parts may be readily formed as die castings.

By means of the ice crusher of this invention the coarse ice particles produced in the first ice crushing zone may, if desired, be further reduced in size in a second ice crushing zone conjointly defined by the crushing rotor and the gate or adjustable crushing member 15. The adjustable crushing member, which may also be formed as a die casting, comprises a shaft 57 having a plurality of integral blades or fins 58 thereon, all disposed normal to its axis and projecting laterally in the same direction therefrom, the spacing between blades being such that each of them is vertically coplanar with one of the fixed fins 52, so that the blades are spaced intermediate the claws on the crushing rotor.

The shaft 57 of the adjustable crushing member is rotatably journaled in the lower body member, with its axis parallel to that of the crushing rotor and spaced

below the latter. To this end the shaft is supported in the bottoms of upwardly opening aligned slots 78 in the front and rear walls of the lower body member, said slots being substantially closer to the slanting side wall 49 than to the side wall 48, so that the shaft of the adjustable crushing member is spaced a substantial distance from the fins 52 that define the first ice crushing zone. The downwardly projecting portions 20 and 21 on the front and rear walls of the upper body member have notches in their lower edges to receive the shaft and confine it to rotation in the bottoms of the slots, and the shaft has circumferential flanges 59 which engage the inner surfaces of the front and rear walls of the lower body member to preclude axial displacement of the shaft.

Also integral with the shaft is a radially extending arm 61 which overlies the front wall of the housing and which provides for angular adjustment of the gate. At its free outer end the arm carries a pin 63, biased rearwardly by means of a compression spring 64 and releasably engageable between any pair of a series of vertically extending spaced apart lands 65 on the front face of the upper housing member. These lands cooperate with the pin in holding the arm 61 and thus the gate 15 in different positions of rotational adjustment, and at the same time attractively ornament the front of the housing. A knob 68 on the front of the arm, connected with the pin 63, may be pulled forwardly to release the pin from the lands and enable the arm to be swung freely from one position of angular adjustment to another.

At one extreme of the range of angular adjustments of the shaft 57, with the arm 61 swung to the extreme right hand position shown in dotted lines in Figure 2, the blades 58 are moved a maximum distance away from the fins 52 and project substantially directly upwardly toward the rotor axis, and are "interleaved" with the claws on the crushing rotor, the outer ends of the blades being closely adjacent to the spacers 32, leaving the throat beneath the first ice crushing zone substantially unobstructed. Consequently, with the gate in that wide open or inoperative position, coarse ice particles from the first ice crushing zone will fall directly down into the outlet.

At the left hand or opposite limit of swinging motion of the arm, the shaft 57 assumes a position in which the blades 58 thereon have their free end portions closely adjacent to the inner ends of the fixed fins 52 so that the blades cooperate with the rotor in defining a second ice crushing zone 70, substantially directly below the first. It will be seen that in this position the blades 58 very materially narrow the throat below the first ice crushing zone, so that coarse ice particles will not be able to fall therethrough without being further acted upon by the crushing rotor. It will also be apparent that between the two positions of the gate just described, which respectively provide for very coarsely crushed ice particles and very finely crushed ice particles, there are a range of intermediate positions to which the gate may be adjusted, in which ice will be crushed to particles of any desired intermediate size. It is particularly noteworthy that the gate may be swung from any of its positions of adjustment to any other while the device is in operation and crushing ice, so that the required size of ice particles may be very readily obtained by inspection and experiment.

If desired, the upper body member may be provided at its top with a hinged cover 72. The upper body member may also be provided with narrow, vertically elongated fixed fins 74 on the interior of one side wall, above the fins 52 on the lower body member which define the first ice crushing zone. These fins 74 may have their inner edges stepped downwardly and outwardly to cooperate with the rotor in forcing chunks of ice downwardly into the first ice crushing zone therebeneath.

From the foregoing description taken together with the

accompanying drawings it will be readily apparent that this invention provides a simple, inexpensive and sturdy ice crusher whereby ice cubes or chunks may be reduced to particles of any of a wide range of sizes, and wherein simple but highly effective means are provided for adjusting the size of particles to be produced.

