E. E. WANN.

PULVERIZING MACHINE.

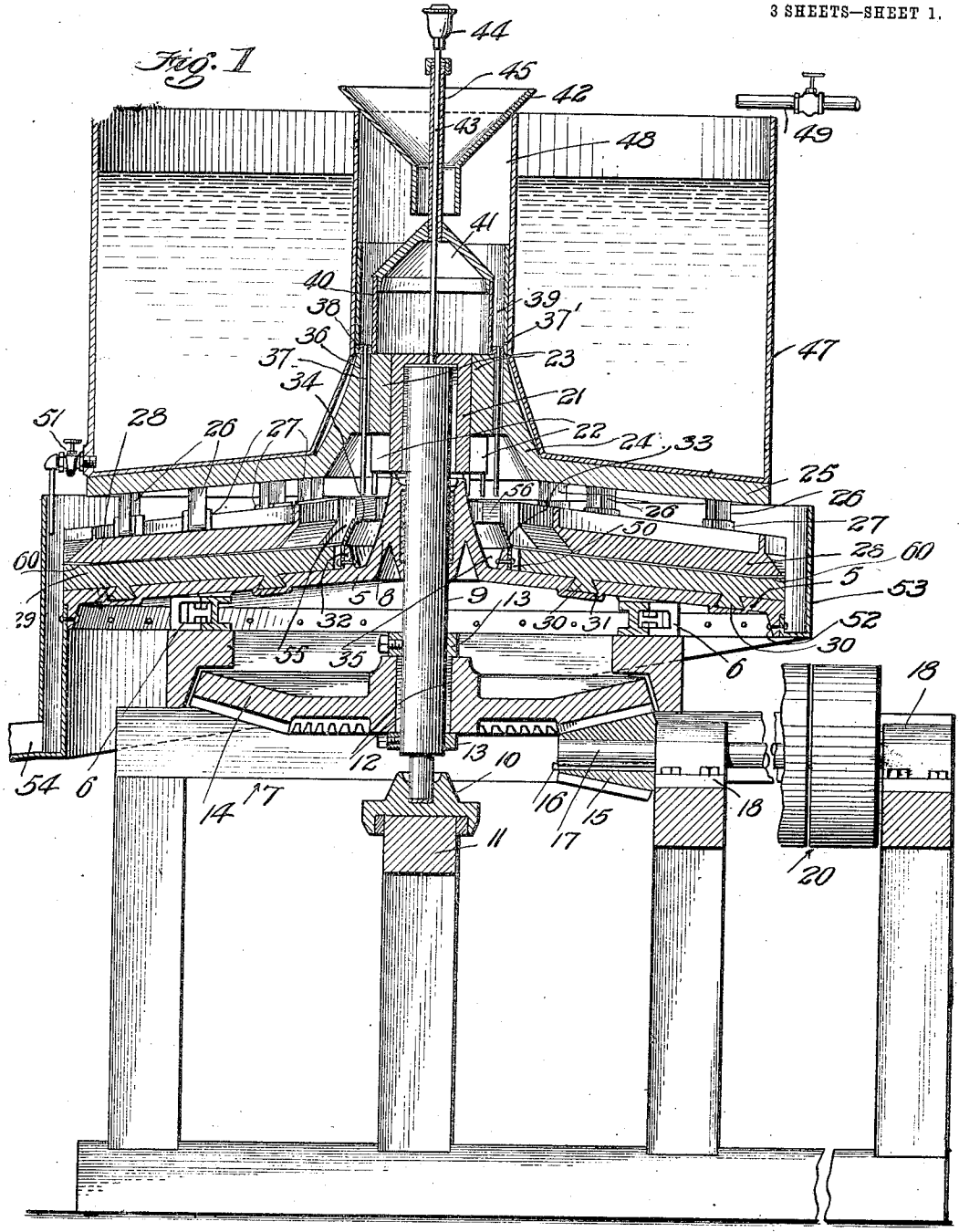
APPLICATION FILED FEB. 19, 1906.

942,424.

Patented Dec. 7, 1909.

3 SHEETS—SHEET 1.

Fig. 1



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3 SHEETS—SHEET 2.

