March 28, 1933. D. Y. BRYANT 1,903,166

MILL FOR PULVERIZING AND THE LIKE

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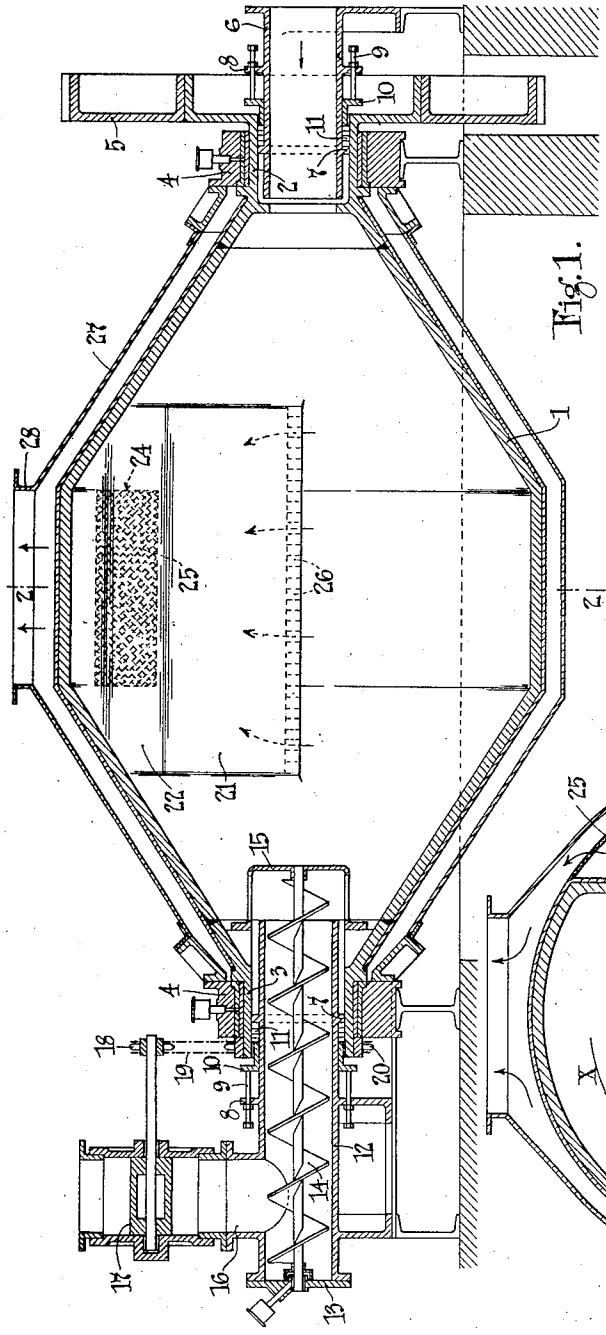

Fig. 1.

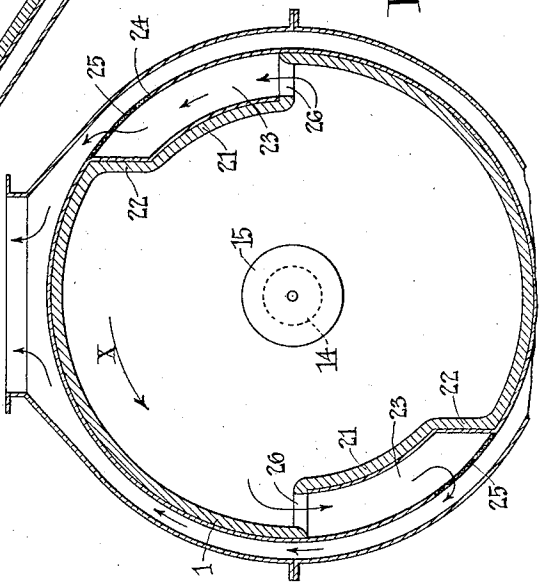

Fig. 2.

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MILL FOR PULVERIZING AND THE LIKE

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This invention relates to mills for grinding, pulverizing, blending, grading and similar operations of the type in which the material to be treated is rotated in a drum together with a mass of steel balls or other grinding elements.

The invention has for object to provide improvements in mills of this type whereby the fine material is more efficiently carried off by an air current as soon as it has been reduced to the required size so that clogging and over-grinding are avoided and the output is increased for a mill of any given size.

The invention also provides improvements in which slippage is eliminated, which requires less power for its operation and which operates efficiently at slow speed.

Further objects of the invention will appear from the following description:—

The invention consists in the construction, combination and arrangement of parts hereinafter described and more particularly pointed out in the appended claims.

Referring now to the accompanying drawing which illustrates, by way of example, one convenient embodiment of the invention:

Figure 1 is a longitudinal vertical section of the improved mill, and

Figure 2 is a transverse section on line 2—2 of Figure 1.

