Feb. 22, 1944. L. N. DOYLE 2,342,255

PULVERIZER

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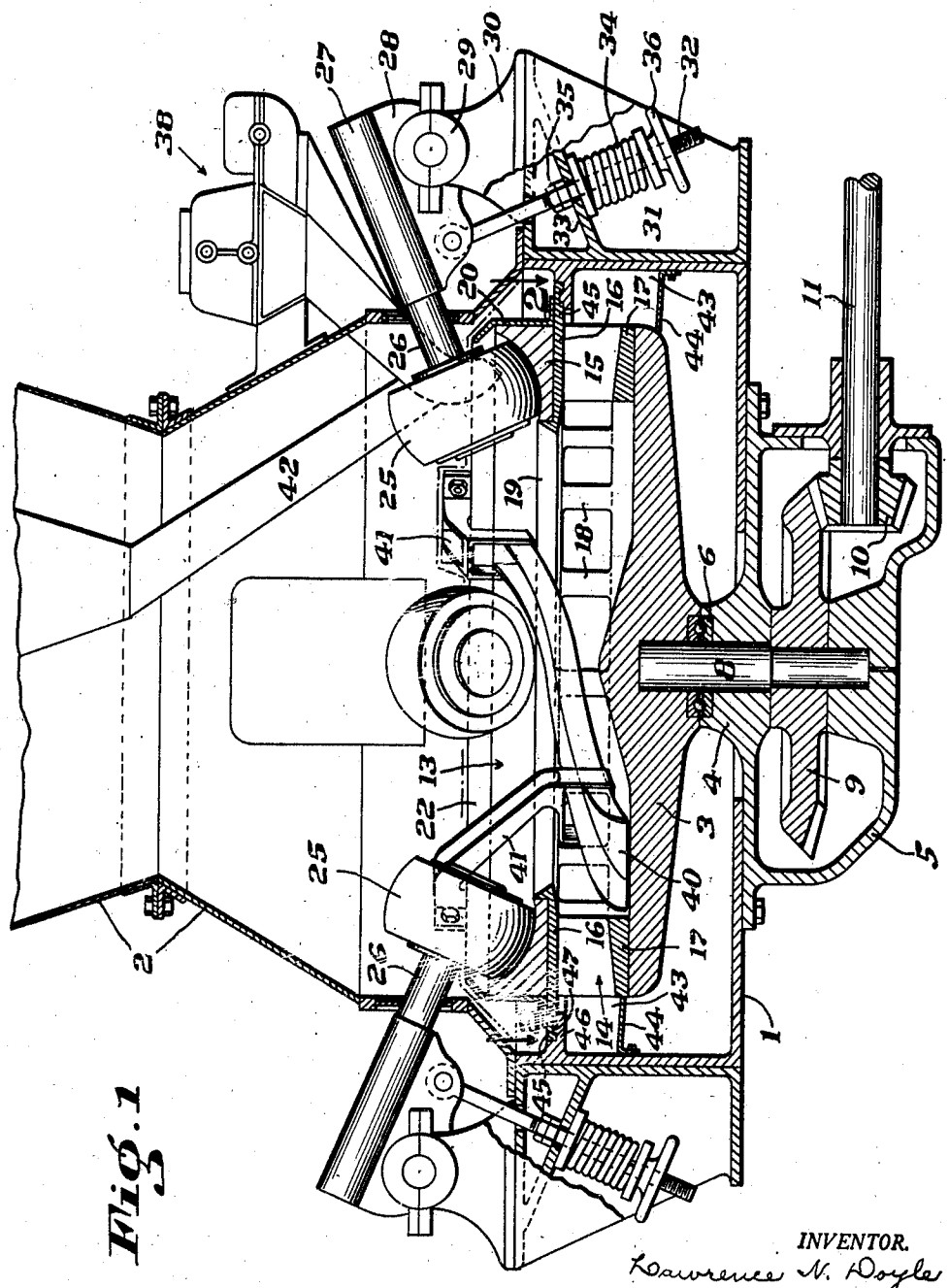

