J. W. COVER.

GRINDING MILL.

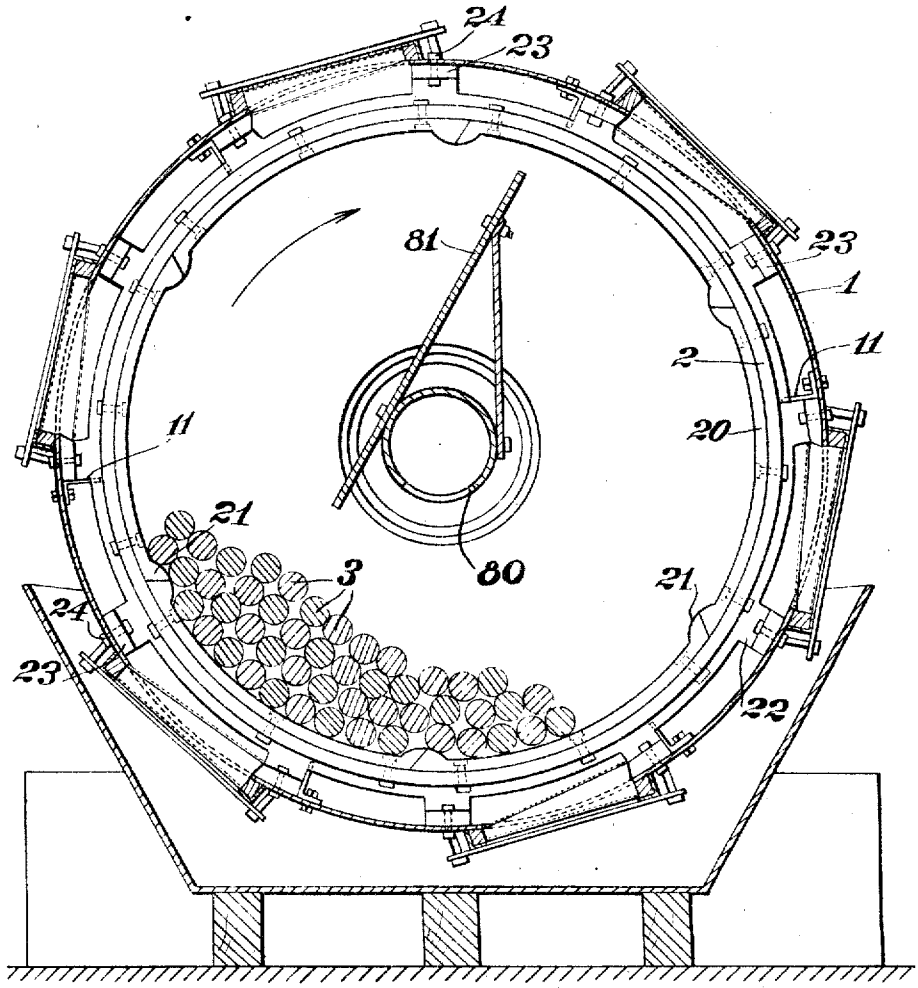
APPLICATION FILED OCT. 28, 1916.

1,242,423.

Patented Oct. 9, 1917.

3 SHEETS—SHEET 1.

Fig. 1.



