Nov. 24, 1925. 1,562,562

A. E. JACOBSON

FEED GRINDING MACHINE

Filed April 21, 1923 2 Sheets-Sheet 1

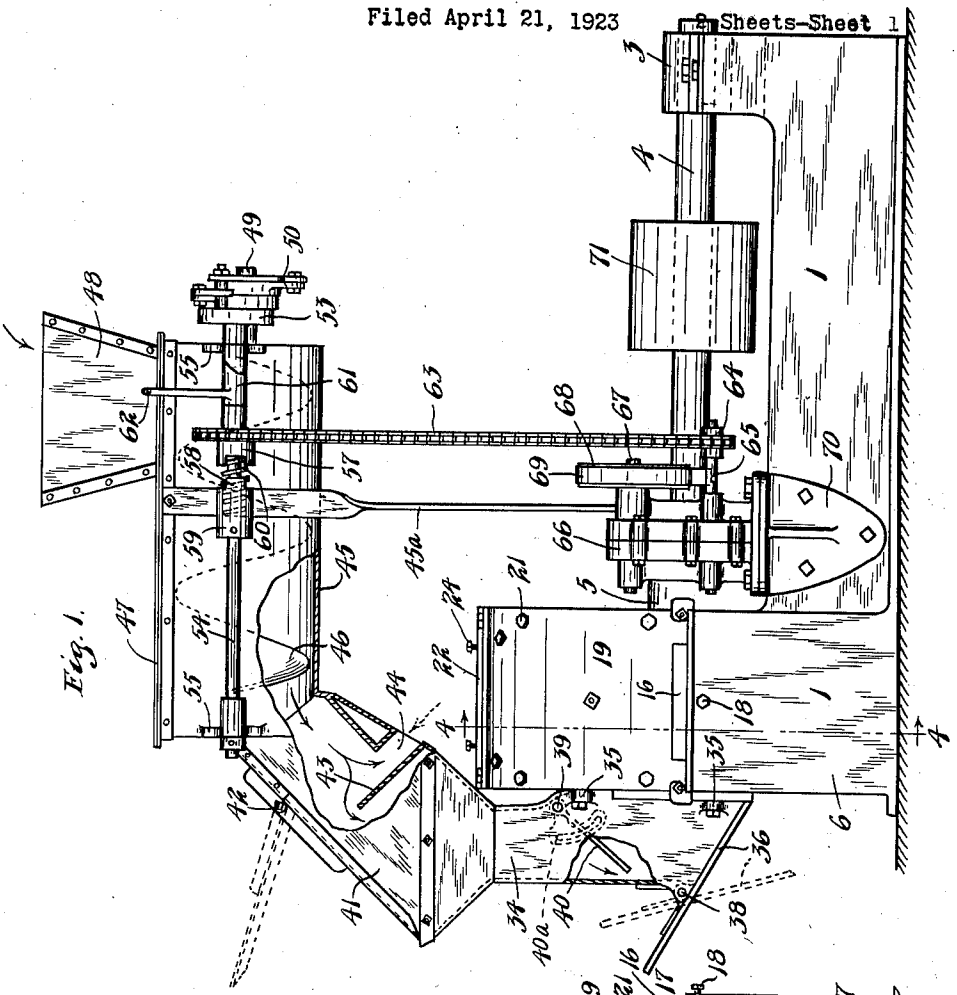


Fig. 1.

