

Sept. 9, 1952

V. J. MATTHEWS

2,609,992

CRUSHING OR PULVERIZING MACHINE

Filed Aug. 30, 1950

2 SHEETS—SHEET 1

Fig. 1.

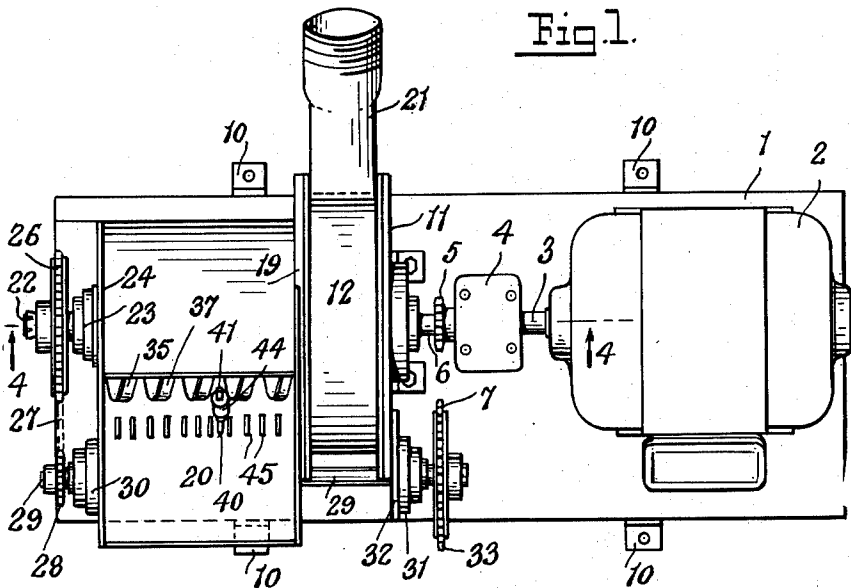


Fig. 2.

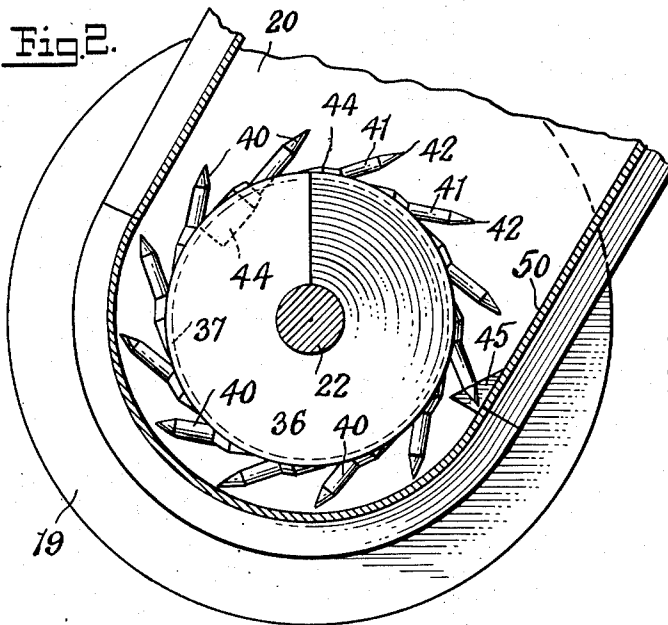
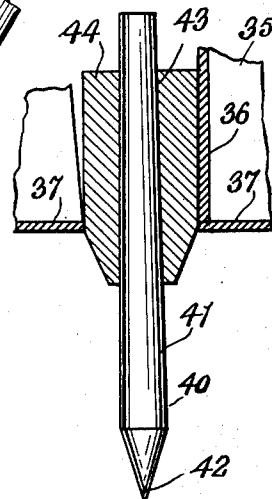


Fig. 3.



