

Dec. 3, 1935.

C. G. H. LÖWENHIELM

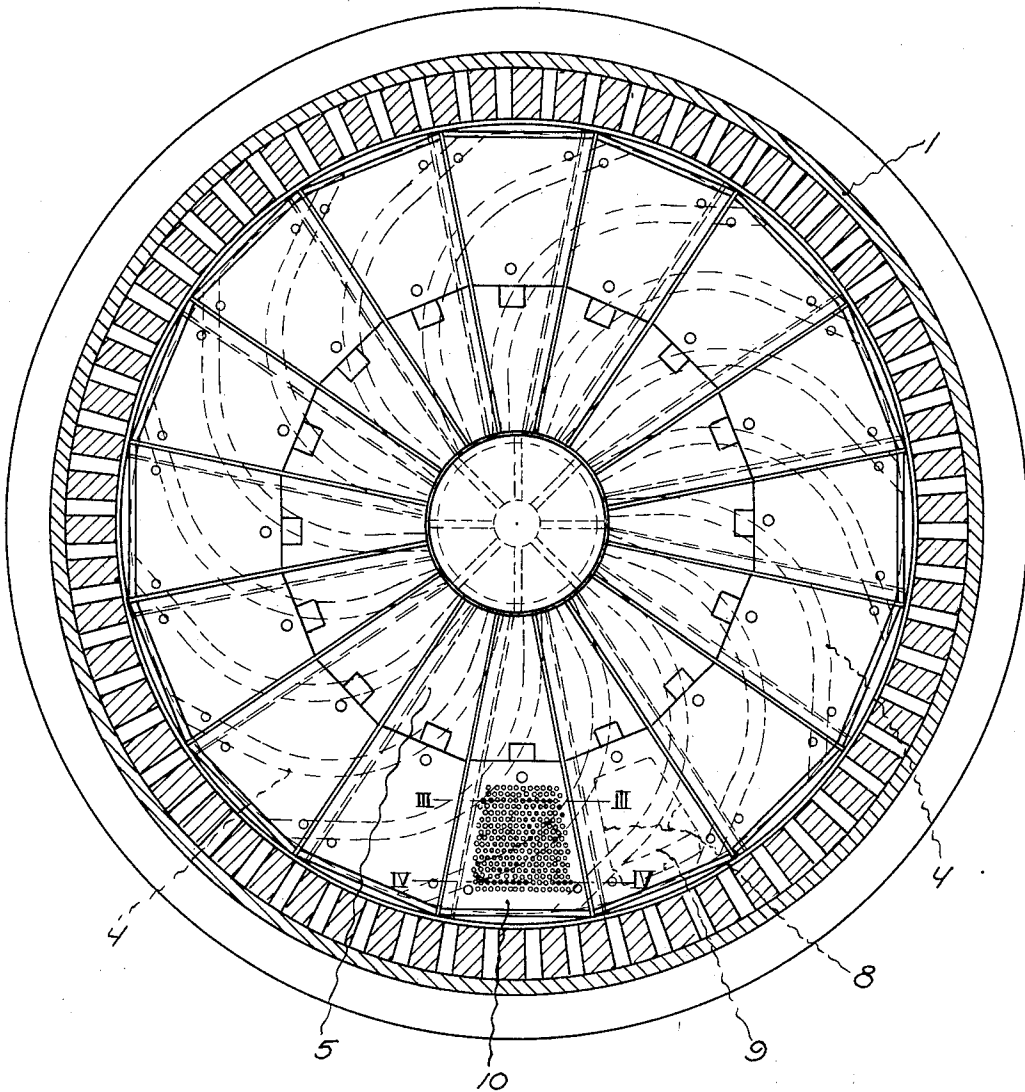
2,023,331

DISCHARGE MEANS FOR BALL OR ROD MILLS AND THE LIKE

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2 Sheets-Sheet 1

Fig. 1



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2 Sheets-Sheet 2

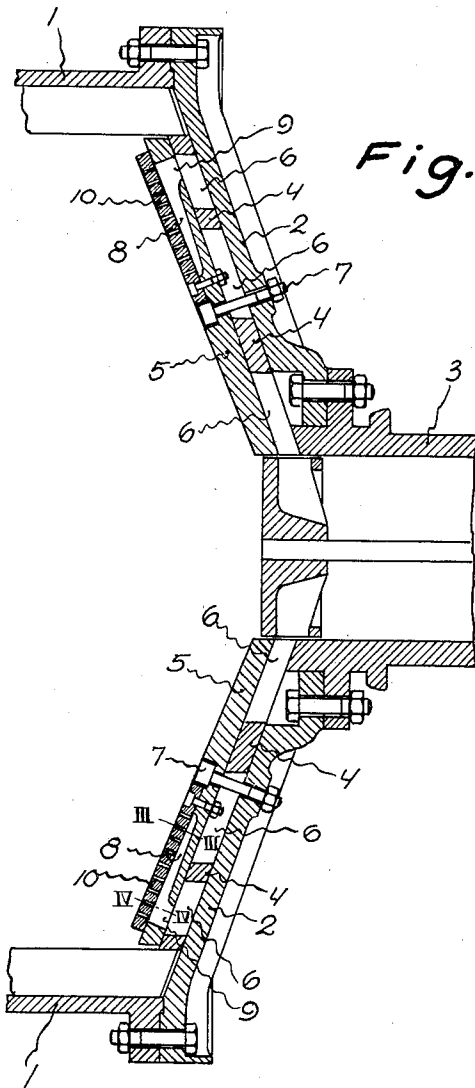


Fig. 2

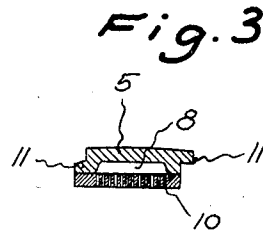


Fig. 3

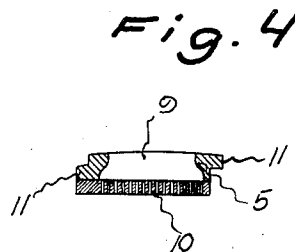


Fig. 4

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DISCHARGE MEANS FOR BALL OR ROD
MILLS AND THE LIKE

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4 Claims. (Cl. 83—9)

My present invention refers to improved discharge means for mills or disintegrators of the rotating drum type and provided interiorly with crushing or grinding means such as balls or pebbles, rods and the like, such general type of mills being referred to in the following under the term of ball or rod mills, which term is intended to include rotary drum mills irrespective of the kind of grinding means used therein.

According to the principle adhered to for discharge of the output from such ball or rod mills, they are to be divided into three groups:—

1. Mills adapted for discharge through the central trunnion,

2. Mills adapted for discharge through an end wall of the drum, and

3. Mills adapted for discharge through or between the constructional elements forming the shell of the drum.

The invention refers to the second mentioned of these groups of mills and has for its object to provide improved discharge means for the ground product to be fed out through the end wall of the mill drum.

In the constructions hitherto known the screens in the end wall of the mill drum for the same purpose have been provided with a plurality of elongated apertures or slits forming the discharge openings.

According to the present invention the discharge is intended to take place through plates of hard steel, or other suitable material adapted to sustain a heavy wear, which plates are provided with a sufficient plurality of small holes having a slightly tapering shape, and such plates are mounted in a protective position to the end wall of the drum at the inside of said wall. The perforated discharge plates are detachably mounted so that they may be substitutable independently of the end wall of the drum.

