No. 741,606. PATENTED OCT. 13, 1903

G. ZARNIKO.

GRINDING MILL.

APPLICATION FILED OCT. 29, 1902.

NO MODEL.

Fig. 1.

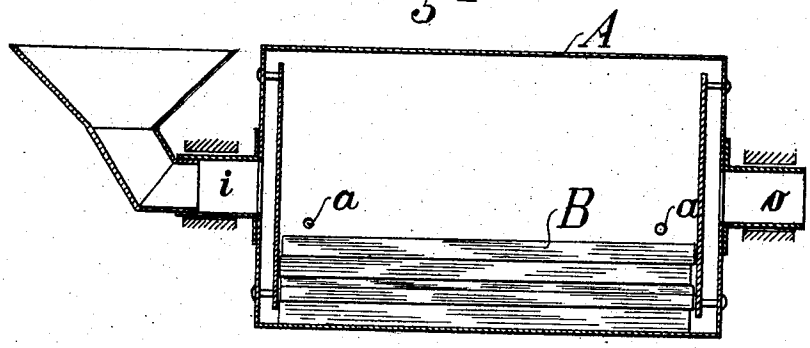


Fig. 2.

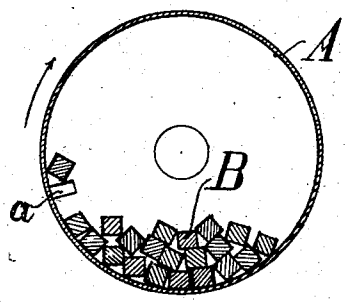


Fig. 3.

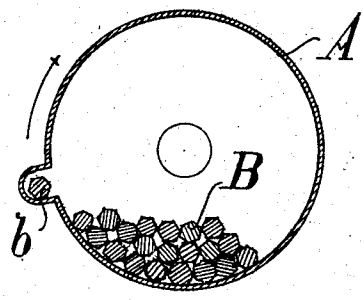


Fig. 6.

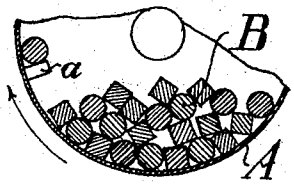


Fig. 4.

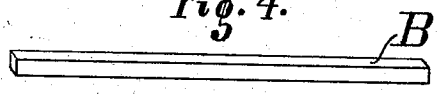
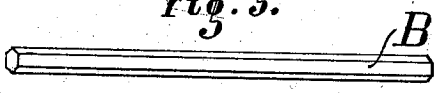


Fig. 5.



Witnesses
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No. 741,606. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

GERHARD ZARNIKO, OF HILDESHEIM, GERMANY.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 741,606, dated October 13, 1903.

Application filed October 29, 1902. Serial No. 129,300. (No model.)

To all whom it may concern:

Be it known that I, GERHARD ZARNIKO, engineer, a subject of the Emperor of Germany, residing at Hildesheim, Province of Hanover, Prussia, Germany, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

This invention relates to drum-mills of that kind in which a number of loose bars are contained in the interior of an elongated drum, which bars when the drum rotates roll loosely over one another and on the drum-walls, and so disintegrate the materials to be ground contained in the drum.

The present invention has for its object an arrangement whereby a more vigorous movement is imparted to the grinding-bars, which latter are of a peculiar form, by which the grinding action is considerably increased.

The above object is secured by the employment in a drum provided with lifting means of polygonal or of a combination of polygonal and cylindrical grinding-bars, the polygonal bars by reason of their contour being retained upon the lifting means, which may be in the nature of a rib or abutment, until elevated some distance above a horizontal plane, whereby upon dropping a greater crushing or attrition of the contained material will be secured than if said bars rolled from the lifting means shortly after the same passed a horizontal plane.

In the accompanying drawings, Figure 1 is a longitudinal section of the mill; Figs. 2 and 3, cross-sections, and Figs. 4 and 5 elevations, of different forms of grinding-bars.

A is the drum, which is mounted and driven in any suitable way. In its interior there are a large number of grinding-bars B, which when the drum A rotates roll freely over one another, and thus disintegrate the material to be ground. This material may be, for instance, minerals and the like, which are introduced at *i*, the ground material being discharged from the drum at *o* in a pulverulent form. In order to produce in such drum-mills a still further acceleration of the grinding process, a periodic complete alteration of the position of the bars or rollers relatively to one another is produced by devices being inserted which detain one or some of the lower stratum of bars and allow the others lying above them to travel freely away until those detained come onto the upper surface of the heap of bars and then travel over the top of them. Round bars may be employed in this arrangement as well as angled bars. As means for this object projections or laths *a*, Figs. 1 and 2, may be employed, one or more of which may be fixed across the entire periphery of the drum. These projections or laths may also be located on the ends of the drum and may be arranged parallel to the axis of the drum in such a way that the bars engaged by them maintain their position parallel to the axis, or they may be so arranged that the traveling bars place themselves obliquely, as the laths or projections or each two projections working together do not lie parallel with the axis. The same or similar action may also be obtained by arranging such projections at only one end of the drum, so that one end of the raised bar travels faster than the other end. The advantages of this moving of the bars at an inclination are multiple. The bar thereby pushes the other bars apart, and thus alters their relative positions and the distribution of the material to be ground, and, further, when rolling over them it exercises a greater shearing action, as it crosses in the manner of shears the bars on which it strikes or over which it rolls.

The projections or laths may be so adjustable in their projection or inclination that the degree of the lifting of the traveling bars may be altered.

In a modification recesses *b*, Fig. 3, may be employed instead of projections or fixed laths *a* and with a similar action. With this arrangement by making the recesses of a depth suited to one of the diameters of the traveling bars and of any desired width one or more of the traveling bars, as desired, may be lifted and allowed to roll over the others without affecting the movement of the others. In such mills the inner side of the drum has already been corrugated; but by this the best grinding action on the smooth inner wall of the drum is lost, as the grinding-bodies can never roll steadily over it, and the small depth of the corrugations causes only a small alteration in the position of the grinding-bodies. The action of such mills may be increased by giving the grinding-bars B a rec-

tangular or polygonal section, as shown in Figs. 4 and 5. The angled rods have a varying diameter in cross-section, and thus during the movement cause a constant displacement of themselves or of the adjacent bars and also of the material to be ground, which considerably assists the grinding action. They have also more or less sharp edges, which when they encounter the edges of an adjacent bar or the surface of the latter have a cutting action on the material to be ground. Finally, the surfaces of the angular or rectangular bars not only produce a constant rolling, but also a periodic sliding, which considerably supports the grinding action, more particularly as regards fineness.

The angular or rectangular bars, more particularly when they are not of too small a diameter, have a favorable action by exerting a crushing blow on the material to be ground when tilting over the lower edge of the next following face.

The rectangular or polygonal bars if employed alone may all be of similar diameter or of varying thickness and section. If they are used in conjunction with round bars, they may also have approximately a similar diameter to the latter or may vary therefrom, Fig. 6, or only a few bars (or only one bar) of larger diameter may also be introduced.

I declare that what I claim is—

A grinding-mill comprising in combination a revoluble drum having internal projections, feed and discharge openings in its heads, baffle-plates over said openings and tumbling-bars extending from one baffle-plate to the other.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GERHARD ZARNIKO.

Witnesses:

WILHELM LEHRKE,

JULIUS SOCKEL.