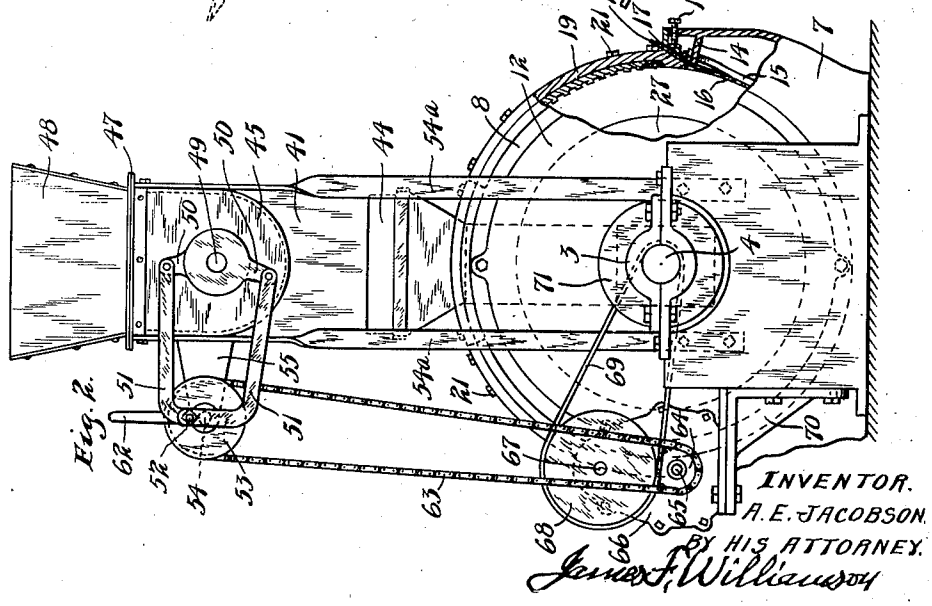


Fig. 2.

INVENTOR.
A. E. JACOBSON.
BY HIS ATTORNEY.
James F. Williamson

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Fig. 6.

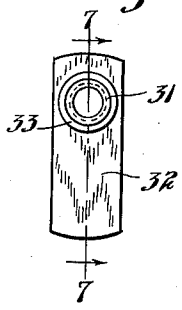


Fig. 3.

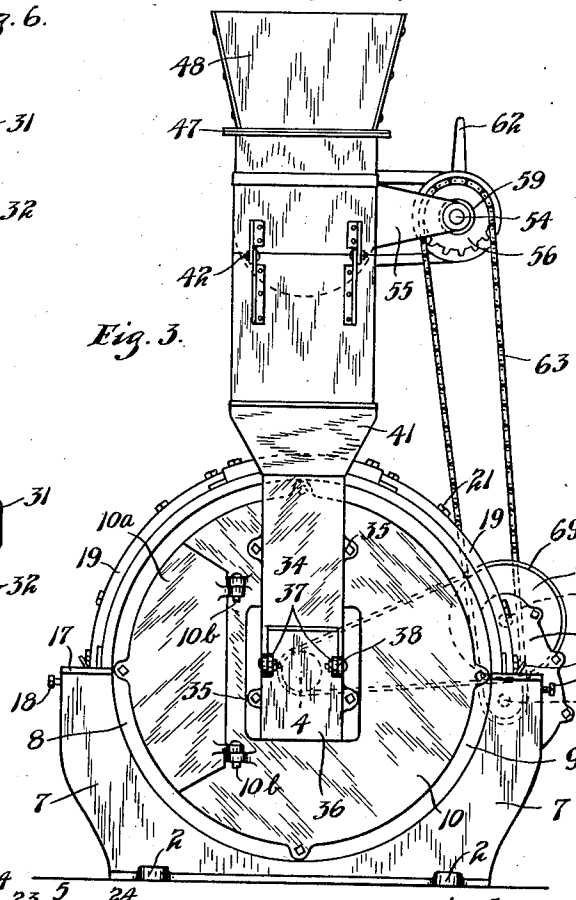


Fig. 7.

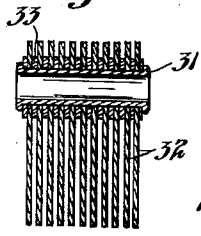


Fig. 4.

