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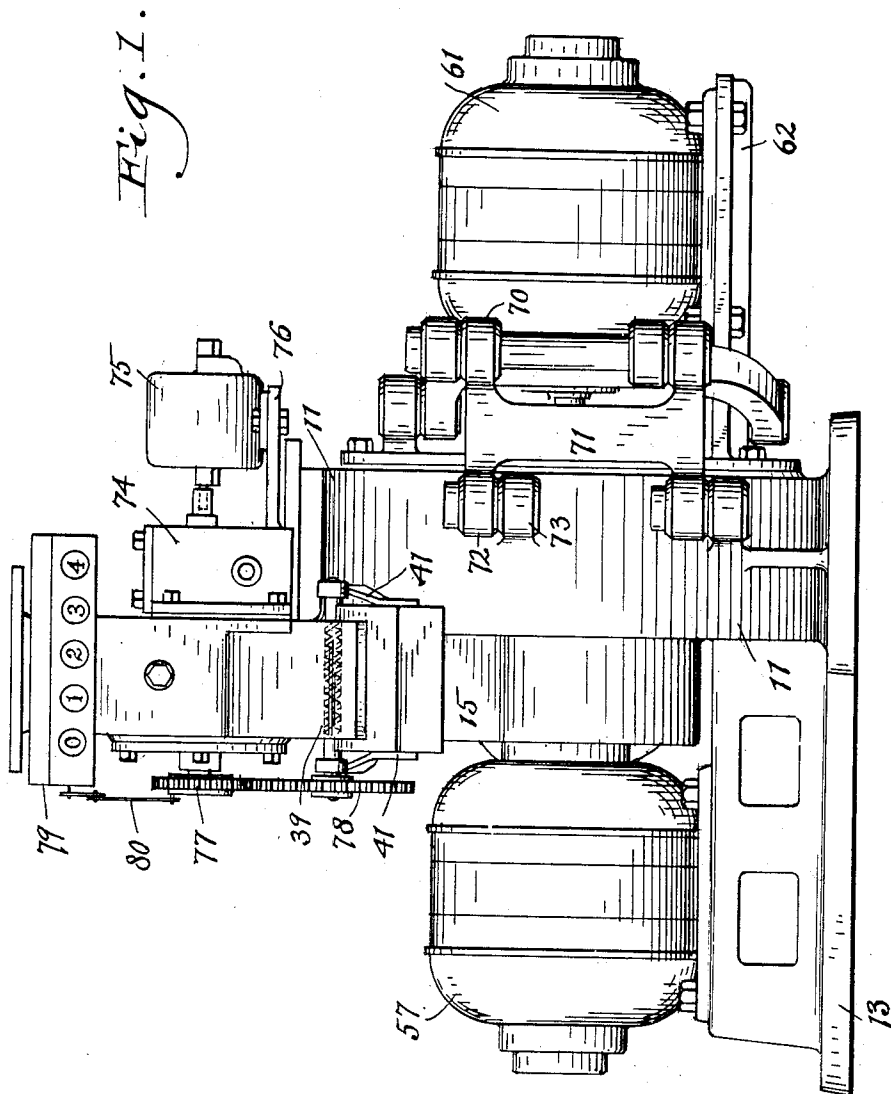
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1,724,876