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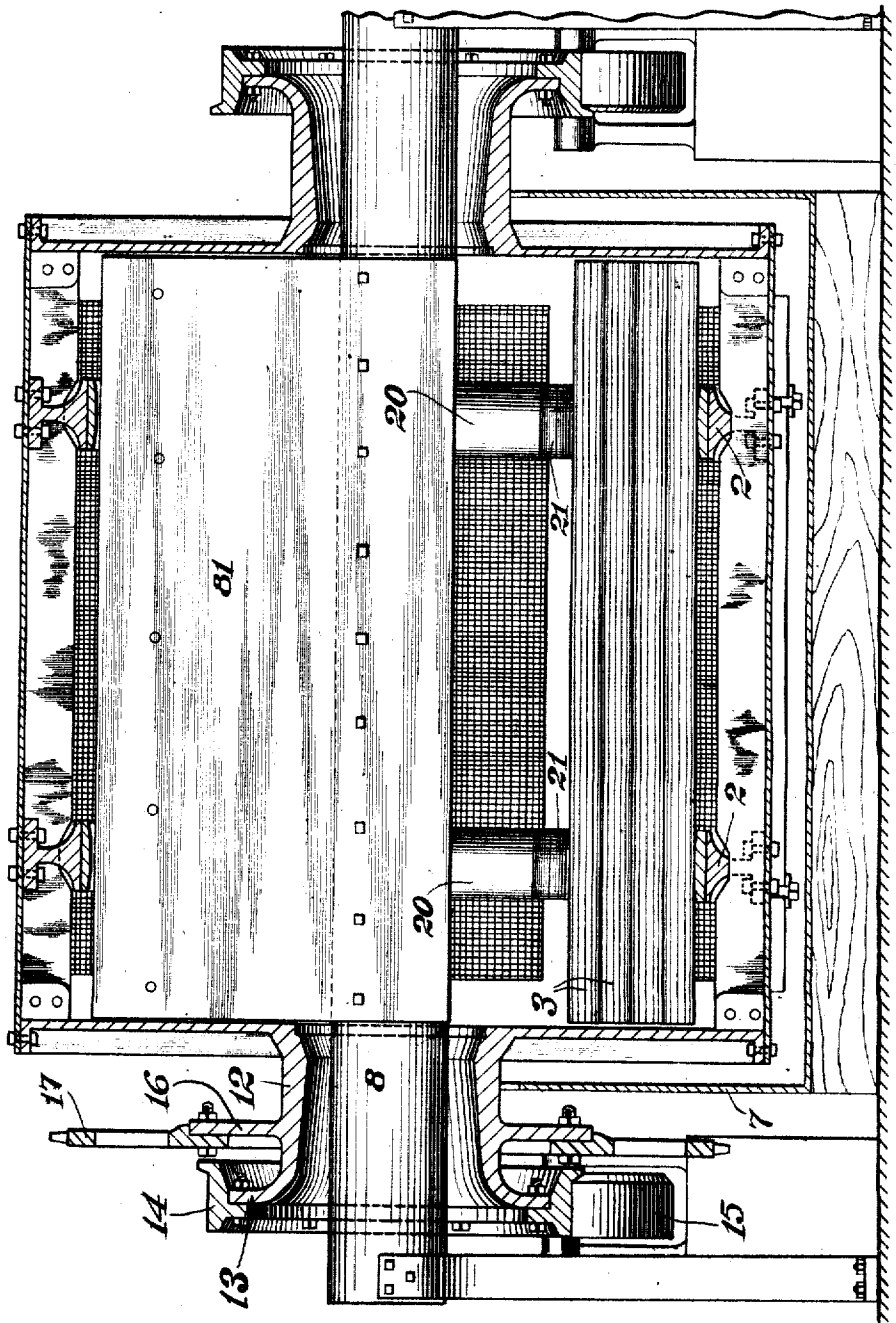
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3 SHEETS—SHEET 2.

Fig 2



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3 SHEETS—SHEET 3.