The invention is illustrated in the accompanying drawings which show a preferred embodiment thereof, and in the drawings:—

Fig. 1 shows a cross section of the mill drum seen in the direction of the discharge end,

Fig. 2 shows a longitudinal section of the discharge end of the drum,

Fig. 3 is a detail section at the lines III—III in Figs. 1 and 2, and

Fig. 4 is a similar section at the lines IV—IV in the same figures.

In the drawings, 1 represents the drum shell which by means of its end wall 2 is rotatably supported by the hollow centre trunnion 3 forming the discharge outlet. Interiorly, the drum

end wall 2 is provided with curved ridges 4 or the like extending from the centre pivot 3 towards the periphery of the drum and serving during the rotation to convey the product to be discharged towards the discharge outlet.

At their inner side, the ridges 4 form a seat means for a plurality of sector-shaped lining plates 5 forming together an interior end wall within the drum. The lining plates 5 are supported by the ridges 4 at a distance from the end wall 2 of the shell, and they form a cover on the channels 6 confined radially by the ridges 4. The lining plates 5 are detachably connected with the shell end wall 2 in any suitable manner, for instance by screws 7 provided interiorly with countersunk heads.

At their inner ends, and to a point about midway between the centre trunnion 3 and the periphery of the drum, the lining plate sections are flat, but at their outer ends they are provided with a countersunk portion 8 communicating adjacent to its outermost end with the channels 6 by means of an aperture 9. The countersunk portion 8 is sector-shaped as will be understood from Fig. 1, and the remaining portions of the plates 5 at this end form each a seat for a discharge plate 10 provided with perforations and mounted detachably as a cover on the corresponding countersunk portion 8. The cross sectional shape of the perforations is immaterial to the invention but the size of said perforations is determining for the maximum size of the particles of material discharged, and it is essential that the perforations have an inwardly tapering shape so as to prevent clogging of the material therein.

