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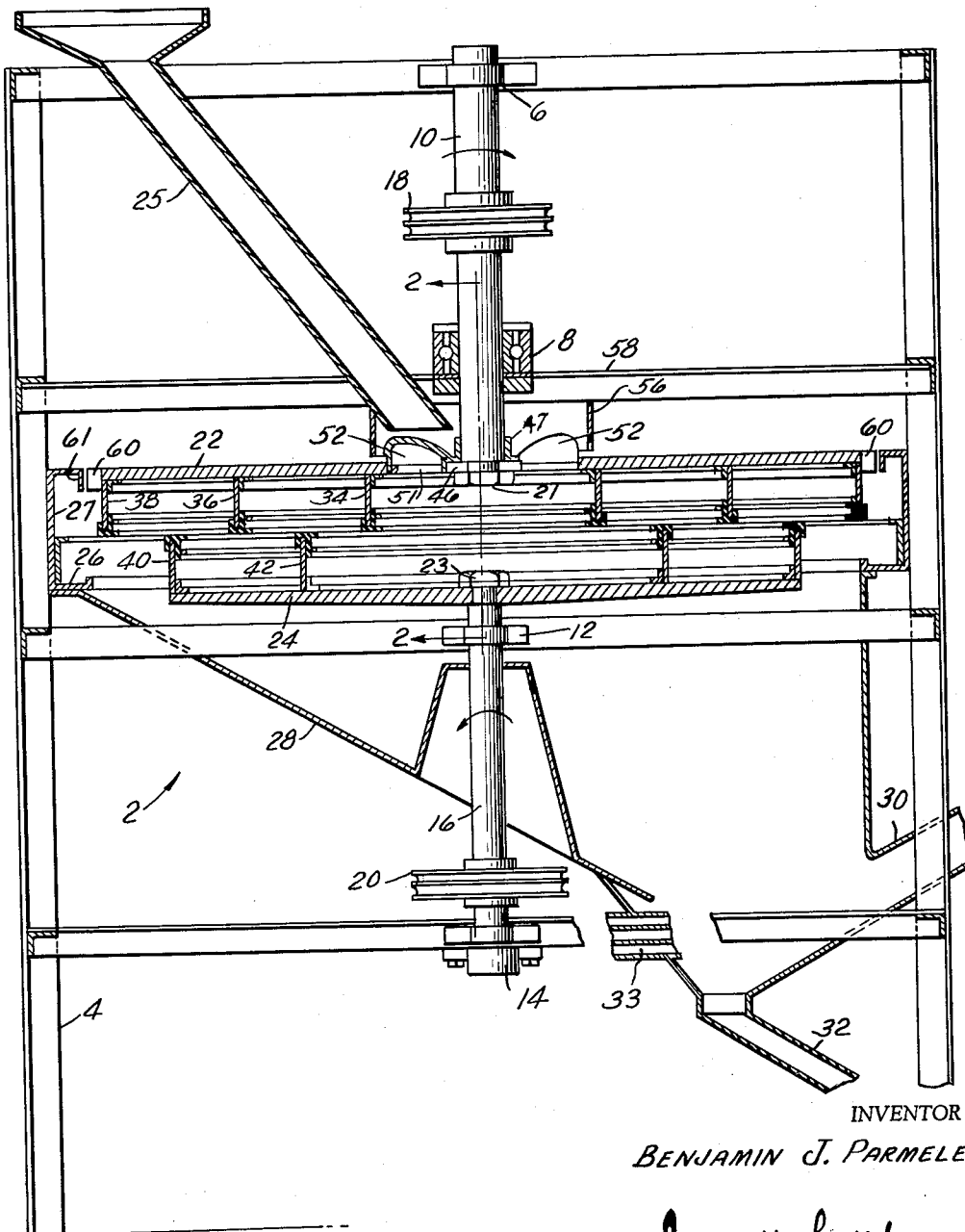
B. J. PARMELE
ROTARY DISC PULVERIZER