Fig. 2

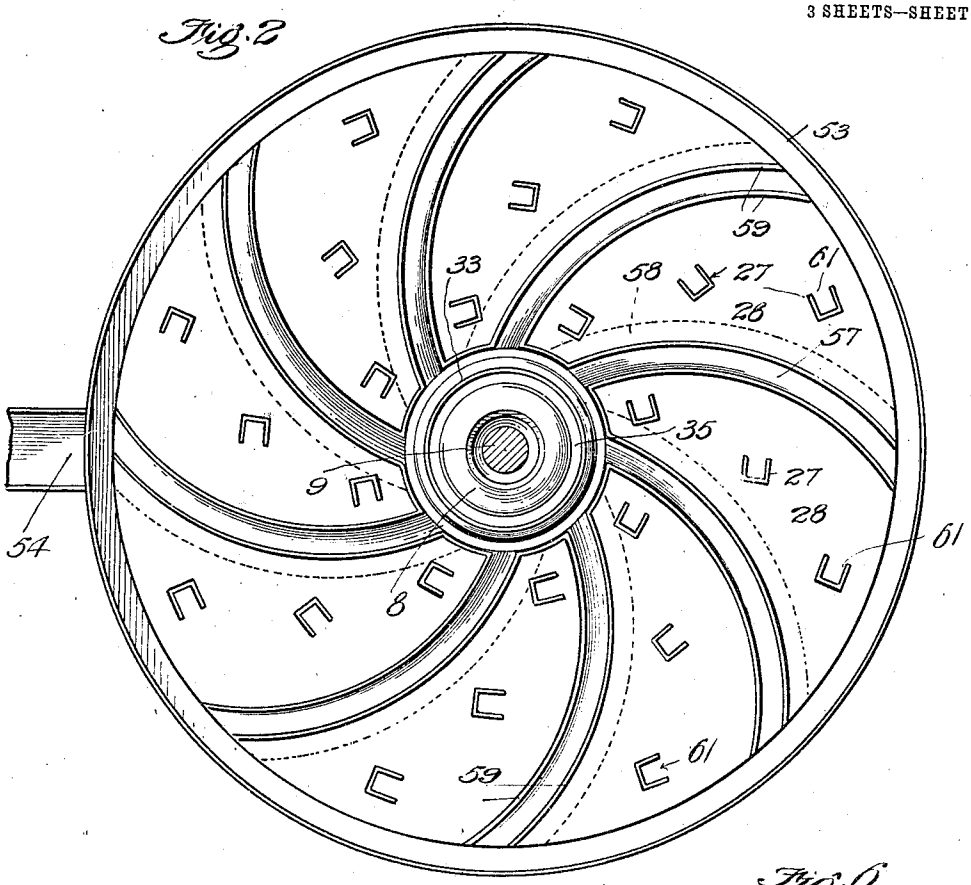


Fig. 6

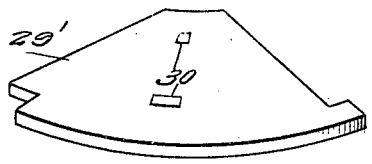
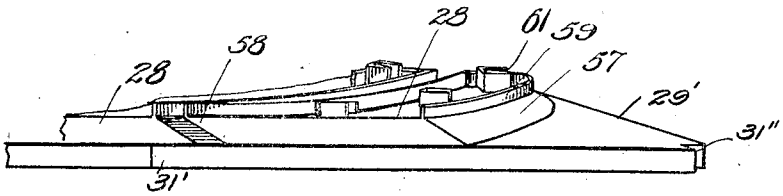