What is claimed as my invention is:

1. In an ice crusher of the type comprising a substantially hopper shaped housing, a rotatable arbor extending across the interior of the housing, and a plurality of axially spaced apart claws secured on said arbor for rotation therewith: a plurality of parallel, spaced apart fins fixed in the housing, said fins being disposed in vertical planes substantially normal to the axis of the arbor, at one side of the arbor, and having inwardly and downwardly inclined edge portions facing but spaced below the axis of the arbor and extending closely adjacent to the orbits of the tips of the claws, said fins cooperating with the claws in defining a first ice crushing zone below and to one side of the arbor in which ice is crushed to coarse particles; a rotatable shaft extending across the housing substantially parallel to the arbor, spaced below the arbor and spaced from said fins; a plurality of blades fixed on said shaft at axially spaced intervals, said blades being disposed substantially normal to the axis of the shaft and all extending laterally in the same direction therefrom, each blade being intermediate a pair of claws on the arbor; and cooperating means on said shaft and on the housing for releasably retaining said shaft in a position of rotational adjustment in which all parts of the blades are spaced a substantial distance from the fins so that coarse ice particles from said first ice crushing zone may pass freely downwardly past the shaft, or a position in which portions of the blades are closely adjacent to the fins and the orbits of the claw tips and cooperate with the claws to define a second ice crushing zone in which the size of ice particles issuing from the first ice crushing zone is reduced.

2. In an ice crusher of the type comprising a hopper shaped housing, a rotatable arbor extending across said housing, and a plurality of axially spaced apart claws secured on said arbor for rotation therewith: means cooperating with said claws to define a first ice crushing zone in which ice is reduced to coarse particles, said means comprising a plurality of spaced apart vertical fins on a wall portion of the housing, disposed normal to the arbor axis and having edge portions facing toward the arbor axis and adjacent to the orbits of the tips of the claws; and means cooperable with said claws to define a second ice crushing zone in which coarse ice particles may be reduced to smaller particles, said last named means comprising a rotatable shaft extending across the housing beneath and substantially parallel to the arbor, a plurality of blades fixed on said shaft substantially normal to its axis, said blades being axially spaced apart along the shaft and all extending in the same direction therefrom, each blade being disposed intermediate a pair of the claws on said arbor, and cooperating means on said shaft and on the housing for releasably retaining said shaft in any of a plurality of positions of angular adjustment, including positions in which the blades are disposed substantially closely adjacent to the fins and to the orbits of the claw tips to obstruct downward passage of coarse ice particles and cooperate with the claws in crushing such coarse ice particles to smaller size, and a position in which the blades are remote from the fins and permit substantially unobstructed discharge of coarse ice particles from the first ice crushing zone.

3. In an ice crusher of the type comprising a hopper-like housing, a rotatable arbor extending across the interior of the housing, and a plurality of claws secured on said arbor at axially spaced intervals therealong for rotation with the arbor: means on the housing defining a downwardly and inwardly slanting wall portion at one side of the arbor axis and spaced therebeneath; a plurality of vertical fins on said wall portion, normal to the arbor axis and projecting toward the arbor, said fins having edge portions adjacent to the orbits of the tips of the claws and cooperating with the claws to define a first ice crushing zone in which ice may be crushed to coarse particles as the claws are rotated; a gate having a plurality of blades disposed normal to the axis of the arbor and in spaced apart side-by-side relationship; and means mounting the gate in the housing beneath the arbor, alongside the inner portions of said fins, for adjusting back and forth movement between a pair of predetermined positions, in one of which the blades thereon are remote from the fins and permit coarse ice particles to pass unobstructedly downwardly from the first ice crushing zone, and in the other of which said blades are disposed with portions thereof closely adjacent to the fins and to the orbits of the claw tips, so as to cooperate with the claw in defining a second ice crushing zone in which coarse ice particles that have passed through the first ice crushing zone are reduced in size.