UNIT PULVERIZER

Filed Sept. 22, 1927

4 Sheets-Sheet 1



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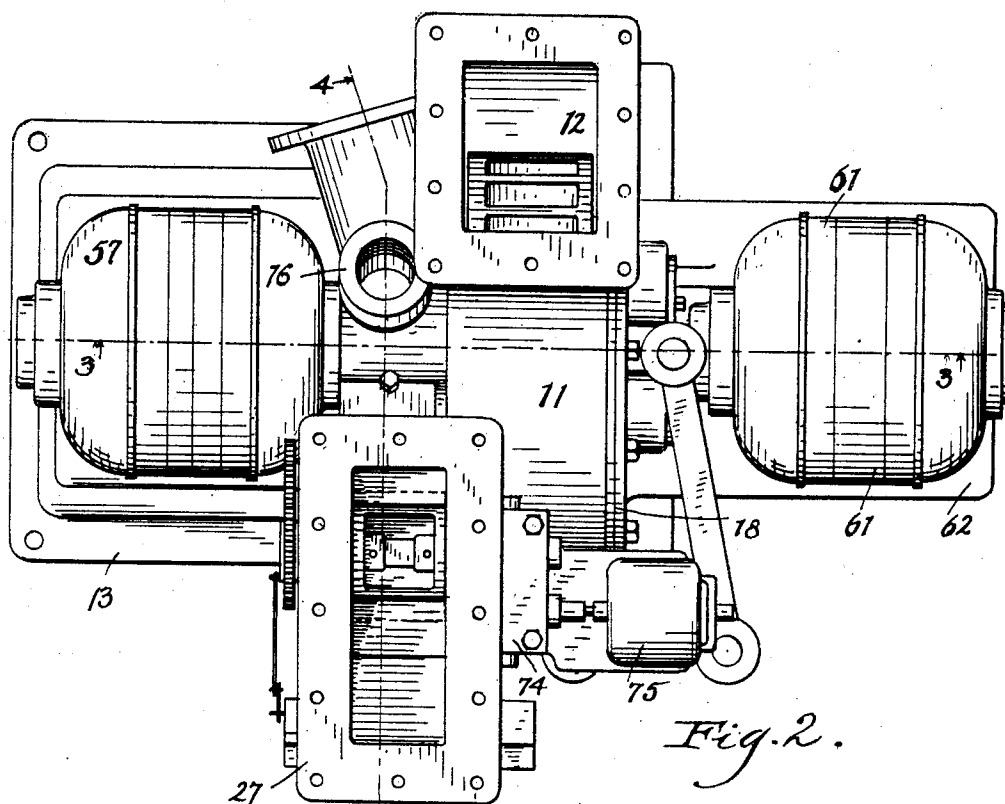
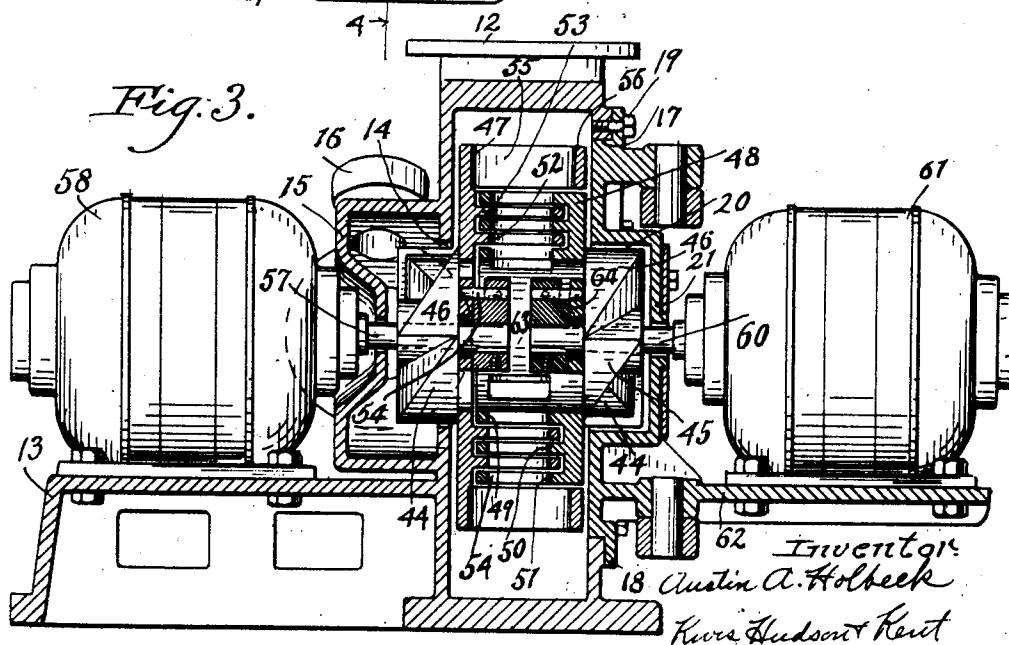
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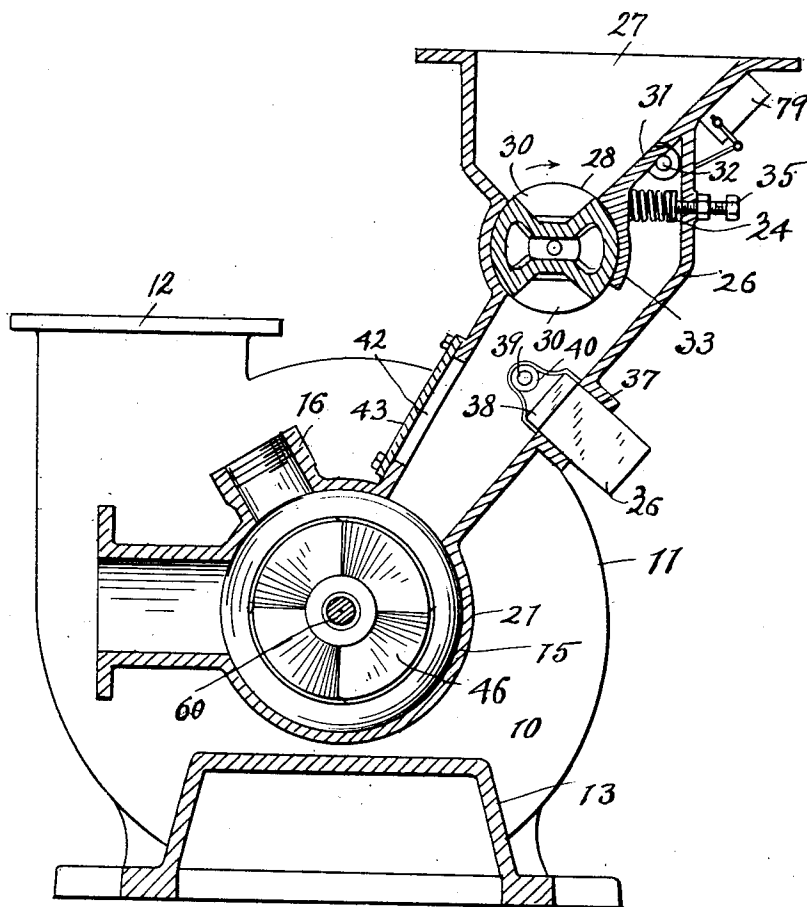


