

Jan. 19, 1937.

A. C. LINDGREN ET AL

2,068,383

HAMMER MILL

Filed Feb. 23, 1933

4 Sheets-Sheet 1

Fig. 2

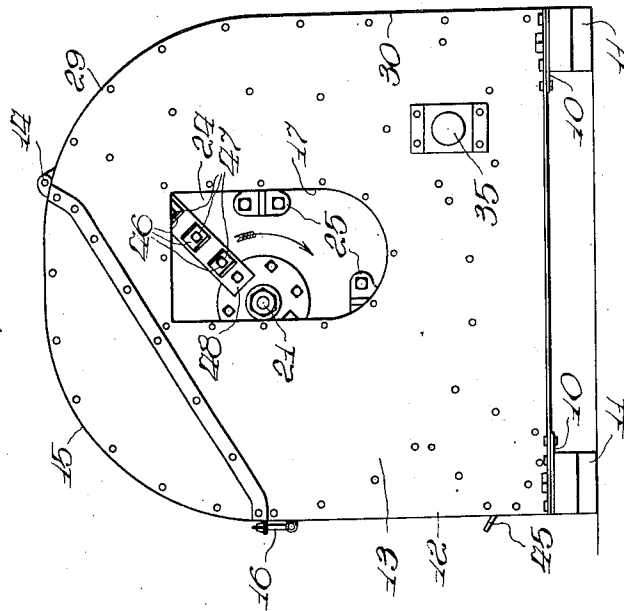
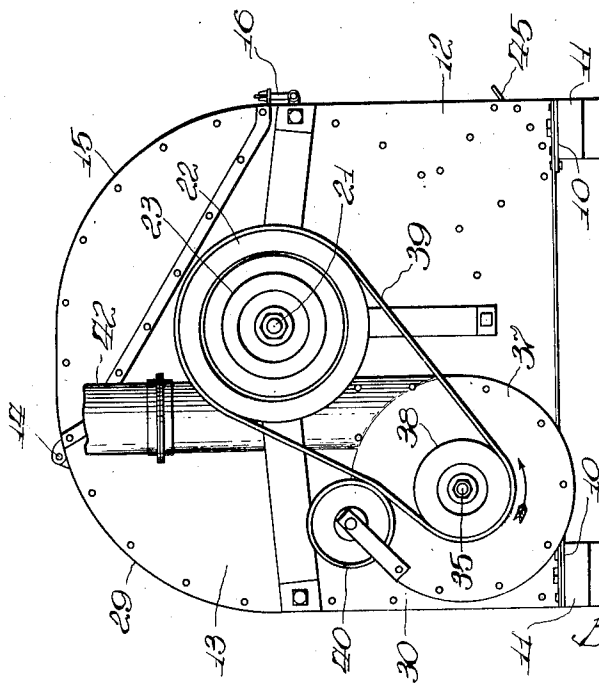