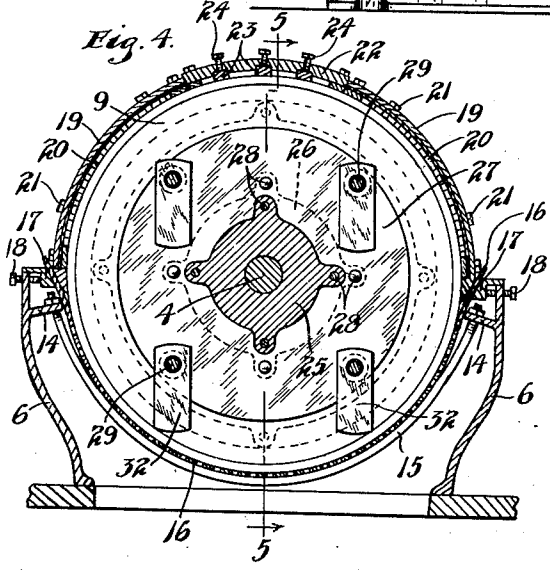


Fig. 5.

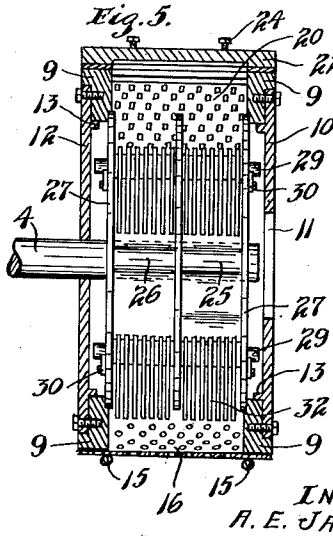


Fig. 8.



INVENTOR
A. E. JACOBSON.
BY HIS ATTORNEY.
Ernest F. Williamson

Patented Nov. 24, 1925. 1,562,562

UNITED STATES PATENT OFFICE.

AXEL E. JACOBSON, OF MINNEAPOLIS, MINNESOTA.

FEED-GRINDING MACHINE.

Application filed April 21, 1923. Serial No. 633,732.

To all whom it may concern:

Be it known that I, AXEL E. JACOBSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Feed-Grinding Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a grinding machine, and particularly to such a machine adapted to grind grain, feed, and the like.

The present invention is an improvement upon the machine disclosed in my prior Patent No. 1,374,207, granted April 12, 1921.

It is an object of the present invention to provide such a grinding machine having improved means for delivering the material thereto and forming a compact and enclosed structure.

It is a further object of the invention to provide a convenient and easily removable and renewable form of grinding surfaces and members in the machine.

It is also an object of the invention to provide a positively driven feeding means for the grinding machine and simple and efficient means for operating the same from the main shaft of the machine.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to the same parts throughout the different views, and in which,

Fig. 1 is a view in side elevation of the machine, certain parts thereof being shown in section;

Fig. 2 is a view in end elevation of the machine as seen from the right of Fig. 1, a portion of the machine being shown in section;

Fig. 3 is a view in end elevation of the machine as seen from the left of Fig. 1;

Fig. 4 is a view in vertical section of the grinding machine, said section being taken substantially on the line 4—4 of Fig.1, as indicated by the arrows;

Fig. 5 is a view in vertical section on the line 5—5 of Fig. 4;

Fig. 6 is a view in end elevation of one of the groups of grinding blades used;

Fig. 7 is a vertical section taken on the line 7—7 of Fig. 6; and Fig. 8 is a view in end elevation of a locking means for one of the grinding element shafts, Figs. 6, 7 and 8 being shown on an enlarged scale.

Referring to the drawings, the machine comprises a housing member 1 forming the base of the machine and provided with lugs 2 adapted to receive foundation or securing bolts. The member 1 extends a considerable distance at one end and has a cap bearing 3 at said end forming one of the bearings for the main shaft 4 which is also journaled in a bearing 5. The end of the member 1 opposite the bearing 3 has side portions 6 connected by end walls 7 formed with semi-circular openings 8. A pair of spaced rings 9 are fitted in said openings and secured to the end walls 7. A disk 10 having a central opening 11 is secured to the outer ring 9, as shown in Fig 8, and a disk 12 having a central opening substantially fitting the shaft 4 is secured to the inner ring 9, said rings being suitably recessed to receive said disks and said disks having inwardly directed circular flanges 13 fitting the inner sides of said rings. The walls 6 each have an inwardly directed straight flange 14 projecting therefrom, which flanges are apertured to receive the threaded ends of spaced semi-circular rods 15 extending downwardly in the member 1 and being provided with nuts at the upper sides of the flanges 14. A semi-circular perforated plate or screen 16 is supported upon the rods 15 and has its top edges disposed somewhat above the horizontal diameter of rings 9, at the exterior of the lower beveled edges of arcuate upper cover plates 19 bolted to the rings 9. Plates or bars 17 are provided having flanged portions extending over the top of the walls 6, said bars abutting against the top margins of the screen 16 and being moved by the screws 18 to press the upper portion of said screen firmly against the plates 19. The bolts 18, as clearly shown in Fig. 4, are threaded through the walls 6. The arcuate