Fig. 1

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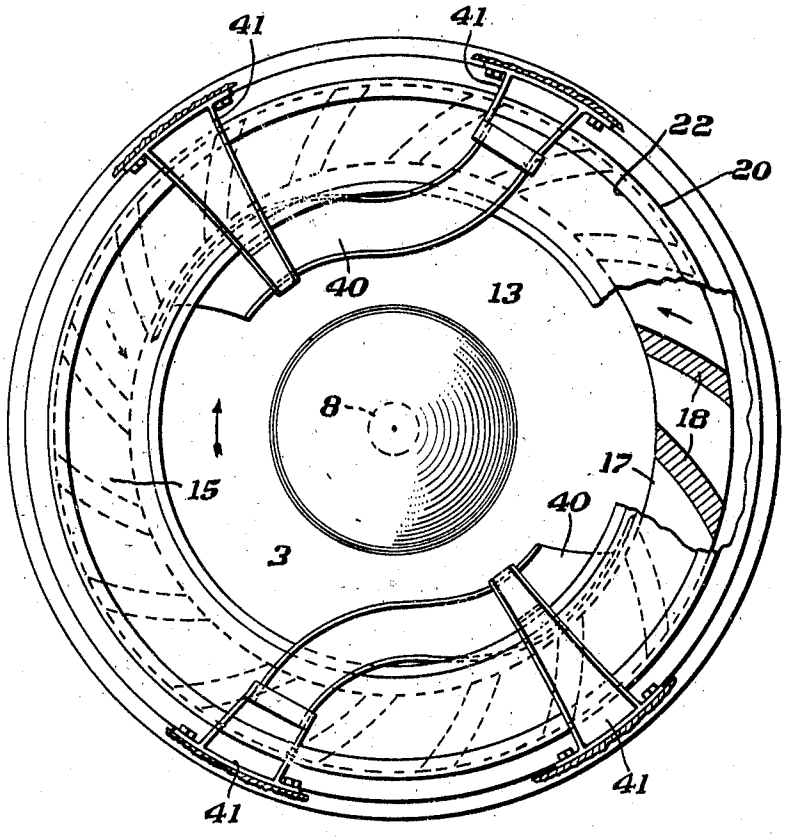

Fig. 2

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PULVERIZER

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Application August 30, 1943, Serial No. 500,461

3 Claims. (Cl. 83—45)

The invention relates to an improvement in pulverizers for the reduction of materials to a finely ground state.

The object of the invention is to obtain greater efficiency in the operation of the pulverizer and lower operating costs, first, by providing a construction which will assure of a positive layer of material on the grinding surface at all times without the necessity of rotating the grinding surface at high speed to maintain this material in a position to be pulverized, second, to retain this material in this position until it has passed several times beneath the rolls, third, to provide a construction which will better serve to get the fine material into a swirling suspension within the grinding chamber after the grinding operation and before its deposit on the floor of this chamber.

The invention can best be seen and understood by referring to the drawings in which—

Fig. 1 is a vertical section of the machine, and

Fig. 2 is a section on the line 2—2 of Fig. 1.

1 represents the machine body, or housing, which forms within it a relatively deep pit or cavity within which is contained many of the operating parts later to be referred to. The body is made of a strong and rugged structure, and is mounted upon any suitable base, not shown. Mounted upon the outer shell of the body is a superstructure 2 which leads to a separator, not shown, as it may be one of known construction.

Located within the pit is a disk-like rotatable table 3. This table is arranged to turn upon a hub 4 which forms part of an auxiliary body casing 5 affixed to the body 1, suitable bearings 6, for reducing friction, being interposed between the table and hub. The table is rotated by a main vertical shaft 8 which extends through the hub, and is otherwise suitably secured to turn within and upon the auxiliary body casing. The shaft 8 has affixed to it a main drive gear 9 which is driven by a pinion 10 borne by a shaft 11 which turns within a bearing on the auxiliary body casing and is itself driven from any suitable source of power, not shown.