2,985,391

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3 Sheets-Sheet 1

Fig. 1



INVENTOR

BENJAMIN J. PARMELE

BY

James H. Littlepage

ATTORNEY

May 23, 1961

B. J. PARMELE

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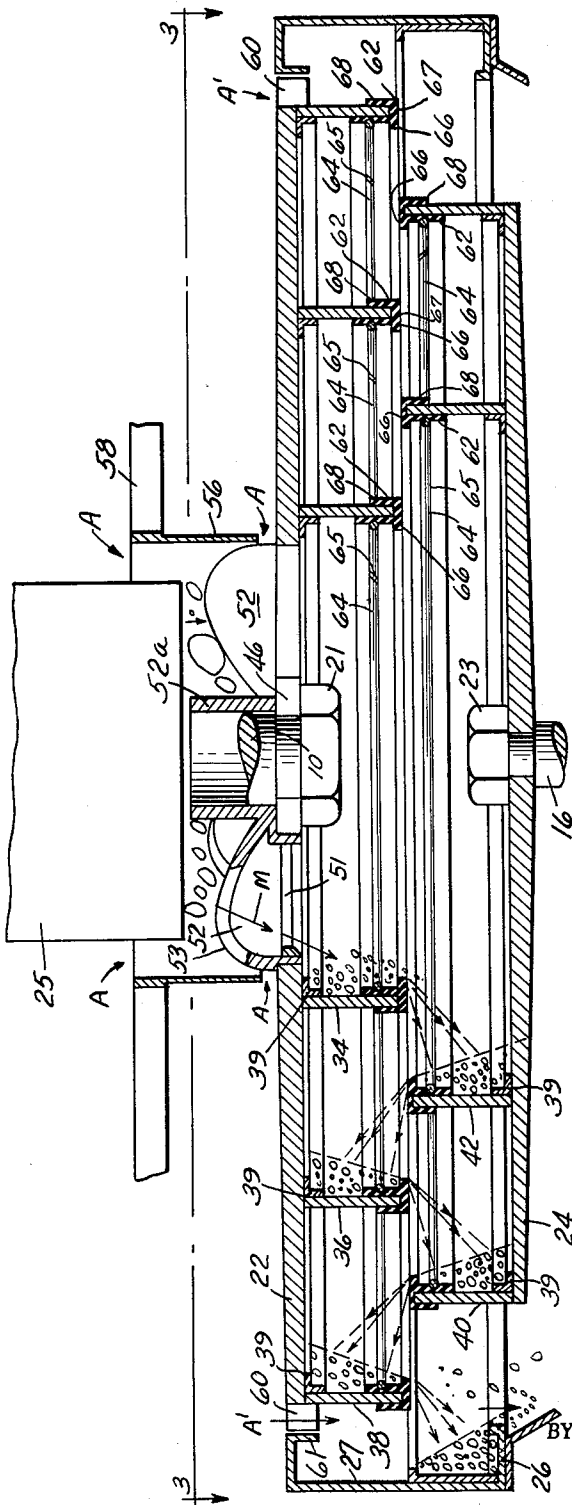