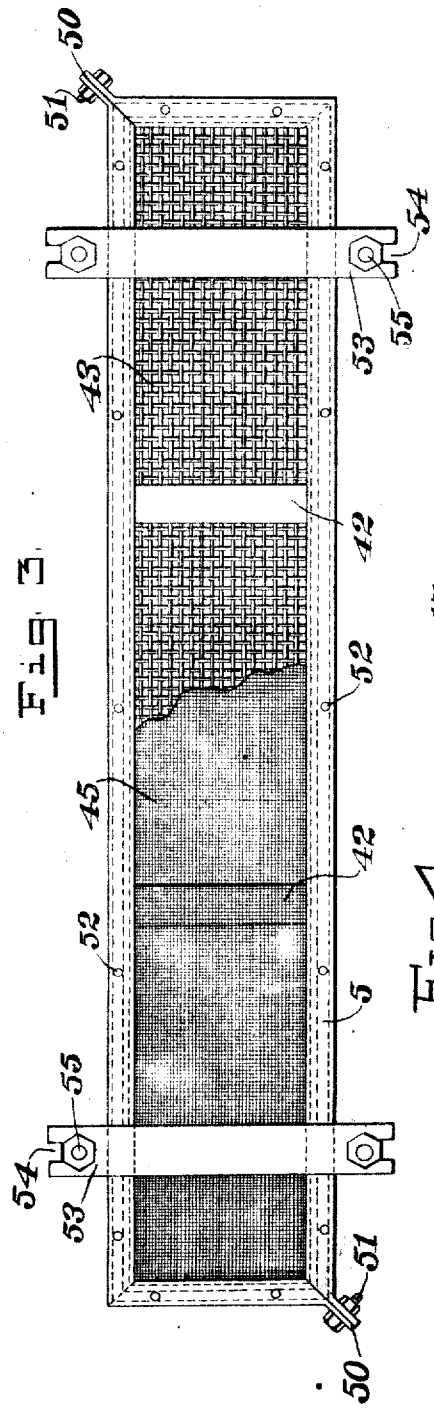


Fig. 3

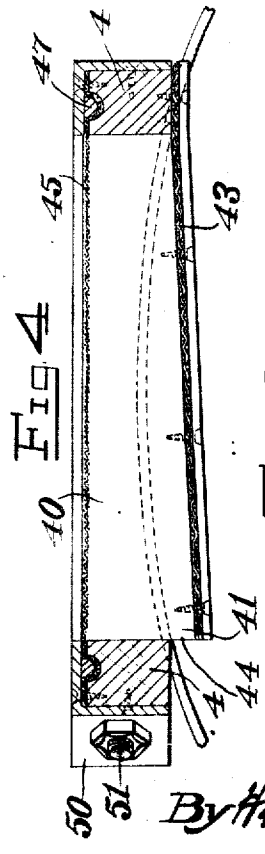


Fig. 4

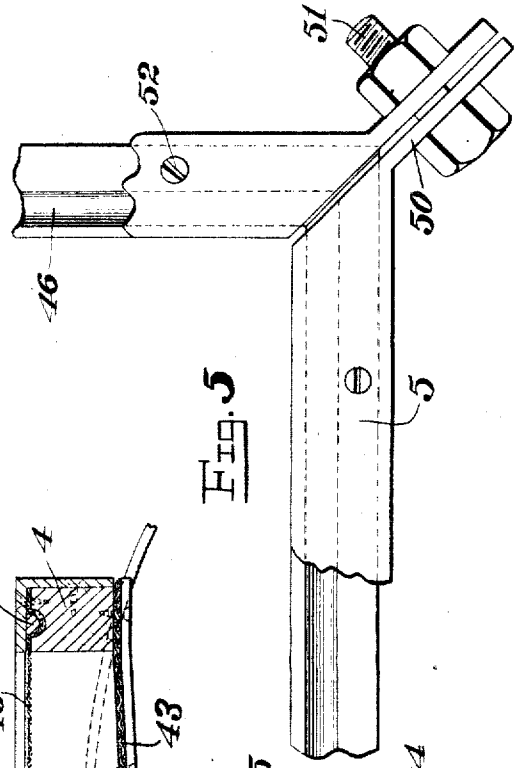


Fig. 5

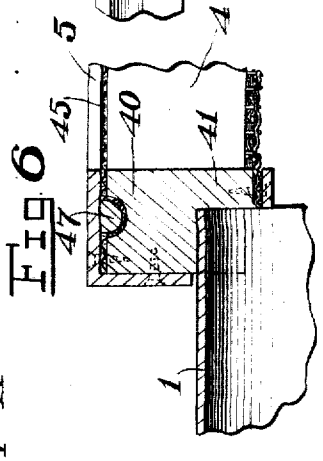


Fig. 6

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UNITED STATES PATENT OFFICE.