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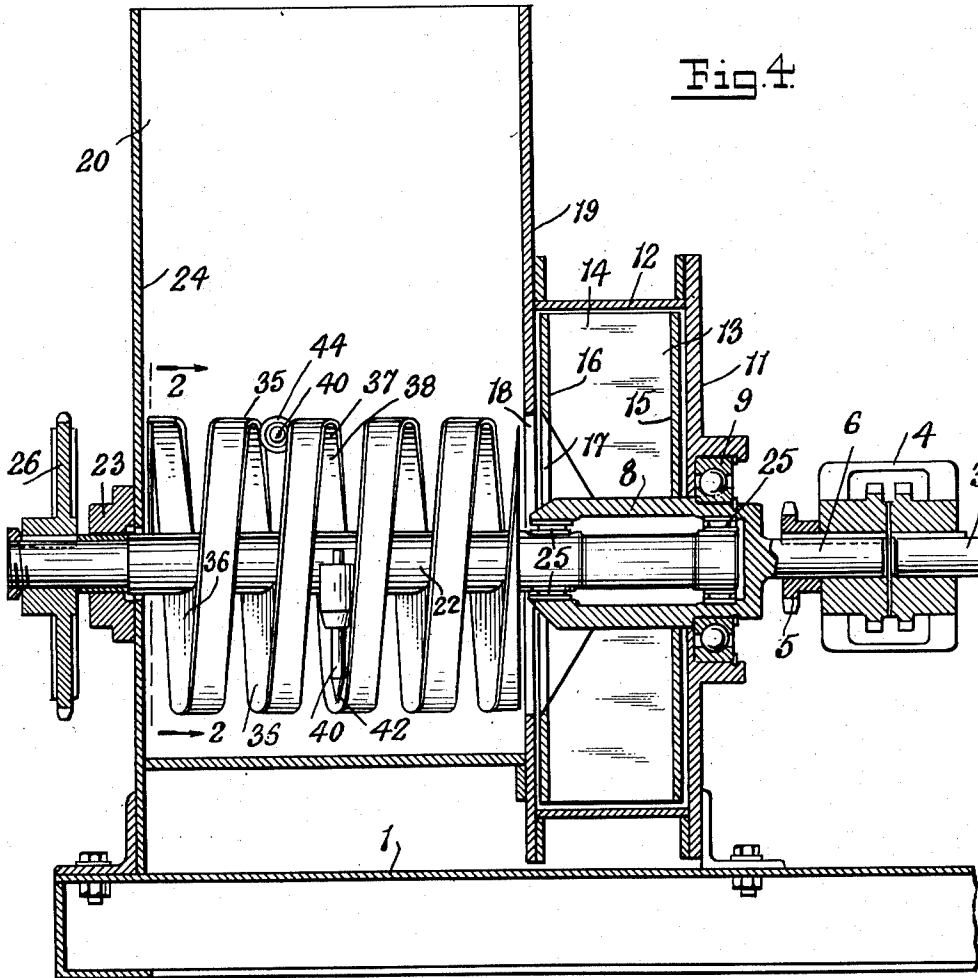
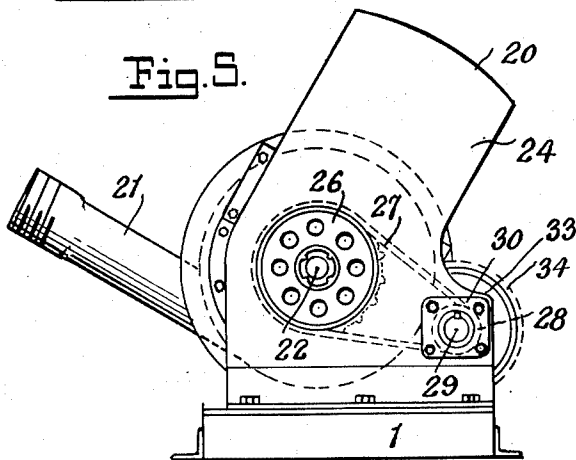
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2 SHEETS—SHEET 2



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CRUSHING OR PULVERIZING MACHINE

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5 Claims. (Cl. 241—56)

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This invention relates to improvements in machines for crushing or pulverizing ice, chemicals or other materials capable of being readily crushed or pulverized.

In many machines in use at the present time, the ice or other material to be crushed is deposited in a hopper in which is mounted a drum or similar rotative member carrying breaker points which, in co-operation with breaker teeth provided on a wall portion of the hopper, crush the ice into small particles or so-called "snow ice." The crushed ice descends to the lower portion of the hopper wherein is located a spiral or helical feeder which feeds the crushed ice through a side opening in one of the walls of the hopper and into a housing containing a centrifugal impeller which directs the pulverized ice out of a discharge pipe to be delivered to or sprayed upon the material to be iced.

In such known prior devices, separate ice-crushing means and feeding means is employed. That is to say, a crushing drum first operates to crush the ice and then a feeder carries it to the impeller. This materially increases the size of the machine, increases the power required for its operation and also increases its manufacturing cost.

It is therefore an object of the present invention to provide in the present apparatus, a combined ice breaker or crusher and a feeding means in a single rotative unit; to provide a feeding device having a helix which will be arranged to prevent the passage of relatively large lumps of ice between its convolutions; to provide a novel means for mounting breaker points on a helical feeder, and to secure other advantages clearly apparent to those skilled in this art.