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 4

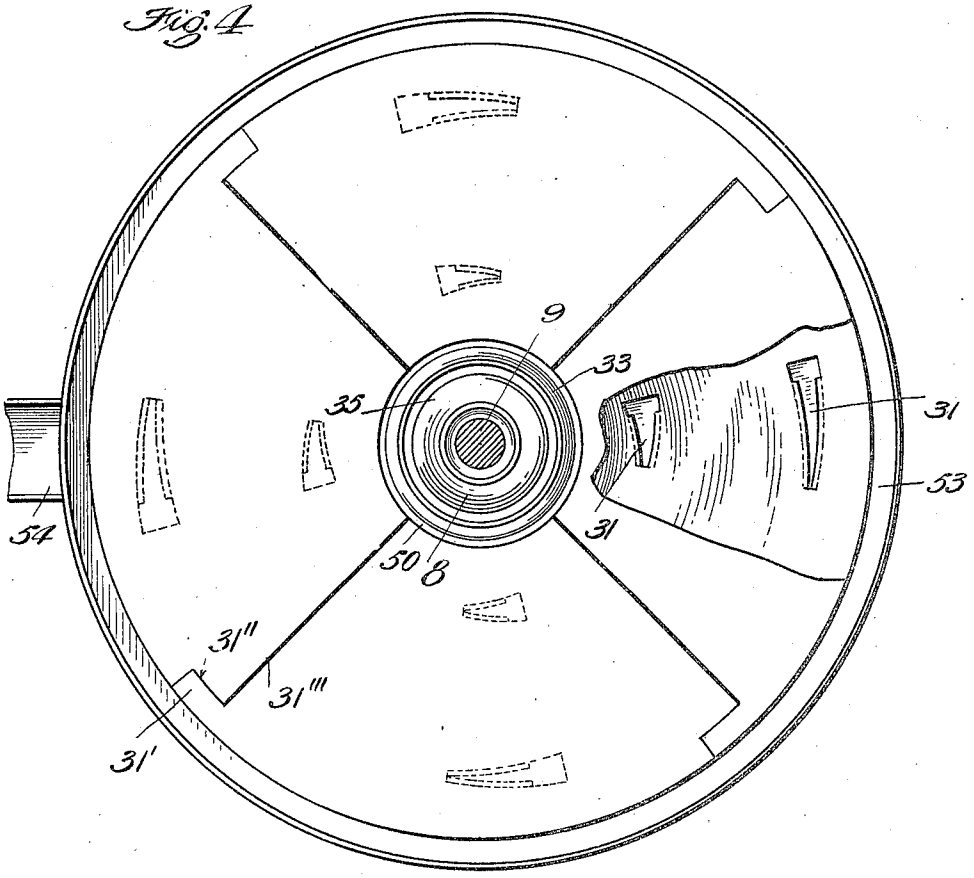
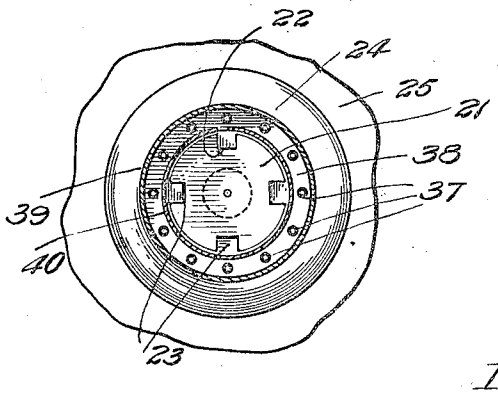


Fig. 5



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UNITED STATES PATENT OFFICE.

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PULVERIZING-MACHINE.

942,424. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed February 19, 1906. Serial No. 301,923.

To all whom it may concern:

Be it known that I, EUGENE ELTON WANN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Pulverizing-Machines, of which the following is a specification.

My invention relates to that class of grinding machines in which the pulverization of the material is accomplished by its introduction between two grinding surfaces, operating on the muller principle; and among the objects of my invention are the following:— To provide a machine that will rapidly pulverize ores, minerals, rocks and earthy substances that have already passed through the sizing screens of stamps, rolls or other coarser crushing apparatus. To provide a free, even, positive and direct distribution of the material to be pulverized to the grinding surfaces and an equally free and direct discharge of the material after pulverization from the grinding surfaces. To provide a machine in which all the working parts are automatically adjustable and in which the muller-disk and the shoes connected thereto, together with a device for increasing their weight, are of sufficient weight to instantly crush or pulverize the material that is fed between the grinding surfaces, so that no particle of material of greater diameter than the distance between shoe and die when in operation can be discharged from the grinding zone into the launder. To provide a machine in which the connections between the movable grinding surfaces and the rotating member of the machine will permit of independent adjustment of the movable grinding surfaces to the inequalities in the surfaces of the die plates and movable grinding surfaces. To provide a machine in which the loss of muller weight occasioned by the wear of the shoes is replaced in an economical manner. And finally to provide a machine which is simple in operation, durable in construction and in which no expensive part is subjected to serious wear except the actual grinding surfaces. I accomplish these objects by the device described herein and illustrated in the accompanying drawings forming a part of this specification in which:—