Fig. 2

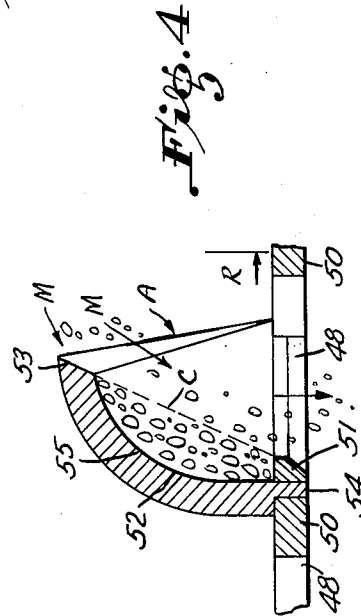


Fig. 4

INVENTOR

BENJAMIN J. PARMELE

James H. Littlepage

ATTORNEY

May 23, 1961

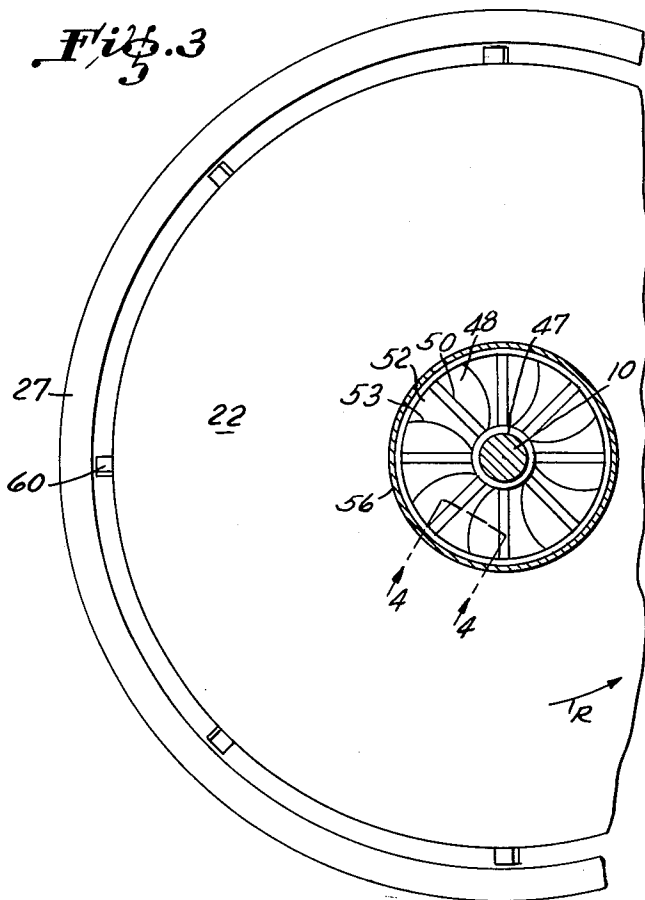
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Fig. 3



INVENTOR

BENJAMIN J. PARMELE

BY

James H. Littlepage

ATTORNEY

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ROTARY DISC PULVERIZER

Benjamin J. Parmele, 1509 Market St., Wilmington, N.C.

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6 Claims. (Cl. 241—275)

This invention relates to pulverizers and, more particularly, to centrifugal pulverizers of the counter-rotating, opposed disk type. This application is a continuation-in-part of my co-pending application Serial Number 630,920, filed December 27, 1956, now Patent 2,919,864, and entitled Centrifugal Pulverizer.

The primary object of the invention is to provide for the feed and flow of material through a centrifugal pulverizer of the type wherein radially spaced annular concentric baffles on opposed working faces of counter-rotating disks define a tortuous path for the material. More specially, it is intended to provide a positive in-feed which will effect a preliminary shearing and battering of the in-flowing material while simultaneously fanning air through the pulverizer in the direction in which the material flows. It has heretofore been known that, by providing in-turned lips on the free edge of concentric baffles of a rotary disk pulverizer, considerable wear of the baffle metal can be avoided by causing part of the material to build up on the baffle inner surfaces, thereby utilizing the built-up material as the grinding surfaces. One of the main objects of this invention is to utilize somewhat similar principals at the pulverizer in-feed, by providing concavo-convex shell-like blades which trap part of the inflowing material on their concave working surfaces, thereby protecting the blades from the extensive abrasion and battering by the material.

Another object of the invention is to prevent the loss of dust at the periphery of the pulverizer. The air forced through with the inflowing material creates considerable pressure within the pulverizer, and the joint between the largest rotating disk and the stationary collector shell is difficult to seal because of the abrasive nature of the material, such as rock or ore. The object now is to provide turbine blades at the periphery of one of the rotating disks so as to force air inwardly and thereby create a seal between the disk and the pulverizer casing.

Still another object is to provide further protection of the concentric baffles, particularly their free edges, against abrasion by the material flowing between the pulverizer disks. While the material flow between the disks is generally outward, and while the inwardly-facing surfaces on the baffles are exposed to the most abrasion, the spaces between the baffles become filled with flying particles, some of which fly past and tend to abrade the axially and outwardly facing surfaces at the baffle edges. The object now is to provide cap-like rings of abrasive-resistant material which fit over the free edges of the baffles so as to provide protection against abrasive attack from all directions.

These and other objects will be apparent from the following specifications and drawings, in which:

Fig. 1 is a vertical cross-section through a rotary disk pulverizer embodying the present improvements;

Fig. 2 is an enlarged vertical cross-section along the line 2—2 of Fig. 1, with part of the frame removed;

Fig. 3 is a horizontal cross-section along the line 3—3

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of Fig. 2, showing the in-feed mechanism, upper disk, turbine blades and other casing wall in plain view;

Fig. 4 is a fragmentary cross-section illustrating one of the in-feed blades with material trapped on its working surface as viewed on line 4—4 of Figure 3.