Fig. 4.

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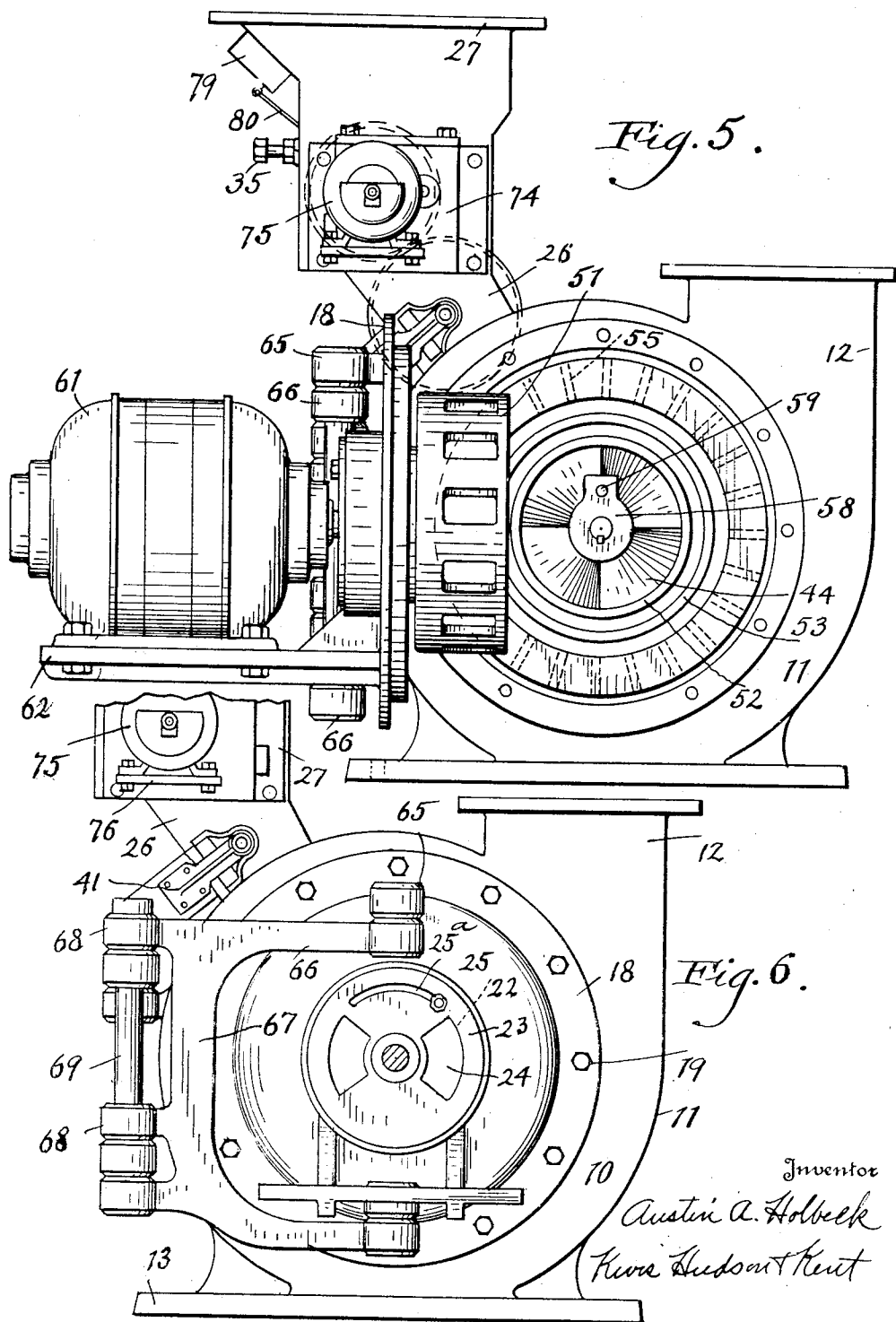
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UNIT PULVERIZER