plates 19 extend between and over the rings 9 at each side of said rings and hold in place grinding plates 20 disposed between the same and the rings 9, bolts 21 extending through both sets of plates 2 and 19. A top section or plate 22 extends between the upper sides of the plates 19 and holds in place spaced grinding bars 23 seated in slots therein and against rings 9 and engaged by screws 24 extending through the top of plate 22. The plate 22 is also held in place by cap screws extending therethrough and into the rings 9. The shaft 4, as shown in Fig. 5, terminates adjacent the plate 10 and said shaft has secured thereto between the disks 10 and 12, spider hubs 25 and 26. These hubs have radially projecting circumferentially spaced lugs and spaced disks 27 are riveted or bolted to said hubs by bolts or rivets 28 extending through the said lugs. Said spider hubs are made of different sizes as shown in Fig. 4 and one adjacent pair of the disks 27 are riveted to one hub and the other adjacent pair of disks 27 are riveted through the lugs of the other hub. Circumferentially spaced shafts 29 illustrated as four in number, extend between and through the disks 27 having the end portions projecting beyond the outer disks 27, said portions having transverse slots formed therein adjacent the disks adapted to receive the segmental swinging plates 30 pivotally connected to the outside of the outer disks. The shafts 29 carry between each pair of adjacent disks the headed bushings 31 having pivotally mounted thereon spaced substantially rectangular plates 32 having spaced washers 33 therebetween. It will be noted that the ends of the plates 32 are formed on the arcs of circles. Plate 10 has a section 10^a formed as a hinged door supported on the hinge bolts 10^b, as clearly shown in Fig. 3.

An upwardly extending housing 34 substantially rectangular in horizontal cross section, is bolted to the disk 10 and extends over the opening 11 therein, the inner wall of said housing being provided with spaced lugs 35 through which the attached bolts to plate 10 extend. The bottom 36 of the housing 24 inclines downwardly and inwardly and is provided with spaced ears 37 pivoted by headed and nutted bolts to spaced ears 38 on the outer wall of the housing 34, so as to be hingedly connected and adapted to be swung when desired, to open position, as illustrated by dotted lines in Fig. 1. A rod 39 extends transversely of the housing 34 adjacent the rear wall thereof and a plate 40 is pivotally connected to said rod and adapted to be moved to various positions in said housing, the same being held in adjusted position by a tightening bolt, not shown, extending through an arcuate slot in the plate 40^a secured to the side of the housing. Said housing 34 has a flaring hopper at its upper end communicating with and bolted to an inclined section or chute 41, a portion of the upper wall of which is hinged on a transversely extending rod 42, so as to be raised, when desired, as indicated by the dotted line position in Fig. 1. The chute 41 has an upstanding baffle 43 extending thereacross which is substantially perpendicular to its top and bottom walls and an opening 44 is formed in the bottom of said chute immediately above and adjacent said baffle. The chute is connected to and communicates with, at its upper end, a trough 45 having a semi-cylindrical bottom in which is disposed a screw conveyer 46. Trough 45 and the parts carried thereby are supported by vertical struts 45^a secured to the sides of the trough at their upper ends and bolted at their lower ends to the housing 1. Said trough 45 has a cover 47 and a hopper 48 extending thereabove at one end and communicating therewith. The conveyor 46 is secured to a shaft 49 extending longitudinally through the trough 45 and journaled in the ends thereof, one of which ends has a pair of members 50 secured thereto having arms projecting in substantially opposite directions to the ends of which are pivotally connected the inner ends of links 51. Said links are formed with right angle turns at their outer ends and are pivotally connected to a crank pin 52 projecting from a crank disk 53 secured to a shaft 54 journaled in bearings 55 projecting from one side of the trough 45. The shaft 54 is driven by a sprocket 56 journaled thereon having a sleeve provided with notches 57 adapted to engage with projections 58 formed on a sleeve 59 which is pinned or otherwise secured to the shaft 54. A spring 60 is disposed about shaft 54 between the sleeves 59 and the sprocket 56 and normally holds said members disengaged. The sprocket sleeve is engaged by a sleeve 61 also journaled on shaft 54 and having one end formed as a cam adapted to cooperate with a cam surface on the end of one of the bearings 55 whereby, when the sleeve 61 is swung by its handle 62, the sprocket 56 will be moved into engagement with the sleeve 59 and the shaft 54 will be driven. When said shaft is driven, the shaft 49 is intermittently rotated as is also the conveyor 46. The sprocket 56 is driven by a chain 63 running over and, in turn, driven by a sprocket 64 carried by shaft 65. The shaft 65 is journaled in bearings formed on the gear box 66 and carries a gear meshing with and driven by a gear on a shaft 67 also journaled in bearings on the gear box

