

R. BENEKE.
COMPOUND BALL MILL.

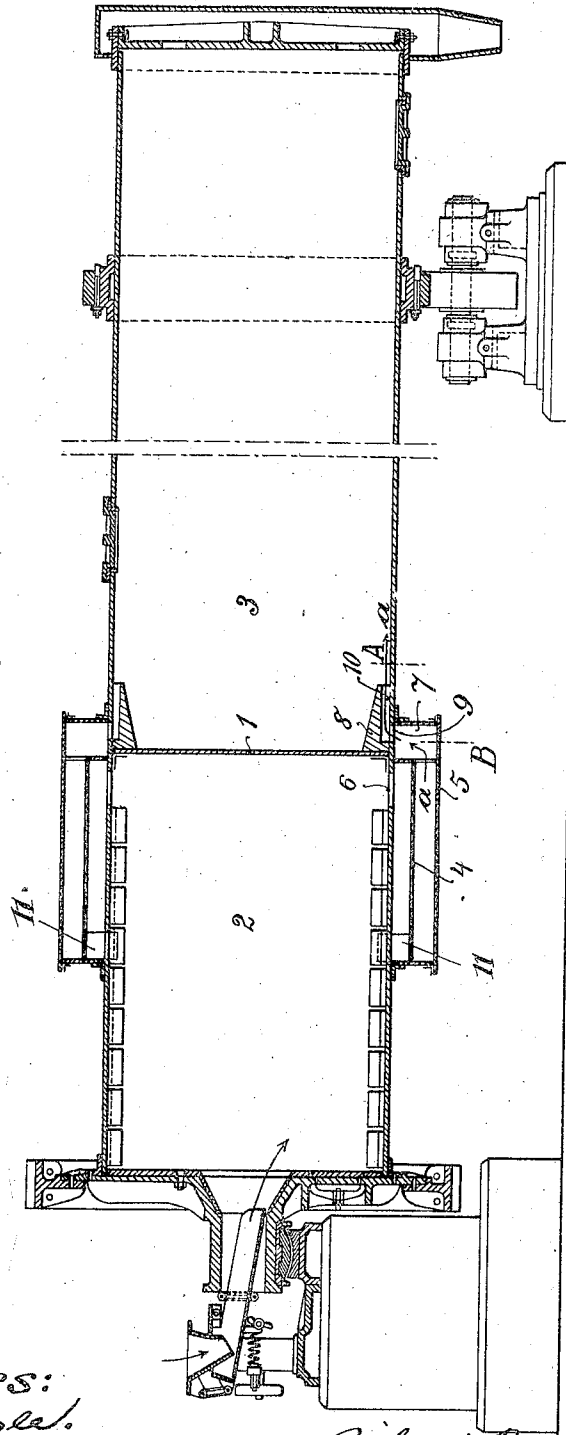
APPLICATION FILED SEPT. 17, 1909.

1,017,946.

Patented Feb. 20, 1912.

2 SHEETS—SHEET 1.

FIG. 1.



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2 SHEETS—SHEET 2.

Fig. 4.

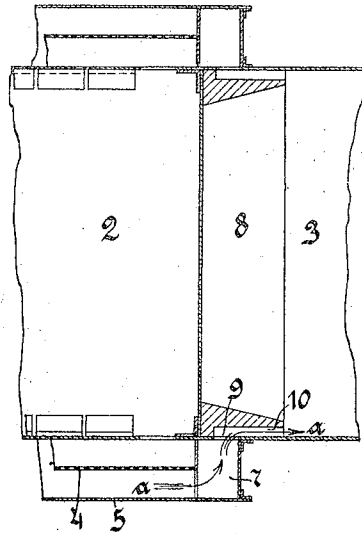


Fig. 8.

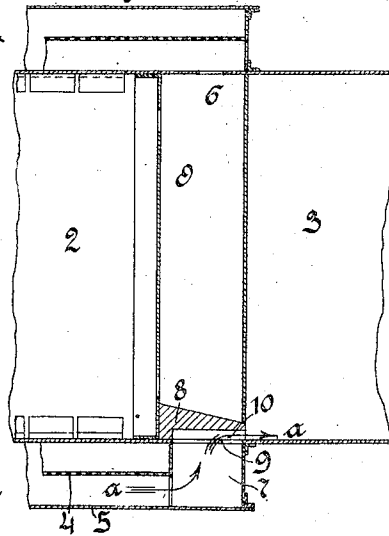


Fig. 5.

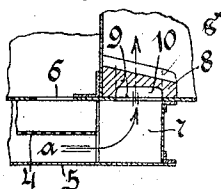


Fig. 6.

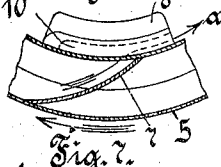


Fig. 7.

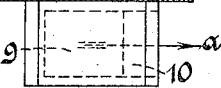


Fig. 2.

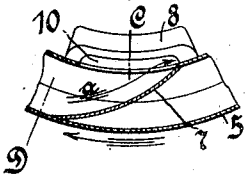
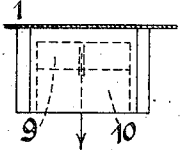


Fig. 3.



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UNITED STATES PATENT OFFICE.

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COMPOUND BALL-MILL.