Fig. 1



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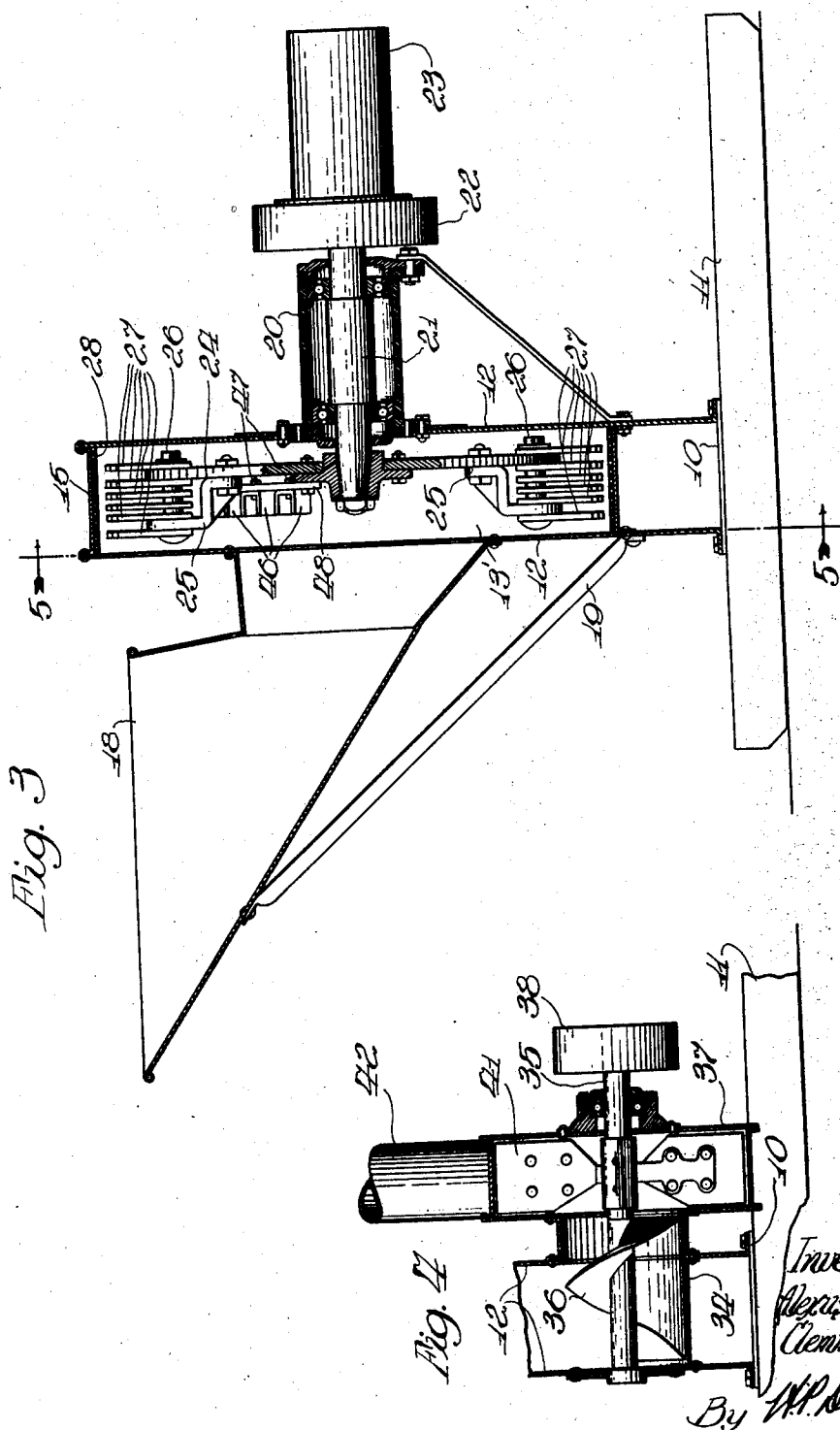
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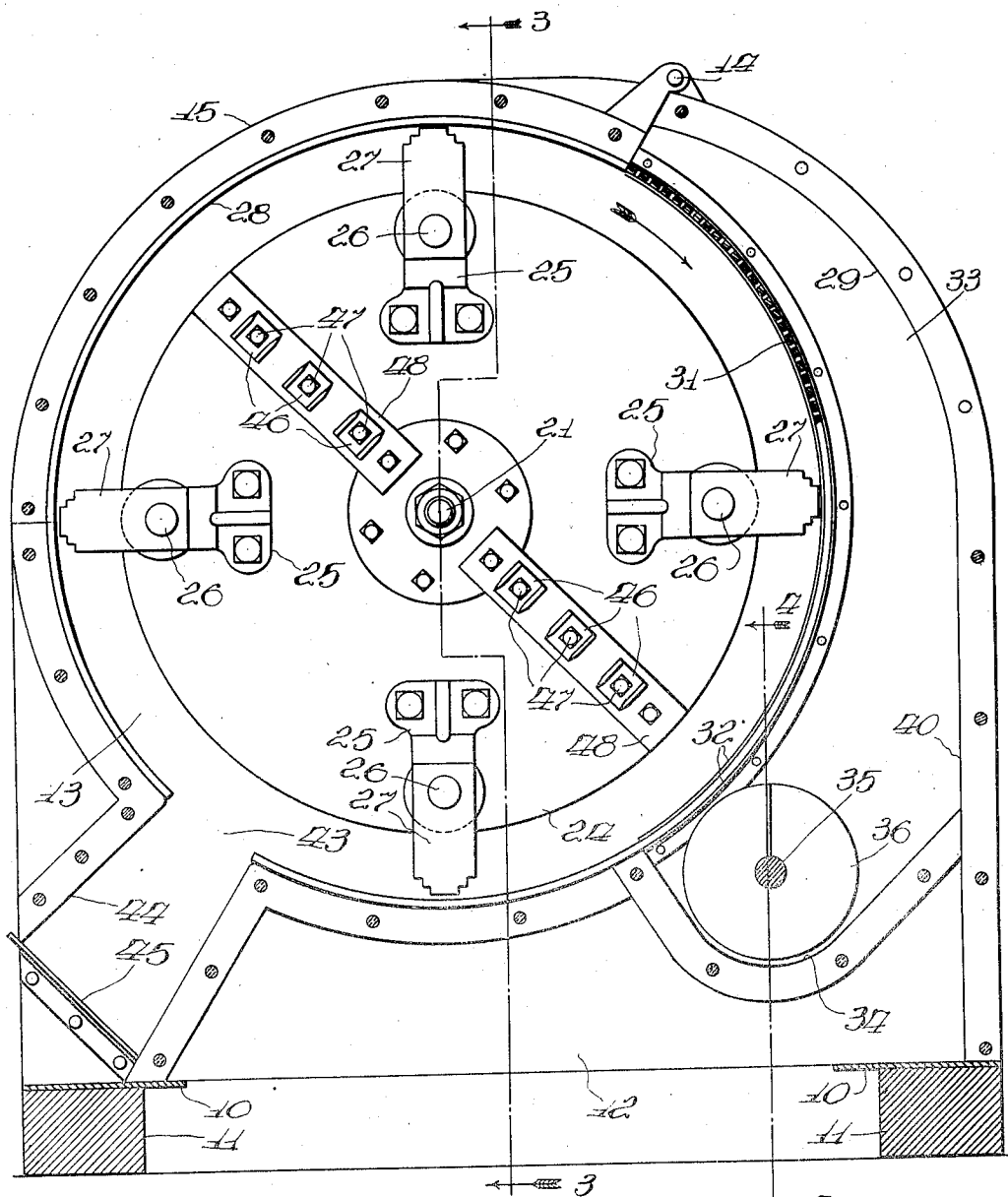