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE.

AUSTIN A. HOLBECK, OF CLEVELAND, OHIO.

UNIT PULVERIZER.

Application filed September 22, 1927. Serial No. 221,181.

This invention relates to pulverizing machines, and more particularly to a unit pulverizer which is inexpensive to manufacture, efficient in operation, due to its simplicity of construction, and novel arrangements of working elements.

One of the objects of the present invention is to provide in a pulverizer of the type referred to, pulverizing members having relative rotation in such a manner that the material being fed thereto is thoroughly pulverized in passing between the pulverizing members.

Another object of the invention is to provide a novel means for feeding the material into the pulverizing members in such a manner that pulverization takes place as the material travels outwardly between the members, and is, as a result, thoroughly pulverized.

Another object of the invention is to provide a novel means for discharging the pulverized material, which includes preferably a fan member carried by one of the pulverizing members, which, by its rotation, forces the pulverized material through a discharge opening as the pulverized material leaves the pulverizing members.

A further object of the invention resides in the provision of separate motors for the pulverizing members, one of said motors being pivotally supported in a novel manner to afford access to the interior of the pulverizer so the latter can be readily inspected and repaired.

Another object of the invention is to provide a magnetic element for attracting the metallic particles present in the material which is fed into the pulverizer, and means for removing the said collected particles without interruption in the operation of the pulverizer.

It is a further object of the invention to provide means adjacent the discharge opening, for separating the coarser material from the pulverized material and to return the coarser material to the action of the pulverizing members, to thereby further pulverize the material.

With the objects above indicated and other objects hereinafter explained in view, my

invention consists in the construction and combination of elements hereinafter described and claimed.

Referring to the drawings,

Figure 1 is a front elevational view of the unit pulverizer embodying my present invention.

Figure 2 is a top plan view.

Figure 3 is a vertical sectional view on line 3—3 of Fig. 2, the motor being illustrated in side elevation.

Figure 4 is a transverse cross sectional view on line 4—4 of Figure 2.

Figure 5 is an end view with the hinged support for one of the main drive motors being swung to open position.

Figure 6 is an end view with the hinged support swung inwardly and with the motor removed.

In the drawings I have illustrated the preferred construction of a pulverizer embodying my present invention, in which 10 represents generally the pulverizer housing of cast iron or other suitable material. This housing 10 comprises a cylindrical portion 11, of a shape similar to that of a fan housing, and has a neck portion 12 at the upper part thereof, serving as an outlet for the pulverized material. The cylindrical portion 11 is formed integral at its lower end with a laterally extending base 13, as shown in Fig. 1, by which the pulverizer is supported upon a floor or other suitable structure.

The cylindrical portion 11 has upon one side thereof a central opening 14 around which extends an integral lateral enclosure 15 provided with an inlet opening 16, through which coarse material separated from the pulverized material discharged from the neck 12 is returned to the pulverizer for further treatment.