Figure 1— is a central vertical section through my complete machine. Fig. 2— is a plan view of the machine with parts in section and parts removed to disclose the shoes in place on the die plate. Fig. 3— is a detailed elevation of the shoes and die plate in their operative position. Fig. 4— is a plan view of the die plate with parts broken away to show the locking means. Fig. 5— is a transverse detail section through the driving hub parts. Fig. 6— is an inverted perspective view of one of the sections of the die plate.

Referring to the drawings 5 is an annular base-plate secured to feet 6 which rest on a frame work of timbers 7. This base-plate is preferably cone-shaped (in order to facilitate the proper distribution and discharge of pulp as will be hereinafter explained,) and has a hub 8 through which passes a vertical driving shaft 9. The lower end of this shaft rests in a step bearing 10 secured to a cross timber 11. Secured to the lower end of this shaft by keys 12, and held in place thereon by collars 13, is a bevel gear 14 which meshes with a driving beveled pinion 15 which is secured by a key 16 on the inner end of shaft 17 which is mounted in suitable bearings 18. On the outer end of this shaft are fast and loose pulleys 20, one of which is suitably connected to a source of power (not shown).

Secured to the outer end of shaft 9 is a driving sleeve 21 having vertical slots 22 which register with and engage lugs 23 on the inner face of the hub 24 of the muller disk 25. This muller disk is cone-shaped and is provided on its under face with a plurality of projections 26 which correspond in number with a plurality of flanged pockets or sockets 27, open on one side and secured to the upper face of a plurality of movable grinding shoes 28. The under face of these shoes and the upper face of the die plate 29, together form the grinding zone of the machine.

The die plate 29 is composed of sections 29′, on the under face of which project a number of dove-tailed wedge-shaped lugs 30 which register with a like number of dove-tailed wedge-shaped recesses 31 in the base-plate 5, the dove-tailed sides of the recesses terminating near its larger end to permit the entrance thereto of the dove-tailed lugs 30, by these means the die plates are rigidly held in place on the base-plate of the machine.

Each die-plate section has on its outer corners a tongue 31′ and an opening 31″ into which the tongue of the adjoining plate fits,

the purpose of which is to prevent any material escaping through the joint formed by the die plate sections into the launder without first being pulverized. The joints formed by the die plate sections have a strip 31''' preferably of wood interposed between them so as to form a tight joint.

Projecting upwardly from the face of the base-plate and near its hub is an annular flange 32 to which is secured a rim 33 whose upper end is bent inwardly as at 34 and forms an annular distributing chamber 35 whose function will be hereinafter described.

Concentrically disposed around the outer edge of the muller disk hub 24 are a number of vertical cylindrical openings 36. Delivery tubes 37 are fitted in openings 36 and extend downwardly to within a short distance of the distributing chamber, into which the material to be pulverized is delivered. The upper ends of these tubes are screw threaded and engage with a like number of screw threaded openings 37' in a ring 38 to whose periphery and perimeter are rigidly attached cylinders 39 and 40, which together form a cylindrical passageway to the delivery-tubes. Cylinder 40 has a conical cap 41 on which the material to be pulverized falls from the funnel 42, the conical cap evenly distributing it to the delivery tubes.

Extending downwardly through the funnel 42 and through the conical cap 41 to the shaft 9 is an oil delivery tube 43 on whose outer end is secured an oil cup 44 by means of which the shaft bearings are supplied with a lubricant. The oil delivery tube is incased in a tube 45 which passes downwardly to the conical cap 41 and in screw threaded engagement therewith to prevent the entrance of grit and water to the bearings and oil ways in shaft 9.

An annular weight increasing tank 47 has a central cylindrical opening 48 larger at its inner end so as to fit over the hub of the muller disk, and which serves to retain the tank in place when the machine is in operation. The primary use of this tank is to make up the loss of muller weight occasioned by the wear of the shoes. The original weight of muller disk and shoes (when the shoes are new and unworn) can be kept constant by admitting a continuous amount of water through the inlet 49, the tank being large enough to hold an amount in excess of that required to replace the total weight lost by wear of shoes, so that if ore should be introduced that is too hard to be instantly crushed by muller weight alone then water may be admitted to the tank 47 to supply the additional weight required. A water outlet 51 is located in the bottom of the tank.