The illustrated form of the invention comprises a drum 1 consisting of a central cylindrical portion and tapering end portions. Coaxial hollow trunnions 2 and 3 are provided at the ends of the drum, the trunnions being journalled in bearings 4, supported on any suitable foundation. Means are provided for rotating the drum, for example a gear 5 carried by the trunnion 2.

Projecting into the trunnion 2 and coaxial therewith is a stationary tubular member 6 formed with an annular abutment 7 and flange 8.

Screws 9 passing through the flange 8 bear against a gland 10, and any suitable packing 11 is compressed between the gland 10 and the abutment 7.

A stationary cylindrical casing 12 projects into the trunnion 3 and is provided with packing means similar to those on the tubular passage 6. The casing 12 is closed at its outer end by a plate 13 provided with a boss in which one end of a conveyor 14 is journalled. The inner end of the conveyor 14 is rigidly connected by a bracket or spider 15 to the interior of the drum 1.

An inlet passage 16 opens into the casing 12, and the passage of material through this inlet is controlled by any convenient form of air-tight feed valve 17 which is driven in any suitable manner from the drum 1. For example, the shaft of the valve 17 may carry a sprocket pinion 18 connected by a chain 19 to a sprocket 20 mounted on the outer end of the trunnion 3 as shown in Figure 1.

The interior of the drum is formed with deflectors which extend over the cylindrical part of the drum and the larger ends of the tapered end portions thereof. These deflectors preferably comprise arcuate portions 21 coaxial with the drum and integral walls 22 which connect the portions 21 with the cylindrical part of the drum. The deflectors form pockets 23 which open into the interior of the drum in a direction opposite to the normal direction of rotation of the drum. The outer shell of the drum is formed with openings 24 at the closed ends of the pockets 23, and these openings are fitted with screens 25 of a mesh which will permit the passage of material of the desired degree of fineness.

The open ends of the pockets 23 are preferably provided with grids 26 to prevent the balls or other grinding elements from entering the pockets.

Any suitable number of deflectors may be provided and spaced equal distances apart around the interior face of the drum.

The drum 1 is entirely surrounded by a stationary air-tight casing 27 provided with an outlet 28, this casing being preferably carried by the bearings 4.

A suitable quantity of grinding balls or elements are introduced into the drum 1 and the material to be treated is introduced thereinto by feeding the material into the inlet 16. The feed of the material is automatically regulated by the valve 17 in accordance with the speed of rotation of the drum 1.

The rotation of the drum causes rotation of the conveyor and thus effects a continuous feed of material into the drum at a regulated rate.

The arrow X in Figure 2 indicates the direction of rotation of the drum and it will be seen that the walls 22 of the deflectors travel in advance of the open ends of the pockets 23 so that the material has no tendency to enter the pockets except when the drum is stationary. The deflectors engage the material in succession and each one lifts the material to a certain elevation after which the mass of material and grinding elements falls to the bottom of the drum with considerable force. The arrangement is such that there is no idle slipping of the material on the interior surface of the drum.

The outlet 28 is connected to the suction of any suitable fan (not shown) and air is thus caused to enter the drum 1 through the passage 6. The air flows over and through the mass of material and out through the screens 25, casing 27 and outlet 28, carrying with it the material which has been ground to the desired size. The fines are thus carried off and collected, as quickly as they are formed, thus preventing clogging of the mill and overgrinding.

When materials having an excess of moisture have to be simultaneously dried and ground, the air current may be heated and caused to flow in the reverse direction. The air will then heat the drum 1 externally in addition to circulating through and over the contents of the drum. The fines will then be carried off through the passage 6 in which a suitable screen may be placed.

The apparatus may be readily modified to effect blending and grading of materials. In this case, materials may feed into the drum at one or both ends, and as soon as the operation has been completed the blended material may be discharged by reversing the direction of rotation of the drum. The material will then enter the pockets 23 and pass out through the openings 24 into a suitable receptacle.

What I claim is:—

1. In an apparatus for grinding, blending or the like, a rotatable drum having a deflector member on the interior surface thereof, said member comprising a partially cylindrical wall coaxial with the drum, and an integral wall connecting said cylindrical wall with said drum at the forward or leading end thereof, said deflector member forming a pocket which is open at its rearward or trailing end and which encloses an opening in the drum, said integral wall being arranged at a steep angle with respect to the interior surface of the drum so as to form a ledge from which the material being treated periodically cascades.

2. In an apparatus for grinding, blending or the like, a rotatable drum having a pair of deflector members on the interior surface thereof, said members each comprising a partially cylindrical wall coaxial with the drum, and an integral wall connecting said cylindrical wall with said drum at the forward or leading end thereof, said deflectors members forming diametrically opposed pockets which are open at their rearward or trailing end and which enclose openings in the drum, said integral walls being arranged at a steep angle with respect to the interior surface of the drum so as to form ledges from which the material being treated periodically cascades.

In testimony whereof I affix my signature.

DAVID YULE BRYANT.