66, said gears being disposed in said box and not shown. The shaft 67 is provided with a pulley 68 driven by a belt 69 from a small pulley on a shaft 4. The gear box 66 is supported on a bracket 70 bolted to one side of the housing 1 and the shaft 4 is driven from the main pulley 71 secured thereto.

In operation, the shaft 4 and the disks 27 secured thereto will be driven at high speed by a belt running over pulley 71 and connected with any suitable source of power. The plates 32 will be thrown outwardly by centrifugal force and will move in close proximity to the grinding plates 21 and the grinding members 23. The sides of plates 32 will also act as a fan and will produce a powerful suction through the opening 11 which forms the eye of the fan. The material to be ground will be placed in the hopper 48 and, as the shaft 49 is driven through the shaft 54, material will be fed by the conveyor 46 into the chute 41. The material will pass down along the bottom of this chute and against the baffle plate 43. The air drawn in by the fan will enter chute 41 through the opening as indicated by the dotted arrow in Fig. 1. This blast of air is sufficiently strong to lift the grain and other material to be ground over the baffles 43 so that the same will drop into housing 34. If foreign material, however, such as stones, iron, nuts or bolts, etc., will drop through the opening 44 and will not be so lifted by the air. The force of the current of air entering the chute 41 may be regulated by adjusting the swinging plate 40. The material dropping down into housing 34 is directed into the eye 11 of the grinding chamber and is thrown out against the grinding surface by the plates 32 and ground as desired. The air blast created by the rotating grinding members and fan passes out through the lower screen section 15 and the ground material is carried through this screen by the blast and also by the action of the plate 32 and is discharged through the bottom of the housing 1.

The screen section 15 is firmly held in position by the rods 15 which can be maintained in tight relation thereto by adjustment of the nuts at the ends of said rods. Said screen is also held tightly in place by the bars 17. If it is desired to remove the screen, one of the bars 17 can be removed. The screen can then be removed by rotating the same and sliding it sideways or circumferentially out through the opening formed by the removed bar. The sections 19 and 23 and the grinding plates carried thereby are also readily removable so that new griding plates can be very easily substituted. The shaft 29 can also readily be removed by merely turning the locking plates or lugs 30 out of the slots therein. Access may also readily be had to the interior of the grinding chamber through the door 10a and the bushings 31 carrying the plates 32 can be removed for any purpose by being brought into alinement with this door and removing the shafts 29. Access may also readily be had to the chute 41 by the pivoted cover formed thereon. Access may also easily be had to the housing 34 by the pivoted bottom 36 thereof. The grinding plates have double-ended grinding projections thereon so that the rotation of the grinding head may be reversed and shaft 4 driven in either direction. The grinding surfaces may be like those disclosed in applicant's prior Patent No. 1,374,207 granted April 12, 1921.