Fig. 5

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4 Sheets-Sheet 4

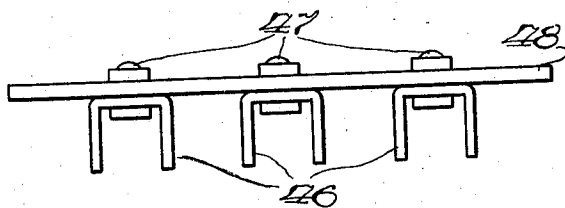
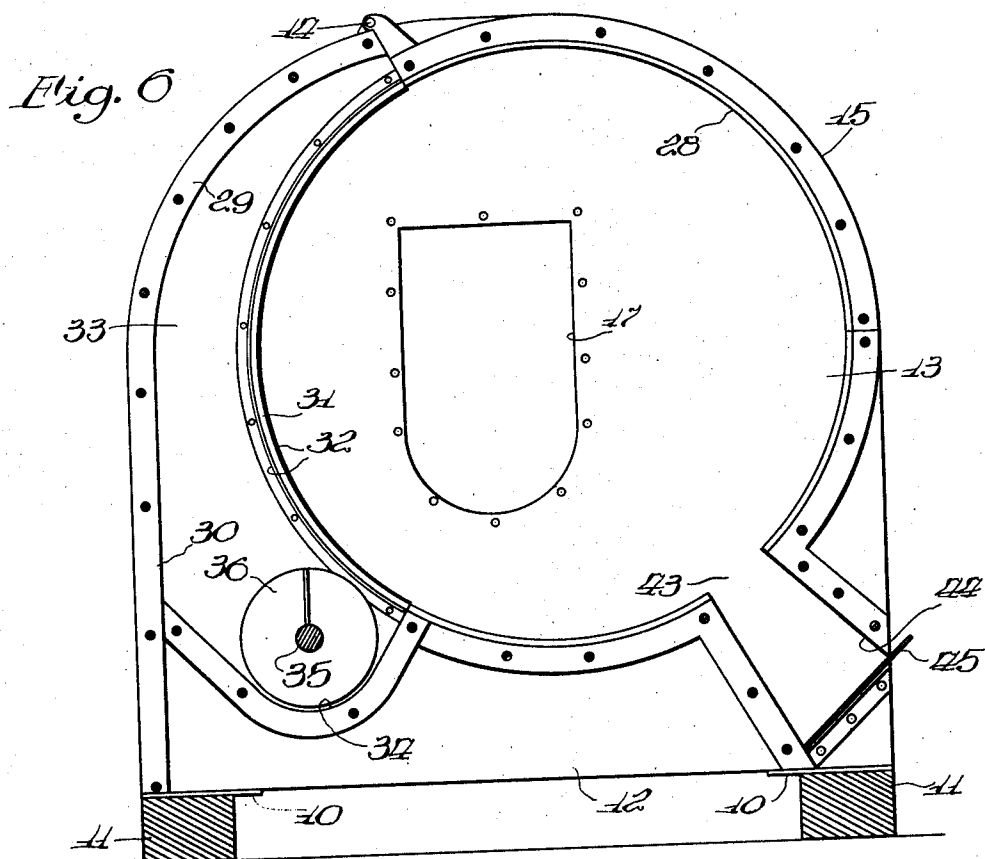