The opposite side of the cylindrical portion 11 has an opening 17 which is normally maintained closed by a cover 18 bolted as at 19 to the cylindrical portion 11 adjacent the opening 17, or by any other suitable means. The cover 18 has a central opening 20, around which extends an integral lateral enclosure 21, the latter being provided with transverse slots 22 for admitting air to within the pulverizer, the quantity of air ad-

mitted being controlled by a rotatable plate 23, having openings 24 cooperating with the openings 22 of the enclosure 21. The movement of the plate 23 is limited by a bolt 25 disposed in a circumferentially extending slot 25^a transversely of the plate 23, and so positioned that the openings 22 and 24 can be moved into alignment to admit a large quantity of air by rotating the plate 23 in one direction or moved completely out of alignment to thereby admit no air, by rotation of the plate 23 in the opposite direction. Communicating with the interior of the enclosure 15, as clearly shown in Fig. 4, and formed integrally therewith is a chute 26 having a hopper 27 at its upper end through which the raw material is fed to the pulverizer 10. A rotary pocket feeder 28 is positioned in the upper portion of the chute 26 and is secured upon a transverse shaft 29 which has its outer ends rotatably journaled in the side walls of the chute 26 and which feeder is rotated in a manner later described. The feeder 28 has longitudinally extending pockets 30 disposed upon opposite sides thereof for receiving the raw material from the hopper 27 and delivering predetermined quantities of the material to the chute 26. To insure against the possibility of breaking any of the operating elements, the hopper 27 has a portion 31 of its rear wall pivotally connected at 32 to the sides of the upper end of the chute 26 and the portion 31 has a depending extension 33, whose front face is concave and cooperates with the periphery of the rotary pocket feeder 28. This extension 33 is maintained in normal engagement with the feeder 28 by a spring 34 abutting at one end with the extension 33 and at the opposite end against a stop on a bolt 35 in threaded engagement with the rear wall of the chute 26. It will be readily understood, therefore, that should exceptionally large pieces of raw material be fed to the pockets 30 of the rotary pocket feeder 28 and thereby carried around toward the chute 26, the pivoted portion 31 would be forced outwardly against the tension of the spring 34 and the material deposited in the chute 26 without in any manner injuring the feeder 28.

The material fed into the chute 26 usually contains metallic particles, and inasmuch as this is undesirable in the pulverized fuel as well as in the pulverizer, I provide a permanent magnet 36 secured within a transverse flanged opening 37 in the bottom of the chute 26 which attracts the metallic particles thereto. The face of the magnet 36 is kept clean and free of the accumulated particles by a brush or wiper 38, which is continuously moved across the magnet by a double acting worm or thread upon a transverse shaft 39, having a reciprocating collar 40 in engagement therewith and screwed to the brush 38. The ends of the shaft 40 are

rotatably supported in brackets 41, attached to the outer sides of the chute 26 and the shaft is rotated by any suitable means, but preferably in a manner to be later described.

The interior of the chute 26 can be inspected and repaired through an opening 42 in the top thereof, which is normally closed by a cover 43 bolted or otherwise secured over the opening.

The material which is fed by the chute 26, as before explained, enters the enclosure 15 at an angle as shown in Fig. 4. A pair of scoops 44 and 45, respectively, are disposed within the extensions 15 and 21, and are rotatable in opposite directions preferably. These scoops 44 and 45 have pluralities of vanes or inclined members 46, which are adapted on the scoop 44 to pick up the material and feed the same inwardly, while the vanes 46 on the scoop 45 assist in the distribution of the air around the pulverizer. The scoops 44 and 45 have secured to their inner faces, or formed integrally therewith, cylindrical members 47 and 48, respectively, the member 48 being of smaller diameter than the member 47. The member 48 is provided with, in this instance, three laterally extending concentric drums 49, 50 and 51, preferably formed integral therewith and having their inner edges freely suspended. The member 47 is provided with, in this instance, two laterally extending integrally formed concentric drums 52 and 53, having their inner edges freely suspended, and so positioned that when in assembled relation with the drums 49, 50 and 51, the latter will interleave or overlap with the former. Each of the drums are provided with a plurality of transversely extending apertures 54, spaced suitably apart throughout their circumferences, and any desirable number of apertures being provided. The outer end of the cylindrical member 47, and beyond the drum 51, has a plurality of transversely extending blades 55 formed integrally therewith, and the opposite ends are joined by a ring 56. These blades 55 serve as a fan for blowing the pulverized material out through the outlet 12.