Detachably secured to a downwardly extending flange 52 on the outer rim of the base-plate, is a sheet iron annular launder 53 whose bottom inclines downwardly to the final discharge spout 54. As the launder is detachable the spout may be located at any convenient point around the machine.

Referring again to the annular distributing chamber 35; this chamber receives the material fed to it by the delivery tubes 37 which are located directly over it. After the chamber becomes filled it overflows in all directions into an annular distributing channel 55, which delivers it by means of the channels 56 to the grinding zone of the machine.

The die plate of the machine consists of a number of sections held in place on the base-plate (as previously explained) and extend to within a short distance of the wall of the distributing chamber. This space between the inner end of the die plate and the outer wall of the distributing chamber 35 forms an auxiliary distributing channel 50, which serves two purposes, namely; first as a small reservoir which will permit a partial if not a complete settling of the pulp received from distributing chamber 35, so that most of the water and finest part (slimes) of pulp will enter the channels 56 in advance of the heavier and larger part of pulp and wash out the material ground by machine to the proper fineness. Second to soften or break the fall of the material overflowing from distributing chamber 35 and prevent it from splashing over the flanges on the shoe.

The movable grinding shoes 28 (here shown as eight in number) are so formed that when put in place on the die plate that the space between them will form distributing channels 56, preferably curved. The arrangement of these channels is the most radical and distinguishing feature of my machine, in that they are located on an angle from the radial lines of the machine which recede toward the periphery in the direction of muller travel. In all other machines of this type the distributing channels have been either radial or on an angle which recedes toward the circumference as you look back from the direction in which the shoes travel. This shoe space angle in connection with the provision made for a free and positive discharge of pulverized material (which is only made possible by use of a base plate without a rim and which will permit a downward discharge from grinding area) are the vital points in a machine of this character, and which render it possible to produce a machine which will not only have an exceptionally large grinding capacity but will be positive in the matter of maximum size of any particle of ground product without screening and returning the over-size to be re-ground. These shoes have beveled edges 57 and 58, the front edge 58 overhanging so that when the material flows to the channels between the shoes it will be swept and overridden by the advancing shoe in the path

of the pulverizing zone. The upper edges and the inner end adjacent to the distribution chamber 35 of the shoes are provided with flanges 59, the purpose of which is to prevent the overflow of the material over the shoes as they wear.

The flanged pockets 27 on the upper side of each shoe (here shown as three in number) which engage the arms or projections of the rotating muller disk, have an opening 61 in their rear in order to facilitate the removal of worn out shoes; and the replacement of new ones. They are intended to fit snugly on side nearest the center of the machine in order that they may have a firm bearing and so that the shoes cannot move outwardly by centrifugal force, but will be held there in proper position in so far as that force is concerned.

It will be seen from the drawings (best shown in Fig. 1) that I have given the pulverizing zone a downward inclination toward the circumference in order to accelerate the flow of the incoming material through the feeding spaces between the shoes so as to insure an even supply of unground material to the outer part of the grinding zone. This inclined plane terminates in a short horizontal plane 60, a few inches from the circumference which serves to prevent any larger or lighter particles from rolling out unground.

The operation of the machine is as follows:—Power is applied to the machine and the material to be ground is fed to the funnel 42 and through the pipes 37 to the distributing chamber 35 overflows when filled to the annular distributing channels 50 and 55, from thence it flows outwardly through the curved channels 56 formed by the shoes 28. The instant the material enters these channels it is retarded by the overhanging edge of the advancing shoe, and as it proceeds downwardly and outwardly the curved front of the advancing shoe rapidly precedes the pulp flow and heads it off long before it can reach the discharge point until all has been swept under the outwardly inclined grinding surfaces and pulverized, thence it is delivered from all parts of the grinding surface to the annular launder 53, from which it is carried outwardly through discharge spout 54.