Referring now to the drawings in which like reference numerals denote similar elements, Fig. 1 shows the general assembly of the pulverizer 2 which includes a frame for supporting, in its upper portion, a pair of shaft bearings 6 and 8 rotatably mounting a vertical shaft 10. Also rotatably mounted by bearings 12 and 14 is a vertical shaft 16 below and coaxial with shaft 10. Shafts 10 and 16 are driven in opposite directions by pulleys 18 and 20 conventionally connected to a source of power, not shown. A nut 21 affixes the hub 46 of an upper disk 22 on the lower end of shaft 10 and a nut 23 affixes a lower disk 24 on the upper end of shaft 16. Alternatively, the rotor disks may be welded or cast as integral parts of their respective drive shafts. It will be understood that material fed in through chute 25 is worked between the counter-rotating disks 22, 24 and thrown outwardly by centrifugal force into a collector ring 26 in a peripheral shell 27 affixed on frame 4. From collector ring 26 the then pulverized material falls by gravity and is blown into a collector pan 28. The small dust-like particles of pulverized material are exhausted through outlet 30 while the heavier particles are removed through outlet 32. A louvered air inlet 33 may be utilized for introducing supplementary air into the interior of the collector pan. Pulverization is effected by a series of concentric ring baffles 34, 36 and 38 affixed, as by annular angle irons 39 on the lower face of upper disk 22, and concentric ring baffles 40 and 42, also affixed as by angle irons 39 on the upper face of lower disk 24, the baffles on the respective disk faces being staggered so as to provide zig-zag paths for the material, as diagrammatically indicated on the left-hand side of Fig. 2. If desired, the ring baffles may be welded, cast or forged as integral parts of the rotor disks.

Around the hub 46 of upper disk 22 are arranged open sectors 48 separated by spokes 50 which rigidly connect hub 46 with the outer portion of the upper disk. Hub 46 is thus integrally connected to the main body of disk 22 by spokes 50. Rigidly affixed in sections 48 are an annular series of concavo-convex shell blades 52, preferably provided with hardened shearing edges 53 which may be replaceably mounted by conventional joints, not shown. The lower edges of shell blades 52 are mounted by suitable conventional means, such as welding, along the edges of open sectors 48 by flanges 54 which are secured between spokes 50 and retaining bands 51 which, it will be noted, form inwardly extending lips. Retaining bands 51, which are secured around the lower edges of blades 52 on the forward sides by suitable conventional means, such as welding, are for the purpose of retaining part of the material which otherwise would tend to slide downwardly along the forward surfaces of blades 52. Shell blades 52 are provided with upstanding flanges 52a which fit against and protect shaft 10 from the abrasion of incoming material. From Fig. 4 it will be apparent that the inner surfaces 55 of shell blades 52 are concave, and that the cord C of each blade is inclined downwardly and rearwardly with respect to the shearing edge 53 of the blade and with respect to the direction of rotation, as indicated by the arrow R, of disk 22. As further indicated in Fig. 4, part of the material which blades 52 feed downwardly through open sectors 48 is trapped and held on the concave inner surfaces 55 so that the trapped material forms a working surface generally along the cord C of blades 52. The relative motion of the material, with respect to the direction of rotation of blades 52 is indicated generally by the arrows M in Fig.

4, it being apparent that as the material drops from chute 25, the shearing edges 53 of the blades batter and break up large chunks or pieces of the material and that, as inflowing pieces move along the surfaces of the material build-up on the concave sides 55 of the blades, considerable abrasion and working of the material is effected. As the particles trapped by concave blade surfaces 55 are abraded and broken up by impact against the other inflowing material, they are forced by the inflowing material and air downwardly through open sectors 48, and are replaced by new inflowing material. A shield 56 mounted on frame cross-pieces 58 surrounds blades 52 and the air flowing inwardly as indicated by the arrows A in Fig. 2 sweeps in the dust which otherwise would tend to be thrown outwardly.

Mounted on the periphery of upper disk 22 are turbine blades 60 which propel air downwardly, as indicated by the arrows A in Fig. 2, through the space between the outer periphery of upper disk 22 and the inner lip 61 of peripheral shell 27. The fan action of shell blades 52 and the centrifugal forces resulting from the rotation of the disks create pressures within peripheral shell 27 which would tend to blow dust outwardly through the space between the periphery of disk 22 and shell lip 61. The tendency to lose dust at this joint is overcome by the draft of the air propelled inwardly by turbine blades 60.