More particularly, the invention contemplates the provision of a housing or hopper in which is rotatively mounted a spiral feeding device having a helical blade provided with a flange extending around the peripheral edge of said blade and extending laterally therefrom, thus not only providing the blade with a continuous spiral pocket, but reducing the entrance opening between the convolutions of the blade. The invention further contemplates the provision of tubular sockets mounted between the convolutions of the spiral blade with breaker points mounted in said sockets and extending tangentially from the blade, thus causing the feeder to serve also as a breaker or crusher.

With these and other objects to be hereinafter set forth, in view, I have devised the particular arrangement of parts described and more par-

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ticularly pointed out in the claims appended hereto.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed, Fig. 1 is a top plan view of a machine constructed in accordance with the invention; Fig. 2 is a view through the hopper, and combined feeder and crusher, the view being taken substantially on the line 2—2 of Fig. 4, looking in the direction of the arrows; Fig. 3 is a detail view through one of the tubular sockets for the breaker points, showing how the socket is located between the convolutions of the feeder; Fig. 4 is a sectional view on an enlarged scale, taken on the line 4—4 of Fig. 1 looking in the direction of the arrows, and Fig. 5 is a side view on a reduced scale, of the machine, looking at the same from the left of Fig. 1.

Referring to the drawings, 1 indicates the supporting base of the machine, the same being adapted for mounting on any suitable supporting surface by means of screws or bolts extended through the mounting brackets shown at 10. Mounted on top of the base, adjacent to one end of the same, is an electric motor 2 having its shaft 3 coupled to a shaft 5 by means of a flexible shaft-coupling 4 of known construction. The shaft 6 has a tubular portion 8 of increased diameter, said tubular portion being rotatively mounted in a ball-bearing 9 supported by a vertical wall 11 constituting one of the walls or sides of the impeller housing 12. Mounted for rotative movement within the housing 12 is the impeller 13 which is of the type conventionally used in machines of this character, and includes a plurality of blades 14 secured on and projecting radially from the tubular part 8 which constitutes the hub of the impeller. The blades 14 are secured between side walls 15 and 16 which walls form part of the impeller, the inner wall 16 being formed with a central opening 17 in registry with an opening 18 provided in the inner wall 19 of the housing 12, which wall 19 also constitutes one of the walls of the hopper 20. By means of the arrangement described, it will be apparent that the motor 2 will cause rotation of the impeller and result in the crushed ice fed to the impeller by the feeder being forced by the impeller out of a discharge pipe 21 constituting an extension of the housing 12 of the impeller. The housing 12 is capable of swing or rotative movement between the walls 11 and 19 to permit the outlet or discharge pipe 21 to be directed as desired to discharge the crushed ice at the selected point.

Extending across the hopper 20 near its lower

end is a shaft 22, which has one end rotatively supported in a suitable bearing 23 mounted on the side wall 24 of the hopper. The other end of the shaft 22 is rotatively supported in bearings 25 mounted in the tubular part 8 of the shaft 6, the shaft 22 being thus rotative within and at a lower speed than the shaft 6. A sprocket 26 is keyed on the end of shaft 22, and said sprocket is driven by a chain 27 extending about a smaller sprocket 23 secured at one end of a shaft 29. The shaft 29 has one end rotatively mounted in a bearing 30 secured to the wall 24, and has its other end also rotatively supported in a bearing 31 secured to plate 32 attached to wall 11. Adjacent to the bearing 31, the shaft 29 carries a sprocket 33 from which a chain 34, not shown in Fig. 1 but shown in dotted lines in Fig. 5, extends to a small sprocket 5 secured on the shaft 6. This arrangement is such that the motor 2 will drive both the impeller and the shaft 22 at different speeds, the latter carrying the combined feeder and breaker to be now described.

Mounted upon the shaft 22 is the feeder, the same being generally indicated at 35, and consisting of a spiral or helical blade 36 secured on the shaft 22. Secured to and extending spirally around the peripheral edge of the spiral blade 36 and projecting laterally therefrom, is a continuous strip or flange 37, which results in the production of a continuous spiral pocket 38 around the blade 36. The provision of this strip or flange 37 on the blade also results in a uniform spacing between the edges of the convolutions of this strip. Hence the size of the pieces of ice which can fall between the convolutions of the blade 36 will be controlled by the spacing defined by the free edge of the strip or flange 37.