When the pulverized material has reached the discharge point at the circumference there is no obstruction whatever to its immediate fall into the off bearing launder, whereas in all other muller grinding machines the pulverized material must rise through a greater or less depth of rapidly moving material to the top and rim of machine sides before it can be discharged either through a rim spout or by rim overflow. In other words the base-plate of all other machines having the muller principle is simply the bottom of a tank or vessel which is kept filled with pulp when the machine is in operation, and all material discharged from such machines is only that which by reason of its being very light rises through the swiftly moving mass of pulp to the top where it is discharged in manner above described, and as it frequently happens the vary lightest particles may be the largest, so that the older machines are not sizing machines, because the larger particles if lightest have no chance whatever to reach the pulverizing zone.

To prevent any discharge of material from the channels 56 without first subjecting it to the grinding action the outer ends of the shoes may be lapped the same as the outer end of the die plate thereby forming an additional safe guard.

It will thus be seen from the foregoing description that I have produced an efficient machine, simple in construction and durable in operation and which has an unusually large grinding capacity.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a pulverizing machine, a base-plate; a die plate secured thereon; a plurality of movable grinding shoes resting on said die plate, the front and rear edges of adjacent movable grinding shoes forming a radial curved channel; and means to rotate said grinding shoes.

2. In a machine of the character herein described, a frame; a base plate having a downwardly and outwardly inclined surface secured to said frame; a sectional die plate secured in locked engagement on said base plate; a plurality of movable grinding shoes resting on said die plate, the front and rear edges of adjacent shoes forming a feed channel; means to rotate said grinding shoes, comprising a downwardly and outwardly inclined rotatable disk; a plurality of projections on the under face of said disk, said projections adapted to engage sockets on the upper faces of said shoes; a centrally disposed hub on said disk having a plurality of vertically disposed lugs on its inner face; a driving shaft mounted in said frame; a driving sleeve keyed to the outer end of said driving shaft, said sleeve having a plurality of vertically disposed slits therein adapted to engage the lugs on the disk hub; and means to rotate said shaft.

3. In a pluverizing machine, a base plate; a die plate secured thereon; a plurality of movable grinding shoes having their upper front, rear and inner edges provided with flanges, resting on said die plate, the front and rear edges of adjacent shoes forming a curved feed channel; and means to rotate said shoes.

4. In a pulverizing machine, a base plate;

a sectional die plate removably secured to said base plate; a plurality of movable grinding shoes resting on said die plate, the front and rear edges of adjacent shoes forming a curved feed channel; a centrally disposed feed way terminating in a plurality of discharge pipes; an annular distributing chamber located below said discharge pipes and communicating with said feed channels; and means to rotate said shoes.

4. In a machine of the class described, a frame; a base plate secured to said frame; a die plate removably secured to said base plate; a plurality of movable grinding shoes resting on said die plate, the front and rear edges of adjacent shoes forming a feed channel; a centrally disposed feed way communicating with said feed channels; a centrally disposed vertical driving shaft mounted in said frame; a muller disk secured to the outer end of said shaft and vertically movable thereon, said disk being in adjustable engagement with said shoes; a weight tank secured to said muller disk; means to keep the weight of said tank constant; and means to rotate said shaft.

6. In a machine of the class described, a frame; a base plate; a die plate removably secured to said base plate; a plurality of movable grinding shoes resting on said die plate, the front and rear edges of adjacent shoes forming a feed channel; a centrally disposed feed way terminating in a plurality of discharge pipes; an annular distributing chamber located below said discharge pipes and communicating with said feed channels; a centrally disposed vertical driving shaft mounted in said frame; a muller disk secured to the upper end of said shaft and vertically movable thereon, said disk being in adjustable engagement with said shoes; a weight tank secured to said muller disk; means to keep the weight of said tank constant; an annular launder secured to said base plate adapted to receive the discharge from the feed channels formed by the grinding shoes; and means to rotate said shaft.

7. In a pulverizing machine, a frame having a base plate rigidly secured thereto; a die plate removably attached to said base plate; a plurality of movable grinding shoes having beveled front and rear edges resting on said die plate, the front and rear edges of each two shoes forming a radial curved channel; and means to rotate said shoes.

In witness that I claim the foregoing I have thereunto subscribed my name this 13th day of February, 1906.

EUGENE ELTON WANN.

Witnesses:
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G. E. HARPHAM.