Wear rings 62 are removably mounted on the free edges of ring baffles. While other means for holding the wear rings in place may be utilized, the illustrated holding structures are spring rings 64 split as indicated at 65 so that the rings may be sprung into place. Wear rings 62 are formed of abrasive-resistant material, such as "Teflon," or one of the other plastics or materials well known for its ability to withstand abrasion. Rings 62 may also be formed of hard metal if desired. Rings 62 constitute caps that may have various sectional shapes which engage over the free edges of the ring baffles as a protection against abrasion, and are provided with inwardly extending lips 66 which, as indicated on the left-hand side of Fig. 2, trap part of the out-flowing material so that the latter builds up and forms a protective surface along the inner sides of the ring baffles. While the flow of material past the ring baffles is generally as indicated by the arrows and broken lines in Fig. 2, the spaces between the ring baffles of varying radii calculated so that the regions between them are occupied by streams of colliding pieces of material which deflect and fly in many directions. The cap-like wear rings 62 protect the axial and outwardly facing surfaces of the ring baffles.

To summarize the operation, coarse material, such as crushed rock, ore and the like, are fed in through chute 25, sheared by edges 53 and forcefully impacted and broken up by shell blades 52, abraded against the material entrapped by concave surfaces 58, and forced through sector openings 48. Simultaneously, the air fanned in, along with the infed material carries the material outwardly against the ring baffles and, as the material moves radially outward, the increasing centrifugal forces create violent impacts and collisions of the material. The wear rings 62 protect the ring baffles in the regions of greatest wear, while the material built up against the inner surfaces of the baffles protects the inner sides of the baffles. Turbine blades 60 create an air seal between disk 22 and lip 61, and the air draft caused by the turbine blades helps blow the pulverized material downwardly into collector pan 28.

The invention is not limited to the details of the structure shown and described herein, but is intended to cover all substitutions, modifications and equivalents within the scope of the following claims.

I claim:

1. A pulverizer comprising a pair of axially spaced discs having opposed inner sides, means mounting said discs for rotation about a common axis, feed means including a plurality of angularly spaced substantially sector-shaped openings through one of the discs adjacent the axis thereof for feeding material to be pulverized between the discs, means for rotating said discs in respectively opposite directions whereby the fed material is thrown radially outward between the discs by centrifugal force, staggered ring baffles on the inner sides of said discs having oppositely facing free edges and defining a tortuous path for the outwardly thrown material, and means surrounding the periphery of the discs for receiving the outwardly thrown material, said openings having forward and rear portions with respect to the rotative direction of said one disc, said feed means further including a plurality of outstanding fan blades affixed on the outer side of said one disc, each of said blades having a base portion disposed adjacent the rear portion of one of said openings and a free edge portion disposed axially outward of said base portion and forwardly thereof, and means for supplying said material to said blades, each of said blades having a forwardly facing concave surface with a chord inclining substantially rearwardly from the free edge portion to the base portion thereof so as to entrap and hold thereon a portion of the supplied material, whereby the entrapped material serves as a buffer for working supplied material and deflecting the same and for fanning air through said openings.

2. The combination claimed in claim 1, said blades having convex rearwardly facing surfaces.

3. The combination claimed in claim 1, the forwardly facing surfaces of said blades being substantially cup-shaped.

4. The combination claimed in claim 1, the means for supplying material to said blades including a chute having an outlet end disposed adjacent the free edge portions of the blades and a shield surrounding said outlet end of the chute and said blades.

5. The combination claimed in claim 1 and wear rings comprising annular caps of abrasive resistant material removably engaging over the free edges of said ring baffles and having surfaces overlying the free edges of the baffles and the baffle surfaces adjacent the free edges on both the radially inward and outer sides thereof.

6. The combination claimed in claim 1, each of said baffles comprising a substantially flat cylindrical member having one edge affixed to one disc and having a free edge disposed towards the other disc, and a cap ring of wear-resistant material engaged over the free edge of the baffle, said cap having surfaces overlapping the inner and outer sides of the baffle adjacent the free edge thereof.

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