Fig. 7

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UNITED STATES PATENT OFFICE

2,068,383

HAMMER MILL

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Application February 23, 1933, Serial No. 657,982

1 Claim. (Cl. 83—11)

The invention relates to hammer type feed grinding mills of the kind embodying a cylindrical drum provided with a feed opening in one side face and a discharge or exhaust opening for the reduced material adjacent the periphery of the drum.

The primary object of the invention is to locate the feed opening in such a manner with respect to the exhaust or discharge opening that the rotor upon which the reducing means is mounted must carry the material worked upon substantially completely around the 360 degrees periphery of the drum, thus subjecting the material to the maximum hammering action before the material is discharged.

Another object is to provide such a mill that will be lower in height, the resultant lowering of its center of gravity serving to make the machine more stable in its mounting and relatively free from objectionable vibration.

Still another object is to improve the reducing action by mounting shredder teeth on the face of the hammer carrying rotor adjacent the feed opening, so that a preliminary breaking up of the material is effected before the material is subjected to the reducing action of the hammers.

These and other desirable objects may be accomplished by the structure selected for illustration in the accompanying drawings, in which form a vertically disposed cylindrical drum is provided. Carried in the drum is a rotor having on its periphery swinging hammers cooperating with a screen on the inside circumferential face of the drum to reduce material fed into the drum through a side opening provided therein for that purpose. The greater circumferential portion of this screen is backed by the periphery of the drum, so that reduced material cannot pass through the screen. An arcuate portion of the screen, however, is not so backed, so that the reduced material upon reaching this point passes through the screen into a passage-way arranged at one edge of the drum, said passage preferably being vertically curved to cause the material to move downwardly to an auger at the bottom thereof, which moves the material into a blower or fan housing from which the reduced material is pneumatically exhausted from the machine. This discharge passage-way so located relative to the feed opening that it is necessary for the material to be hammered substantially completely around the entire 360 degrees of curvature of the drum before passing to the outlet passage-way mentioned. The arrangement is such that the discharge auger can be placed at one side edge of

the drum instead of directly underneath it, and, as a result, the height of the mill may be substantially lowered. The discharge passage-way mentioned is bounded at one side by an arc of the concentric drum screen, while its other side is preferably formed by an extension wall of the circular drum, which wall begins approximately at the top center point of the drum, leaving it along a tangent line, and then with a gradually increasing curvature spacing away from the adjacent arc of the screen to merge in a straight line perpendicular to the floor on which the mill stands. As a result, the passage gradually enlarges from top to bottom to handle an increasing volume of material. At the bottom of the passage, the transverse auger moves the material into the fan housing. Further, the face of the rotor adjacent the feed opening is provided with diametrically aligned bars, carrying shredder teeth which serve the purpose of preliminarily breaking up the material as it is fed into the reducing drum.