JOHN W. COVER, OF TACOMA, WASHINGTON.

GRINDING-MILL.

1,242,423. Specification of Letters Patent. Patented Oct. 9, 1917.

Application filed October 28, 1916. Serial No. 128,337.

To all whom it may concern:

Be it known that I, JOHN W. COVER, a citizen of the United States, and resident of the city of Tacoma, county of Pierce, and State of Washington, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

My invention relates to grinding mills and particularly to mills intended for grinding or pulverizing ores and is of the type which are commonly referred to as bar or tube mills, in which the grinding effect is due to the rolling of a mass of loose bars upon themselves, with the material to be ground mixed therewith.

The object of my invention is to provide a mill of this character which shall be simple and cheap in construction, in which the parts which are most liable to wear are so constructed that they may be easily replaced and which shall have both a large grinding and a large screening capacity.

My invention consists of the novel features which will be hereinafter described and then particularly pointed out in the claims.

In the accompanying drawings I have shown a mill constructed in accordance with my invention, the same being, in its details of construction and in the arrangement of its parts, of the character which is at the present time preferred by me.

Figure 1 is a transverse sectional elevation of the mill.

Fig. 2 is a longitudinal sectional elevation of the mill.

Fig. 3 is an outer face view of one of the screen frames.

Fig. 4 is a transverse section through a screen frame.

Fig. 5 is a detail view of one corner of a screen frame showing the outer face.

Fig. 6 is a section taken through one end bar of the screen showing its relation to the shell of the mill.

In constructing my mill I provide a shell 1, which is preferably of cylindrical shape, and provide the periphery of this shell with a series of screen receiving openings, which openings preferably extend throughout a good portion of the length of the shell. Screens are provided for closing these openings of a construction which will be hereinafter described.

Within the shell and spaced inward therefrom is a plurality of rings 2, which rings form a support for the bar contacting members 20, said members 20 being herein shown as composed of segmental plates bolted to the ring 2. I have shown these segmental wear plates as provided with projections 21 at each end, which act, to a certain extent, to carry upward the grinding bars as the cylinder is revolved. It is intended that these wear plates 20 be made of a hard resistant material so that they will not be quickly worn out by the action of the mill.

I have shown two rings 2 as installed within the cylinder. This number, it is believed, will be found ample for mills of medium size, although the number may be increased, if there be any reason for doing so.

The rings 2 are provided, upon their outer surfaces, with projections 22, forming legs to space the rings inward from the shell 1. These legs 22 are secured to the outer shell 1. One manner of doing this is by providing flanges 23, through which securing bolts 24 pass. This construction leaves a series of openings between the shell and the ring, bounded at their ends by the legs 22. This provides free circulation of the finer material contained in the cylinder throughout the length of the cylinder, and the rings do not reduce the screening area.

The shell has secured thereto a series of angle plates 11, which project inward, but stop short of the inner face of the rings 2. These flanges form material elevating shelves which, as the mill revolves, carry the material up and discharge it upon the pile of rods or bars. The rods 3 are herein shown as being round in cross section, although they may be made of any cross section which is found to work satisfactorily. These rods extend substantially from head to head of the cylinder, being sufficiently shorter than this distance to make it impossible for them to become wedged between opposite heads.

The type of screen which I prefer to employ is shown in detail in Figs. 3 to 6 inclusive. This is composed of a rectangular frame consisting of side bars 4 and end bars 40, to which the other parts are secured. The end bars 40 are preferably cut away in their outer parts in a curve such as will fit closely to the curvature of the outside surfaces of drum 1. This leaves a flange section 41, which at one end projects through the opening into the drum chamber and at

its other end runs out to nothing as is shown in Fig. 4, wherein the curved dotted line represents the extent of the cut-away portion. The thickness of this flange is shown in Fig. 6.