1,017,946.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RICHARD BENEKE, merchant, a subject of the King of Prussia, residing at No. 6 Mittelstrasse, Bromberg, German Empire, have invented new and useful Improvements in Compound Ball-Mills, of which the following is a specification:

My invention relates to so-called compound ball-mills, that is, ball grinding mills whose drum is divided by partitions into two or more chambers in which the material that is to be ground is disintegrated in stages to different degrees of fineness, passing automatically from the chamber containing large grinding balls into the succeeding chamber containing smaller balls. In prior mills of this class this continuous feed of the material through the successive chambers has been effected by means of so-called "conveying-chambers," such as, for instance, are described in German Letters Patent No. 193,782. The defects of such chambers, however, are that they occupy very considerable space, the effective working-area of the grinding-drum being diminished by this amount, and that they are relatively expensive to construct, so that the cost of the mill is considerable.

According to my invention, I dispense with conveying-chambers and substitute therefor what I designate "conducting-hoods," whose outer surface is such that it can be utilized as grinding-surface.

My invention is illustrated in the accompanying drawing, in which:

Figure 1 is a longitudinal section of one form of construction of the new mill, the section being taken on the line C—D of Fig. 2. Fig. 2 is a fragmental cross section on the line A—B of Fig. 1. Fig. 3 is a plan of Fig. 2. Fig. 4 is a view similar to Fig. 1, showing a modification, in which a single annular hood is employed. Fig. 5 is a fragmental longitudinal sectional view illustrating a second modification, in which the channels in the hoods are directed at right angles to the longitudinal axis of the drum. Fig. 6 is a cross sectional view of Fig. 5. Fig. 7 is a plan of Fig. 6. Fig. 8 is a view similar to Fig. 1, showing a third modification, in which the hoods are located in the same plane as the exit-apertures in the drum-wall.

Referring more particularly to Figs. 1-3 the drum of the mill is divided by a partition 1 into a coarse-grinding chamber 2 and

a fine-grinding chamber 3. 4 is a screen and 5 an imperforate shell, which may be secured to the drum in any well-known manner. The material under treatment in the chamber 2 passes through the apertures 6, 60 and falls upon the screen 4. The tailings travel along the screen to the end thereof remote from the apertures 6 and from thence back to the chamber 2 by means of the scoops 11 Fig. 1, while the finer material that passes through the screen descends upon the shell 5 and is conveyed by means of curved vanes, or scoops, or the like 7 to the hoods and conductors 8 which conduct it for further reduction into the chamber 3, instead of the 70 material, as in prior mills of this class, being fed into a conveying-chamber.

The conductors consist of plates or hoods 8, which lie direct against the inner wall of the chamber 3, above the orifices 9 of the 75 latter. The plate 8 is angularly channeled on the underside at 10, so as to present a vertical passage above the orifice 9 and a horizontal passage running parallel with the longitudinal axis of the drum and conducting 80 into the chamber 3.

The screened material from the shell 5 is conducted by the scoop 7 through the orifice 9 into the channel 10 of the hood 8 and thence into the chamber 3. The path of the 85 material is indicated in the drawing by the arrows *a*, and since the material enters the chamber in a direction parallel with the longitudinal axis, choking of the channel 10 either by the material itself or by the grinding-balls cannot occur.

It will be observed that the plates 8 in no wise shorten the working-surface of the drum, since their outer face constitutes a grinding-surface. I prefer to form the top 95 of the plate 8 with a longitudinally extending channel 8* as shown in Fig. 5, so that it will act as a shovel and continually throw off sidewise the balls and material falling upon it. This still further prevents the 100 possibility of the channel 10 getting choked.

If desired, the channel in the plate 8 might be so shaped that the surface which advances the material being ground constitutes a species of scoop, such as shown at 7, 105 Figs. 2 and 6, this surface, rising in rearward direction, (if desired, spirally) and thus preventing penetration of the balls into the channel. Instead of having a number of detached plates 8, a ring might be employed, 110

as shown in Fig. 4, which ring forms a continuous grinding surface.

In mills having a perforated wall *o* (Fig. 8) through which the material has to pass before reaching the outlet apertures 6, the orifices 9 may lie in the same plane as these apertures, and thus without the drum 3 being shortened, or the essential feature of the invention being departed from. For the intermediate space which is formed is in no wise a "conveying-chamber", in the sense that the expression is employed in this specification, but serves a totally different purpose.

The horizontal portion of the channel 10 in the plate 8, it is clear, need not necessarily run parallel with the longitudinal axis of the drum; it might for instance, run inclined to such axis, or at right angles to it, as shown in Figs. 5, 6 and 7.

By means of this invention the cross section of the orifices through which the material enters the fine-grinding drum may be made as large as desired, without there being any danger of the small grinding-balls

of such chamber entering and choking such orifices.

Having thus described my invention, I claim as new:

A rotatable drum having adjacent grinding chambers, in combination with an imperforate shell surrounding the adjacent ends of said chambers and secured to said drum, a screen between said drum and shell; vanes in said shell at one end thereof, and longitudinally extending hoods secured to said drum within one of said chambers and separated from the peripheral wall thereof, and covering openings therein; said chambers having orifices in their peripheral walls; which, with the spaces between the hoods and the peripheral walls form passageways from one chamber to the other.

In witness whereof I have hereunto signed my name this 2nd day of September 1909 in the presence of two subscribing witnesses.

RICHARD BENEKE.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.