In the drawings:

Figure 1 is a side elevational view of the mill, as viewed from the driving side thereof;

Figure 2 is a side elevational view of the mill, as viewed from the feeding side;

Figure 3 is a transverse cross sectional view, as seen along the line 3—3 appearing in Figure 5, when viewed in the direction of the arrows;

Figure 4 is a detail, transverse sectional view through the auger and fan device, as seen along the line 4—4 appearing in Figure 5 when looking in the indicated direction;

Figure 5 is a face view of the interior of the reducing drum, showing the rotor and other parts, as viewed approximately along the line 5—5 in Figure 3 from the feed side and showing a portion of the screen in section;

Figure 6 is a face view from the drive side showing the interior of the drum, with the rotor removed to illustrate the relative location of the feed opening with respect to the discharge passage-way; and,

Figure 7 is an elevational view of the bar carrying shredder teeth.

The mill comprises base plates 10 mounted on runner supports 11. The plates 10 carry two vertically disposed, spaced apart, sheet metal plates 12, which constitute the parallel sides of a cylindrical drum 13, the sides being appropriately connected by a circular piece 13' to form the cylindrical or circular drum. An upper, arcuate portion of the drum 13 is hinged at 14 to provide a cover 15 clamped in place removably by a latch 16, whereby the cover 15 may be

raised to permit access to the interior of the drum 13.

One side plate 12 of the drum is provided with an elongated opening 17 disposed vertically and off center with respect to the center of said wall 12, which opening constitutes the feeder opening for the entry of the material, that is to be reduced, into the drum. A hopper 18 is carried by a brace 19 on said wall 12, the hopper arranged to feed material to the opening 17.

The other wall 12 of the mill carries at its center a sleeve 20 in which is journaled a drive shaft 21 carrying a large pulley 22 and a wide pulley 23. The shaft 21 extends centrally into the drum 13 and carries at its end within the drum a rotor 24 in the form of a circular disk, which disk adjacent its periphery and on the face adjacent the feed opening 17 carries at circumferentially spaced points, brackets 25 that support pins 26, on which are hingedly or swingably mounted reducing hammers 27.

Closely fitting the circular part 13' of the drum is a circular screen 28 provided with holes, which foraminous interior surface cooperates with the hammers 27 in reducing the material. The circular wall 13' adjacent the top point of the circle, as seen in Figure 5, projects out from the circle at a tangent, to form an extension 29 of the wall, which curves away from the concentric drum 13 on an increasing radius or curvature to a point substantially along the horizontal diameter of the machine, and thence said wall 29 moves down, as at 30, in a vertical line or perpendicular to the floor on which the machine stands. It will be noted that this increasing curvature of the wall 29 begins substantially at the hinge 14 and moves in a direction away from the latch 16 or the cover 15. The section of the screen 28 adjacent this curved wall 29—30 is preferably a separate piece, as indicated at 31, and it may have holes somewhat larger than the holes in the screen 28, said screen 31 running from a point adjacent the hinge 14 to a point near the bottom of the drum 13, as shown in Figure 5. The arcuate section 31 of the screen 28 is a concentric continuation of the screen 28 and forms a cylinder or circle therewith. This arcuate section 31 is carried in guideways 32 to permit withdrawal of the screen section 31, access thereto being had when the cover 15 is raised. See Figure 5 where screen portion 31 has been shown in section.

It will be noted that a passage-way 33 is formed between the arcuate screen section 31 and the wall 29—30, which passage-way gradually increases in size from top to bottom, as the passage-way is substantially vertically disposed around one side edge of the drum. The screen 31 is open to said passage-way 33, by which is meant that the material reduced within the drum, when it passes the screen 31, is forced through the holes therein into the passage-way 33.

It is of greatest importance to note that this exhaust or outlet screen 31 is so located with respect to the feed opening 17 that the material entering the drum through the feed opening 17 must pass or work its way around substantially the entire 360 degrees of curvature of the drum before it reaches the screen 31, or, at least, the main portion thereof, and, as a result, assurance is given that the material will be thoroughly reduced and worked upon by the hammers 27 before it gets to said screen 31. The direction of rotation of the rotor is indicated in the drawings

by arrows. The bottom of the passage 33 is formed as a trough 34 between the circular wall of the drum and the lower end of the wall 30, there being a shaft 35 disposed transversely in the sides 12 of the drum, upon which shaft is arranged an auger 36 which receives the reduced material and conveys it transversely into a fan housing 37 disposed at and connected to the driving side 12 of the mill. This shaft 35 projects out of the fan housing 37 where it carries a pulley wheel 38, as shown in Figure 1, and by means of a belt 39 is connected to be driven from the pulley wheel 22 heretofore described. An idler pulley 40 may be carried in the manner shown in Figure 1, to tension the belt 39.