Secured between the convolutions of the feeder blade 36 are breaker points 40. In Fig. 4 only two of these points are disclosed in order to more clearly show the construction of the feeder. However, as will be noted in Fig. 2 a substantial number of them are generally employed between the several convolutions of the feeder blade. Each of the breaker points consists of a tapered pin 41 having a pointed end 42, and adapted to be driven into a tapered bore 43 in a tubular socket 44. These sockets 44 are secured to the blade 36 of the feeder by being welded thereto. In Figs. 1 and 4, the socket 44 is shown as being attached only to the face of the blade, while in Fig. 3 the socket is shown as bridging the space between the face of the blade 36 and the free edge of the strip 37 and being welded to both the blade and strip, thus very securely attaching the socket to the feeder. The point, consisting of the pin 41, can be easily driven out of the tapered bore 43 in the socket whenever it is desired to replace it.

The inner face of the housing is provided with a plurality of spaced breaker teeth 45 between which the points 40 will pass during the rotation of the combined feeder and crusher, thus causing the ice to be crushed or pulverized to the desired size.

From the foregoing, the operation of the improved crushing machine will be readily understood. The ice or other material to be crushed is deposited into the hopper 20 through its open top to descend and be crushed or pulverized between the teeth 45 and pins 40 provided respectively on the feeder and breaker plate 50 of the housing. The crushed and pulverized ice, when in a size to be engaged by

the helical feeder 35, will be forced thereby through the opening 18 and into the impeller housing 12 to be there picked up by the rapidly-rotating impeller and ejected out of the outlet or discharge pipe 21 which can be swung to the selected angle to cause a discharge of the ice at any desired point.

Through the form of driving means described, the impeller and combined feeder and crusher are driven from a single power source, and through the combination of the breaker teeth with the feeder, a simplified yet sturdy and effective construction is provided.

While I have herein specifically described the improved machine as being particularly adapted for the crushing or pulverizing of ice, it can be readily employed for crushing chemicals, salts and possibly many other materials. Therefore, when herein referring to the material used in the machine as "ice" I wish to be understood as meaning any other material which can be effectively and usefully pulverized or crushed by the machine.

What I claim is:

1. In a crushing or pulverizing machine, a hopper for receiving material to be crushed, a rotatable shaft extending across the interior of the hopper, a spiral feeding blade on said shaft, the periphery of said blade being provided with a continuous laterally-extending flange, breaker points secured between the face of the blade and the free edge of the flange, breaker teeth provided at spaced intervals on the inner wall of the hopper, the breaker points being movable between the teeth on rotation of the shaft, an impeller housing in communication with the hopper, an impeller rotatively mounted therein and receiving the crushed material from the feeder, the impeller having an outlet through which the crushed material is discharged on rotation of said impeller.

2. In a crushing or pulverizing machine a spiral feeder, means for rotating the same, said feeder having a helical blade, a flange secured to the periphery of the blade and extending laterally therefrom, sockets located between the edge of the flange and the face of the blade and attached to said edge and face, and breaker pins carried by said sockets and extending tangentially from the blade.

3. In a crushing or pulverizing machine, a hopper, an impeller housing adjacent to said hopper, an impeller rotatively mounted in the impeller housing, said impeller having a hollow hub, said hub having a shaft portion located externally of the housing and motor-driven, a shaft extending across the interior of the hopper, said shaft having one end portion rotatively mounted within the hollow hub of the impeller, the opposite end of said shaft being located externally of the hopper and carrying a sprocket, drive means connecting said sprocket to the motor which drives the hub, a spiral feeder on the shaft, breaker points located between the convolutions of the spiral feeder, and breaker teeth on the interior of the hopper for co-operation with the points to break up the material deposited in the hopper, the hopper and the impeller housing being in communication so that crushed material will be directed into the impeller housing from the spiral feeder.

4. In a crushing or pulverizing machine, a hopper, a shaft rotatively mounted on the hopper, a spiral feeder on said shaft, breaker points secured between the convolutions of the spiral

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feeder and extending tangentially from said feeder, breaker teeth on the interior of the hopper for co-operation with the points to crush material in the hopper, an impeller housing in communication with the hopper and receiving the crushed material from the spiral feeder, an impeller in the housing, said impeller having a tubular hub in which one end of the shaft is rotatively mounted, means for rotating said hub and means for driving the shaft but at a lower rotating speed than the rotated speed of the hub.

5. In a crushing or pulverizing machine, a spiral feeder, means for rotating the same, said feeder having a helical blade, a flange on the periphery of the blade and extending laterally therefrom, breaker points located between the edge of the flange and a face of the blade, said points having their axes transverse to the axis of the feeder attached at diametrically opposite points to the edge of said flange and face of the

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blade respectively, said points extending tangentially from the blade and having ends projecting beyond the edge of the blade.

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