For the sake of simplicity, the perforations in the discharge plates 10 are shown in the lowermost plate in Fig. 1 only, although it is to be understood that similar, or corresponding, perforations are at hand in all discharge plates around the entire circumference of the drum end.

The manner of action of the constructional parts described is obvious to those familiar with the subject, and the nature or construction of the crushing means used for grinding purposes within the mill drum is of no consequence as far as the invention is concerned, such means being omitted in the drawing for the sake of clearness.

The essential features of the construction just described are:—

1. The discharge is performed through slightly tapering holes provided in detachable discharge plates having a sufficient hardness to sustain wear during a long period of operation without sub-

stitution, and said plates are of a sufficient thickness for preventing deformation.

2. The discharge plates are most economically produced from rolled or cast steel and perforated by means of conical drills, whereafter the plates are suitably hardened. The size of the holes may be chosen according to the maximal size allowed on the material to be discharged, but from practical reasons the size cannot be chosen so small that sufficiently ground material is discharged only. The ordinary size of the holes is something between 5 and 12 mms. in diameter, and the taper must be sufficient to prevent clogging. On the other hand, the taper ought not to be too great, as then the variation in size of material will be too great when operating with new discharge plates as compared with worn ones. As an example of a suitable taper, it may be mentioned that in case of discharge plates having a thickness of about 30 mm. the diameter of the hole ends facing the interior of the drum ought to be about 1-2 mm. smaller than the diameter of the opposite end of the holes.

3. The discharge plates are detachably mounted on the end lining plates which together with adjacent parts of construction are adapted for conveying the ground material to the hollow outlet trunnion. The perforated discharge plates are preferably constructed so as to cover a part of the shell end lining only, such part thereof being positioned at the periphery of the mill drum, in which place the wear is the greatest. The discharge plates are affixed to the shell end lining plates prior to the mounting of the latter within the mill, and the said lining plates may be removed for substitution of the discharge plates when the latter have been worn out.

4. The shell end lining plates at their sides are provided with offset flanges 11 (Figs. 4 and 5), the flange at the one side being offset in opposite direction to the flange at the other side so that the lining plates, when being mounted within the drum, will overlap each other at the edges. Naturally this construction could be changed in such a manner that every second of the plates has edge flanges offset in one direction and the intermediate ones have similar flanges offset in the opposite direction so that every second plate at its edges overlaps two adjacent plates.

5. Adjacent to their outer edges, the lining plates are provided with one or more apertures 9 and shaped so as to form a space behind the discharge plates (or the perforations therein), and the ridges 4 forming conveyors for the

material towards the outlet may be cast in one piece with the lining plates, if desired, or they might be made separately and fixedly mounted between the lining plates and the shell end wall

2. In any case these ridges form distance pieces or seats for the lining plates.

6. By providing the shell end lining plates with side flanges, and by positioning of the apertures 9 therein adjacent to the periphery of the drum, the interior of the latter, apart from said openings, will be entirely confined from the space 6 between the lining plates and the shell end wall, or the outlet as a whole, so that ground material, having once been discharged through the perforated plates 10, cannot again enter the interior of the drum, this being of an especial advantage inasmuch as the pulp would otherwise tend partly to return into the drum.

What I claim and desire to secure by Letters Patent is:—

1. In a rotary drum mill of the character described, in combination with a cylindrical drum, a drum end wall, a hollow center trunnion supporting said wall and adapted to form an outlet for the ground material, a sectional drum end wall lining consisting of a plurality of sector-shaped lining plates each of which is detachably secured to the end wall independently of the others, said lining plates being mounted at a distance from the end wall of the drum so as to form a space therebetween, conveying means mounted in said space and adapted to convey the ground material towards the aforesaid hollow trunnion, and a perforated discharge plate detachably mounted on each of the corresponding lining plates at the side of the lining plate facing the grinding chamber of the mill.

2. In a rotary drum mill according to claim 1, wherein the sector-shaped lining plates at their radially extending sides are provided with edge flanges adapted to overlap each other when mounting the lining plates in the mill.

3. In a rotary drum mill according to claim 1, wherein the conveying means consist of curved ribs of the same number as the lining plates.

4. In a rotary drum mill according to claim 1, wherein each of the screen plates is adapted to cover a portion of the corresponding lining plate adjacent to the periphery of the drum only, and that the portion of the lining plates thus covered is provided with at least one aperture leading to the space between the lining plates and the end wall of the drum.

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