The table 3 forms the bottom of the grinding chamber 13. The table is of lesser diameter than that of the housing within which it is contained, in order to leave air space between the table and the body housing which encloses it. Mounted upon the table is an air turret 14 upon which is mounted a grinding ring 15, all of which—table, turret, and ring—rotate as a unit in relation to the grinding chamber. The table and turret are necessarily made of a strong rugged structure, preferably an integral casting, in order to bear the crushing strain to which the grinding ring is subjected, and provide ample support for this ring.

The air turret 14 is made up of annular spaced top and bottom sections 16 and 17, respectively, between which are interposed spaced vanes 18 diagonally arranged in order that air may pass through the ports between these vanes in tangential direction.

The grinding ring 15 rests upon the top section 16 of the air turret which provides a setting for it. The ring in retained against displacement by a flange 19 rising from the inner edge of this section 16 and against which the inner edge of the ring has bearing. The grinding ring is also retained by a plate or guard 20 against which the outer edge of the ring has bearing. This guard is detachably secured to the top section 16 of the air turret in any suitable manner. It is made a removable guard in order to facilitate the removal of the grinding ring, for the grinding ring is a removable ring.

The grinding ring 15 is a concaved ring. The general concavity is at an angle, preferably of about 26.5° angle from the horizontal. The inner edge of the concavity lies substantially flush with the top of the flange 19 against which the inner edge of the ring has bearing. Thence there is a slight dip in the concavity with relation to this edge, and thence the concavity rapidly rises by reason of its inclination, with the back portion of the ring made relatively deep. Thus the grinding ring is one in which the material to be worked upon will hold to the ring without undue outward displacement, although the material is subjected to some slight degree of outward displacement on account of centrifugal force due to rotation of the ring which in practice is rotated at a speed of preferably 40 to 50 R. P. M. In any event the material will not escape over the back side of the ring due to the overhanging lip 22 of the guard which will operate to throw any sufficiently outwardly displaced material back onto the ring.

25 are the crushing rollers with rounded faces which engage the concaved surfaces of the ring for crushing material thereon. Four rollers are preferably provided. Each roller is borne by a shaft 26 turned within a bearing 27 on a rocker 28. This rocker is journalled to turn in a bearing 29 on a bed 30 on the top of an auxiliary fixture 31 forming a part of, or attached to, the body 1 of the machine. Each rocker has pivotally secured to it a shaft 32 passing through an opening in the top of the fixture 31 and through a plate 33 within the fixture. The shaft is under the control of a spring 34 with adjusting nuts 35, 36 upon the shaft engaging the plate and spring, respectively, by which the spring may be adjustably tensioned to draw the crushing roll hard against the surface of the grinding ring.

The material to be crushed is deposited within the machine through a hopper 38 from which

leads a spout for directing the material onto the grinding ring between a set of the grinding rolls. Material depositing upon the top surface of the table 3, or bottom of the grinding chamber 13, is raised by scoops 40 as the table is rotated and directed back onto the grinding ring between a set of the grinding rolls. Two of these scoops are preferably employed. Each scoop is fixed by bolting to the body of the machine by hangers 41 which extend over the guard of the grinding ring and hold each scoop in position. Rejected material from the separator will be returned to the grinding ring through a spout 42.

Formed within the pit with location outside the air turret 14 encircling this turret is an annular air chamber 43. Compressed air is introduced into this chamber whence it escapes to pass between the vanes of the air turret into the grinding chamber. The bottom of this air compression chamber is closed from the main chamber of the pit by an annular plate 44 fixed to the body 1. The top of the chamber 43 is closed by an extension 45 from the top section 16 of the air turret which slidably co-ordinates with a flange 46 extending from the body of the machine, a seal 47 of the grease type being formed between these parts in order to seal the air in the compression chamber. The compression chamber 43 is preferably made contracting from the point where air under compression is admitted to it, in order that the force of the air passing through the ports of the air turret will be as uniform as possible for all the ports.