From the above description it is seen that applicant has provided a compact and efficient grinding mill, all the necessary parts of which may readily be removed for substitution or repair and which mill is conveniently accessible at all necessary points. The machine is very compact and the parts thereof are easily constructed and assembled. The machine is being manufactured and marketed and has proven very efficient in actual practice for the purposes had in view.

It will, of course, be understood, that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of applicant's invention, which, generally stated, consists in a device capable of carrying out the objects above enumerated, such as shown and described and set forth in the appended claims.

What is claimed is:

1. A grinding machine having in combination, a casing, a grinding surface secured therein, a rotary grinding member disposed in said casing and co-operating with said surface and constituting a fan, said casing having an axial lateral opening forming the eye of said fan, an upwardly extending housing communicating with said eye, and an inclined chute to which the material to be ground is delivered, a baffle plate extending upwardly across the major part of said chute, said chute having an opening in its lower side immediately above and adjacent said baffle plate through which air is drawn by said fan to lift the material delivered to said chute over said baffle plate and through which heavy foreign material may pass.

2. The structure set forth in claim 1, a hinged cover for said inclined chute, a hinged door forming the bottom of said upwardly extending housing, and an air regulating valve intermediate of said housing.

3. A grinding machine having in combination, a base housing having side and end walls, one of said end walls having an axial opening therein through which material is fed to said machine, a shaft carrying a grinding member extending axially through

the other end wall and terminating adjacent said opening, said side walls having semi-circular recesses formed therein, spaced rings fitting in and secured in said recesses, said side walls having inwardly extending flanges projecting therefrom, longitudinal adjustable curved members having their ends secured in said flanges, a semi-circular screen supported by said members, and a plurality of top sections removably secured to said rings and forming a semi-circular top above said housing.

4. The structure set forth in claim 3, laterally adjustable bars at the sides of said base by which the upper edges of said semi-circular screen are held in position, said screen being removable when one of said bars is removed by a slidable circumferential movement.

5. A grinding machine having in combination, a housing comprising spaced bearings and a casing having side and end walls at one end of said bearings and extending through one end wall and terminating adjacent the other, the latter having an opening through which material is fed around said shaft, a rotary shaft journaled in said bearings, a grinding member secured to said shaft, said side walls having flanges extending inwardly therefrom semi-circular curved spaced rods extending downwardly between said flanges and having their threaded and nutted ends extending through said flanges, spaced rings secured in the sides of said end walls, a semi-circular screen supported on said rods, bars secured at each side of said housing at the top thereof, means for moving said bars inwardly to clamp the top portions of said screens, a plurality of removable arcuate sections forming a semi-cylindrical top for said housing secured to said rings, and a plurality of grinding plates held in place by said removable sections.

6. A grinding machine having in combination, a housing having end walls, one of which has an axial opening therethrough, a shaft extending axially through the other end wall and terminating adjacent said opening, a rotating grinding member secured to said shaft, a pair of spaced rings secured in the sides of said housing, a removable semi-circular screen forming the lower half of a grinding casing surrounding said grinding member, means for holding said screen against said rings and removable top and side sections forming a semi-cylindrical upper half of the grinding casing, said sections being secured to said rings and securing in place a plurality of members having grinding surfaces thereon in the upper half of said grinding casing.

7. A grinding machine comprising a casing, a rotary grinding member therein comprising a shaft, spaced disks secured thereto, a plurality of circumferentially spaced shafts extending between and through said disks, headed bushings on said last mentioned shafts between each pair of adjacent disks, spaced blades revolubly mounted on said bushings, spaced washers between said blades, said last mentioned shafts projecting beyond the outer disks and movable locking means on said outer disks engaging said shafts to hold the same in endwise position, said locking members being movable to permit endwise removal of said shafts.