The scoop 44 is loosely mounted on a rotatable transverse shaft 57 and actuated by a motor 58 supported upon the base 13 suitably connected in an electrical circuit. The inner end of the shaft 57 terminates short of the center of the drums, and has a hub 58 keyed, or otherwise secured thereto, and rotation is transmitted to the scoop 44 and drums 52 and 53 by a break pin 59 secured to the hub 58 and a portion of the scoop 44.

The scoop 45 is loosely mounted on a transverse shaft 60 and actuated, preferably in the opposite direction to the shaft 57, by a motor 61 supported by an extension 62 formed integrally with the lower portion of the removable cover 18. The inner end of

the shaft 60 terminates short of the center of the drums and adjacent the shaft 58 and has keyed thereto a hub 63 through which rotation is transmitted to the scoop 44 and drums 49, 50 and 51 by a break pin 64.

It will, therefore, be understood that the material is fed to the innermost drum 49 by the scoop secured thereto and rotating in one direction, and will cause, by centrifugal action, the material to pass outwardly, and as the latter passes through the apertures 54 of the drum 49, will come into contact with the drum 52 rotating in the opposite direction to the drum 47 which will cause the material to be finely ground and pulverized. When the pulverized material is finally forced out through the apertures 54 in the outermost drum 51, the blades 55 will cause the material to be blown out through the outlet 12 to any desirable location.

It is desirable to be able to have access to the interior of the pulverizer, and this may be had through the cover 18, but for convenience I have provided the cover with a pair of ears or extensions 65, which are pivotally connected to a pair of horizontally extending arms 66 of a bracket 67, the latter being provided with a pair of arms 68 extending in the opposite direction and pivotally connected by a vertically extending rod 69 to a pair of arms 70 of a bracket 71. This latter bracket 71 has a second pair of arms 72 which are pivotally connected to a pair of extensions or ears 73 formed integrally with the fan shaped housing 11. With this pivoted arrangement it is, therefore, possible to first move the cover 18, together with the drums 49, 50 and 51 and motor 61, in a horizontal plane until the drums 49, 50 and 51 have been moved out of cooperative engagement with the drums 52 and 53, and to then swing the supporting platform 62 about its vertical pivotal axis, thereby exposing the interior of the pulverizer.

It will also be noted that this cover plate 18 supports the drums 49, 50 and 51 and the scoop 46 which are driven by the motor 61, so that in removing the cover 18 from the housing 11 the connections between the motor 61 and the drums are not interrupted.

The rotary pocket feeder 28 can be rotated at any desirable speed, depending upon the quantity of raw material the pulverizer is required to handle, and in the present instance I have shown suitable reduction gearing enclosed in a housing 74, bolted or otherwise secured to one side of the chute 26, as clearly shown in Fig. 1. The reduction gearing is suitably connected between the rotary pocket feeder 28 and a motor 75 supported on a bracket 76 secured to the lower part of the reduction gearing housing 74. The motor 75 may be actuated by any suit-

able source of power, and the reduction gearing serves to rotate the rotary pocket feeder 28 at a reduced speed with respect to the motor. The opposite end of the transverse shaft 29 of the rotary pocket feeder 28 is provided with a gear 77 securely fastened thereto, which meshes with a gear 78 secured to the outer end of the transverse shaft 39 for reciprocating the wiper 38. A counter 79 can be secured to the upper portion of the hopper 27 and connected by suitable links 80 to the gear 77 for the purpose of ascertaining the number of revolutions of the rotary pocket feeder 28 or the number of charges of material to the chute 26.

The operation of the pulverizer is as follows:

The raw material is deposited in the hopper 27, and passes in predetermined quantities into the chute 26, and thence into portions of the housing, where it is picked up by a rotary scoop 44 and fed inwardly to the interior of the innermost drum 49. These cooperating drums are rotated by the motors 57 and 61, in opposed directions, or at least at different relative speeds, the material within the drums being thrown outwardly by centrifugal action. The drums being provided with transverse openings 54 permits portions of the material to pass therethrough and the material coming in contact with the adjacent drum travelling at a different rate of speed results in finely grinding or pulverizing the material. The material becomes more finely pulverized as it passes through the openings from the innermost drum to the outer drum, and as the material leaves through the openings 54 in the outer drum 51 it is blown out through the discharge outlet 12 in the fan-shaped housing 11 by the action of the blades 55.