The general operation is as follows:

As the grinding ring is rotated the crushed material, after having passed under several rolls, will discharge over the inner side of the grinding ring into the grinding chamber, falling in a thin sheet or blanket by the outlet ends of the ports of the air turret. The ring is rotated in a clockwise direction and the blanket of material discharging from it will, as it falls, have like direction, which direction is reverse to the direction of the air entering tangentially through the ports of the turret. Accordingly the entering air will strike the falling material with explosive action and separate out the fine before it has opportunity to fall onto the floor of the grinding chamber, the ensuing action of the air being one in which the particles borne by the air in suspension circulate within the grinding chamber in a swirling action and are afterwards carried up and drawn into the separator. During this operation there is little to impede the free course of the air. The grinding rolls not only lie outside the grinding chamber and, inasmuch as these rolls are being rotated through the rotation of the ring with a relatively slow rotation, no reactive air currents will be created to interfere with the free course of the air. The rotation of the air turret itself, though counter to the direction of the entering air, will enable the entering air to engage the blanket of falling material with substantial unbroken continuity throughout the entire circle, as distinguished from a construction in which the turret is stationary, if it were possible to use a stationary turret with a rotating grinding ring. In such case the necessary size or thickness of the blades of the turret, in order to provide necessary support for the grinding ring, would in a measure interfere with an unbroken continuity of entering air, but this difficulty is overcome through the rotation of the air turret itself. Material falling upon the floor of the grinding chamber and that rejected by the separator is returned to the grinding ring as previously explained.

I claim:

1. In a pulverizer the combination comprising a housing, a rotary table mounted within the housing, an air turret with ports tangentially arranged mounted upon said table in surrounding relation to a grinding chamber, a crushing ring mounted upon said turret, said ring being adapted and arranged whereby the crushed material will fall from off the inner edge of said ring through said grinding chamber and by the outlets to the ports of the air turret, a set of crushing rolls, means for maintaining said rolls in engaging relation to said ring, means whereby compressed air will be directed to pass through the ports of said air turret into said grinding chamber, and means for rotating said table, air turret and crushing ring as a unit whereby the material falling from said ring will move, during the rotation of said ring, in a direction reverse to the direction of the air entering through the ports of said air turret.

2. In a pulverizer the combination comprising a housing, a rotary table mounted within the housing, an air turret with ports tangentially arranged mounted upon said table in surrounding relation to a grinding chamber, a crushing ring mounted upon said turret, said ring having a concaved face angularly arranged with inclination towards the inner edge of said ring whereby material to be crushed will tend to hold to said ring and crushed material will fall from off the inner edge of said ring through said grinding chamber and by the outlets to the ports of the air turret, a set of crushing rolls, means for maintaining said rolls in engaging relation to said ring, means whereby compressed air will be directed to pass through the ports of said air turret into said grinding chamber, and means for rotating said table, air turret and crushing ring as a unit whereby the material falling from said ring will move, during the rotation of said ring, in a direction reverse to the direction of the air entering through the ports of said air turret.

3. In a pulverizer the combination comprising a housing, a rotary table mounted within the housing, an air turret mounted upon said table in surrounding relation to a grinding chamber, said turret having ports for directing air into said grinding chamber, a crushing ring mounted upon said turret, said ring having a concaved face angularly arranged with inclination towards the inner edge of said ring whereby material to be crushed will tend to hold to said ring and crushed material will fall from off the inner edge of said ring through said grinding chamber and by the outlets to the ports of the air turret, a set of crushing rolls, means for maintaining said rolls in engaging relation to said ring, means whereby compressed air will be directed to pass through the ports of said air turret into said grinding chamber, and means for rotating said table, air turret and crushing ring as a unit.

LAWRENCE N. DOYLE.