8. A grinding machine having in combination, a substantially cylindrical grinding casing having abrading means on its inner peripheral wall, a grinding head in said casing comprising radially swinging beaters co-operating therewith, a shaft carrying said head and extending axially into said casing at one side thereof, the other side of said casing having a central opening therethrough, a feed chute at the last mentioned sides of said opening, said chute having a member therein over which the material must be lifted, said grinding head acting as a fan to lift the material over said member and drawing said material and air into said central opening.

9. A grinding machine having in combination, a casing, a grinding surface secured therein, a rotary grinding member disposed in said casing and co-operating with said surface and constituting a fan, said casing having axial lateral opening forming the eye of said fan, a chute extending partially across the same leading to said eye, a baffle in said chute, said chute having an opening in the bottom thereof adjacent said baffle, said fan being adapted to draw air through said opening to lift the material to be ground over said baffle, and means for regulating the air drawn through said opening.

10. A grinding machine having in combination, a substantially cylindrical grinding casing having abrading means on its upper interior portion, and a screen wall at its lower portion, said casing having a closed side, a shaft projecting axially through the closed side of said casing, feeding means including a baffle over which material must be lifted to pass into said material opening, a head secured to said shaft and rotatable therewith adapted to co-operate with said casing and feeding means, said head acting as a fan to lift the material over said baffle and to draw said material and air through said central opening, said casing having a discharge passage below said screen wall through which the ground material and air is discharged.

11. A grinding element for a grinding machine comprising a shaft, a headed bushing journaled on said shaft, spaced blades revolubly mounted on said bushing and

spaced washers between said blades, said bushing and the blades and washers carried thereby being removable as a unit from said shaft.

12. In a grinding machine, a grinding head comprising spaced disks, a longitudinally removable shaft extending between said disks, movable means holding said shaft in place, a bushing on said shaft, beater blades journaled on said bushing, spacing means on said bushing between said blades, said bushing having means at its end for holding said blades thereon whereby said shaft may be removed and said bushing, blades and spacing members can be removed from said shaft as a unit.

13. A grinding machine comprising a casing, a rotary grinding member therein comprising a shaft, spaced disks secured thereto, a plurality of circumferentially spaced shafts extending between and through said disks, bushings on said last mentioned shafts between each pair of adjacent disks, beaters revolubly mounted on said bushing, said bushings having means holding said beaters thereon, spacing means between said beaters, and movable locking means for holding said last mentioned shaft in position in said disks whereby said shaft can be removed endwise and said bushings and beaters removed as a unit.

14. A grinding machine having in combination, a housing comprising spaced bearings, and a casing having side and end walls, said side walls having rings about the outer edges of their inner sides, a rotary shaft journaled in said bearings, a grinding member secured to said shaft, said side walls having flanges extending inwardly therefrom, semi-cylindrical curved spaced rods extending downwardly between said flanges and having threaded and nutted ends extending through said flanges, a semi-circular screen supported on said rods, and means at the sides of said casing movable against the screen to press the same against said casing for holding the same in place, said screen being removable by a circular sliding movement when said latter means are moved outwardly.

15. A grinding machine having in combination, a cylindrical casing having a vertical side wall with an opening thereinto, a chute leading downwardly directly to said opening having an inclined portion, said portion having an opening in the bottom thereof, a baffle below said opening extending upwardly toward the top of said chute, a rotary head in said casing constituting a fan and acting to draw air through said opening in said chute and air and material into said casing whereby the material to be ground will be carried up over said baffle and any heavy foreign articles will fall through said opening and chute

16. A grinding machine having in combination, a housing comprising spaced bearings, a casing having side and end walls, a rotary shaft journaled in said bearings, a grinding member secured to said shaft, spaced semi-circular means disposed at the lower portion of said casing and supported by said side walls, a flexible metal screen supported on said semi-circular means, movable members adjacent the central portion of said casings and the ends thereof adapted to engage said screen adjacent its ends to hold the same in operative position, and means for operating said movable members said screen being removable endwise by a circumferential movement when released by said movable members.

In testimony whereof I affix my signature.

AXEL E. JACOBSON.