4. An ice crusher of the character described comprising: a lower body member having upright front and rear walls connecting with a pair of opposite side walls, said lower body member being open at its top and bottom and having aligned slots in its front and rear walls opening to the upper edges thereof and located closer to one of the side walls than to the other, the bottoms of said slots being located at a zone intermediate the top and bottom of the lower body member, and said side walls having portions which converge downwardly toward said zone; a plurality of vertical fins projecting inwardly and upwardly from the convergent portion of said other side wall; a shaft extending across said zone of the lower body member with its end portions rotatably received in the bottoms of said slots, said shaft having a plurality of blades normal to its axis, at spaced intervals therealong, all extending in the same direction, and said shaft also having a radial arm overlying the front wall of the lower body member; an upper body member seated on and secured to the lower body member to provide a hopper thereabove, said upper body member having downwardly projecting front and rear wall portions cooperating with the shaft to hold it in the bottoms of said slots in the lower body member and thus confine the shaft to rotation; a rotatable arbor extending across the interior of the upper body member near the bottom thereof, substantially parallel to said shaft, and having an end portion projecting beyond the rear wall of the upper body member to provide for rotative driving of said arbor; a plurality of claws on said arbor, at axially spaced intervals therealong, each of said claws being disposed in a plane between a pair of said fins and having a length such that the orbit of its tip is closely adjacent to said fins, to cooperate with the fins in crushing ice fed into the upper body member into coarse particles; and cooperating means on said radial arm on the shaft and on the front wall of one of said body members for releasably retaining said arm in any of a plurality of positions of rotational adjustment of the shaft ranging from a position in which the blades thereon are spaced a substantial distance from the fins and permit unobstructed downward passage of coare ice particles, to a position in which the blades are closely adjacent to said fins and to the orbits of the claw tips to obstruct downward passage of coarse ice particles and cooperate with the claws in crushing them to smaller particles.

5. In an ice crusher of the character described: an upper body member having upright opposite side walls and front and rear walls, said upper body member being open at its top to permit pieces of ice to be fed thereinto and being open at its bottom; a crushing rotor rotatably carried by the front and rear walls of said upper body member, near the bottom thereof and intermediate the side walls, said rotor having a drive portion at

one end thereof projecting outside the upper body member; a lower body member secured to said upper body member and having opposite front and rear walls and side walls forming downward continuations of those of the upper body member, the front and rear walls of said lower body member each having a slot opening to the upper edge thereof, said slots being aligned with one another and being located nearer to one of the side walls than to the other; a plurality of fins fixed on the inner surface of said other side wall of the lower body member, laterally opposite said slots, said fins being disposed normal to the axis of the crushing rotor and spaced from one another and having inner edge portions cooperating with the crushing rotor to define a first ice crushing zone wherein pieces of ice fed into the upper body member are crushed into coarse particles; a shaft having its end portions rotatably journaled in said slots in the front and rear walls of the lower body member; downwardly projecting members on the front and rear walls of the upper body member engaging the shaft to hold it in the bottoms of said slots and thus confine the shaft to rotation; a plurality of blades on said shaft, disposed normal to its axis and at axially spaced intervals therealong, all projecting laterally from the shaft in the same direction; and cooperating means on the shaft and on one of the body members for holding the shaft in any of a plurality of positions of rotational adjustment ranging from a position in which the blades are spaced a substantial distance from the fins and permit substantially unobstructed downward passage of coarse ice particles from said first crushing zone, to a position in which the blades are closely adjacent to the fins and cooperate with the crushing rotor in defining a second ice crushing zone in which coarse ice particles are crushed to particles of smaller size.

6. In an ice crusher of the type comprising a substantially hopper shaped housing, a rotatable arbor extending across the interior of the housing, and a plurality of axially spaced apart claws secured on said arbor for rotation therewith: a plurality of parallel, spaced apart fins fixed in the housing substantially normal to the axis of the arbor, having edge portions spaced below the axis of the arbor and to one side thereof but closely adjacent to the orbits of the tips of the claws and cooperable with the claws in defining a first ice crushing zone in which ice is crushed to coarse particles; a gate having a plurality of blades disposed parallel to one another in laterally spaced apart relationship; means mounting said gate in the housing, below the arbor, for movement in opposite directions between defined positions, at one of which the blades are close to the fins and adjacent to the claw tips, so that the blades cooperate with the fins and the claws to provide a second crushing zone in which coarse ice particles issuing from said first ice crushing zone are reduced in size, and at the other of which positions all parts of the blades are spaced a substantial distance from said fins so that coarse ice particles from said first ice crushing zone may pass substantially unobstructedly downwardly past the gate; and cooperating means on the gate and the housing for releasably holding the gate in either of said positions.

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