If for any reason coarser material should be injected into the pulverizer than the latter can handle and cause the drums to lock, the possibility of breakage of the working parts of the pulverizer is eliminated by the provision of break pins 59 and 64.

While I have described the preferred construction embodying my present invention, it is to be understood that changes may be made thereto without departing from the spirit of the invention as defined in the appended claims.

Furthermore, it is to be understood that I am not to be limited to a pair of pulverizing drums rotatable in opposite directions to effect complete pulverization, inasmuch as the same result may be obtained by having the pulverizing drums rotatable in the same direction but at relatively different speeds, or one of the pulverizing drums may be stationarily mounted, while the other of said drums is adapted to rotate to effect pulverization of the material.

Having thus described my invention what I claim is:

1. In a pulverizer of the type described, a housing, a removable cover plate attached thereto, a pair of cooperating pulverizing members, one of which is removable with said cover plate, means for delivering material to said members, and means for causing relative rotation therebetween.
2. In a pulverizer of the type described, a housing having a stationary motor base and a movable motor base, motors supported on said bases, and a pair of cooperating pulverizing members associated with said motors and disposed within said housing.
3. In a pulverizer of the type described, a housing having an opening in one side thereof, a movable base supported by said housing, a cover plate for said opening carried by said base, a motor on said base, and a pair of cooperating pulverizing members disposed within said housing, one of said members being connected to said motor.
4. In a pulverizer of the type described, a fan housing, a removable cover therefor, a pair of cooperating pulverizing members disposed in said housing, one of said members being removable with said cover, transverse openings in said members, blast means carried by one of said members, and means for causing relative rotation between said members.
5. In a pulverizer of the type described, a pair of relatively rotatable members, flanges carried by said members, the flanges of one member being disposed between the flanges of the other member, transverse openings in said flanges, blast means carried by one of said members and positioned over said openings, and means for feeding material to the inner flange.
6. In a pulverizer of the type described, a housing provided with a material inlet and an outlet, a pair of slotted pulverizing members having overlapping portions, a scoop on one of said members adapted to feed material from said inlet to the inner member, and means for relatively rotating said members.
7. In a pulverizer of the type described, a housing provided with a material inlet and an outlet, an opening in said housing, a movable cover for said opening, a pair of slotted pulverizing members having overlapped portions, a scoop on one of said members adapted to feed material from said inlet to the inner member, and motors for rotating said members, one of said motors being supported by said movable cover.
8. In a pulverizer of the type described, a housing having an inlet opening and an outlet opening, a base for said housing, an opening in the side of said housing, a movable cover for said opening, a rotatable pulverizing member having concentric slotted cylinders, a plurality of blades carried by said member, a second rotatable pulverizing member having concentric slotted cylinders, the latter cylinders overlapping and being disposed in alternate relation to the slotted cylinders of said first member, scoops rotatable with said members, one of which is adapted to deliver material to the innermost cylinder, a motor for rotating one of said members and supported by said base, and a motor for rotating the other of said members, and supported from said pivoted cover.
9. In a pulverizer of the type described, a hopper, a chute, means for transferring predetermined quantities of material from said hopper to said chute, a housing, a pair of pulverizing members in said housing, said members having concentric slotted cylinders disposed in overlapping alternative relation, means for feeding material to the innermost cylinder, and means for rotating at least one of said members.
10. In a pulverizer of the type described, a hopper, a chute, means for delivering predetermined quantities of material to said chute, a housing communicating with said chute, a pair of slotted pulverizing members in said housing, said members having portions overlapping and disposed in alternate relation, scoops secured to said members, one of which is adapted to deliver material to the interior of said overlapping portions, transverse shafts upon which said members are mounted, means including break pins for connecting said members to said shafts, and means for actuating said shafts to cause said members to be rotated relatively.
11. In a pulverizer of the type described, a housing, pulverizing members supported within said housing, and a motor movably supported with respect to said housing and adapted to cause rotation of some of said members, said last mentioned members being removable when said motor is moved.
12. In a pulverizer of the type described, a housing, pulverizing members supported within said housing, and a motor movably supported with respect to said housing and adapted to cause rotation of some of said members, said last mentioned members being movable through said housing when said motor is moved.
13. In a pulverizer of the type described, a housing, pulverizing members supported within said housing, a support movably carried by said housing, and a motor mounted on said support and adapted to cause rotation of some of said members, said last mentioned members being movable with said support.

In testimony whereof, I hereunto affix my signature.

AUSTIN A. HOLBECK.