The shaft 35, wherein the fan housing 37 carries a fan or blower 41, which exhausts the material delivered by the auger 36 and blows the same pneumatically up through a vertical pipe 42 and out of the machine to any suitable point desired where the material will be accumulated or caught in bags or other suitable receptacles in any well known manner.

Just below the feed opening 17 and to one side thereof in the direction of rotation of the rotor 24, the drum 13 is open, as at 43, to communicate with a chute 44 for catching stones and other heavy foreign particles, to trap the same. Such particles, being heavy, are obviously forced outward centrifugally and caught in said trap 44. The lower end of this trap 44 is provided with a slide or door 45 that may be slid out to remove such foreign objects from the machine. The trap 44 and auger 36 are disposed on opposite sides of the vertical diametric line of the drum 13 and adjacent the lower curvature of said drum.

To make the reducing action of the rotor 24 and its hammers 27 more efficient, a preliminary reducing action is provided by means of channel, or U-shaped shredder teeth 46 secured by bolts 47 to bars 48, there being two such bars 48 carrying shredder teeth 46 arranged diametrically in alignment across the face of the rotor 24 adjacent the feed opening 17, so that material entering the opening 17 is initially broken up or shredded by these teeth 46 before the material moves centrifugally out to the circumference of the drum 13 where the action of the hammers 27 and screens 28, 31 finally reduce the material.

The arrangement of the passage-way 33 is such that the auger 36 may be arranged to one side of the bottom of the drum 13 rather than directly underneath said drum, and, as a result, it is possible to lower very substantially the overall height of the machine. This is most desirable because lowering of the center of gravity of the machine permits of a more stable mounting, which will eliminate vibration and, incidentally, make feeding of the machine more easy.

A belt from any source of power, such as from an engine or a tractor, will be connected to the wide pulley 23 to drive the machine.

From this description it will now be obvious that the location of the passage-way 33 with respect to the feed opening 17 is such that, with the direction of rotation of the rotor being such that it is, material in being operated upon by the hammers must be carried around substantially the entire 360 degrees of the periphery of the drum before the material reaches the screen 31 through which it is to pass in reduced form into the passage-way 33. This is highly desirable, as it permits the hammers 27 and shredders 46 to operate to a maximum extent on the material to be reduced. Further, it enables such location of

the passage-way 33 at the edge of the machine to permit lowering of the over-all height of the machine. Also, the shredders initially reduce the material as it is fed into the machine and, as a result, all of the features of this invention co-

operate in a manner to produce a finer grade of milling. Thus, all of the objects of the invention heretofore recited are accomplished.

It is the intention to cover all such changes and modifications of the form of invention herein shown as do not depart in material respects from the spirit and scope of the invention, which is covered in the appended claim.

What is claimed as new is:

15 A hammer mill comprising a drum having two upright spaced sides and a cylindrical portion connected therebetween, a screen lining the inner periphery of said cylindrical portion, an arc of the screen along one side edge of the drum being
20 open for the passage of ground material there-through into a discharge passageway arranged vertically and adjacent said open arc of the screen and delineated by a wall extending from the drum from a point near the top thereof and along

a tangent line and gradually curving downwardly on increasing radii to a point substantially on the projected horizontal diameter of the drum, said wall then continuing substantially vertically downwardly alongside the drum to form a gradually enlarged passageway from top to bottom, said ground material discharging through said open portion of the screen only, a rotor disk having peripheral hammers rotatable within the drum, one face of the disk carrying reducing cutters thereacross, one upright side of the drum having a feed opening arranged off center relative to the axis of the disk and serving to feed material to said adjacent face of the disk, said feed opening being also arranged in proximity to the open arc of the screen and discharge passageway whereby material in process is carried around substantially the entire periphery of the drum before reaching the discharge portion of the screen, and an auger conveyer at the lower end of the discharge passageway for moving ground material from the said passageway.

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