Cross bars 42 are placed at such intervals as may be desired or necessary. The inner surfaces of these cross bars are in the same plane as the inner surface of the end bars 40. Upon the inner surfaces of these bars and the flanges 41 of end bars 40 and one of the side bars 4, is secured a relatively coarse screen 43. This screen, at one side of the frame, is spaced inward from the bar 4 of the frame and also inward from the shell of the drum 1, thus leaving an opening 44 of such size that any particles which pass through the screen 43 but are too large to pass through the outer screen 45, will be discharged therefrom when this side of the screen is down.

Upon the outer surface of the screen frame a fine screen 45 is secured. This screen is of whatever fineness it is desired the material shall be ground before discharge and whatever material passes through this screen is discharged from the mill. Anything too coarse to go through this screen would be discharged from the opening 44 back into the mill chamber and be reground.

The manner of securing the outer or fine screen to the screen frame, which I have herein shown and which I now prefer to use, is as follows. The outer faces of the bars 4 and 40 are provided with groves 46, extending lengthwise thereof, into which a screen is forced by means of strips 47, which are forced in place by means of a metal frame composed of angle bar sections 5. The angle bar for one of these frames consists of two pieces, one of the flanges being clipped so as to permit bending at the corner, and the other flange which engages with the edge surfaces of the frame members, is projected outward to form ears 50 which are joined as by a bolt 51. In addition, the angle iron frame may be secured by screws 52. The screens are secured in place on the drums by any suitable means. I have shown bars 53 as extending across the screen frame and provided with openings, which for convenience may be made as slots 54 in the ends thereof, which are adapted to receive clamping bolts 55. Any suitable means for securing the frames may be employed.

The screen openings and the material elevating flanges 11, are preferably placed in such relation that the flanges 11 lie fairly close beneath the screen opening upon the side of the drum which is moved upwardly as it turns. The direction of motion of the drum is indicated by the arrow in Fig. 1. The screen openings are also located so as to lie between the legs 22 by which the rings 2 are connected with the drum. These rings 2 serve not only as the support for the wear plates upon which the grinding bars 3 rest, but also as stiffening ribs for the drum.

The drum is provided with a neck 12 at each end, which neck has a flange 13 at its outer end, to which is secured a wheel tread 14, and this wheel tread turns upon wheels 15 which are mounted on fixed frame work. This leaves a central or axial opening at each end of the drum, through which material may be inserted and by which access may be had into the interior of the drum when desired.

Movement may be imparted to the drum by gear wheel, or sprocket wheel, or any other suitable manner. I have shown one of the necks 12 provided with a flange 16 to which is secured a rim section 17 of a sprocket wheel.

By providing a tank or tub 7 of suitable size, the lower portion of the drum, including the part wherein the grinding action is taking place, may be immersed in water and the mill thus run as a wet mill. If desired, the water may be dispensed with and dry grinding done.

Through the axial openings existing at the ends of the mill, a tube or feed chute 8 may be inserted. This may be provided with discharge openings 80 and the material to be ground may be fed through this tube. The feed of the material into and through this may be secured by any of the well known methods of advancing granular or dry material through a tube. Secured to this tube and extending upward at an angle at the upper portion of the drum is a deflecting plate 81, which will catch any material which has been carried well toward the top of the drum and deflect it back upon the upper portion of the pile of grinding rods 3.

By supporting the rings 2 which inclose the grinding rods 3, upon legs which are spaced inwardly from the shell of the drum, a considerable space is provided for the reception of the material being ground. Also, this makes it possible to utilize a large percentage of the surface of the drum for screens. It also makes it possible to provide elevating flanges, such as the flanges 11, which serve as elevators to carry the material up and deposit it upon the grinding bars. The device thus constitutes an efficient grinding mill of large capacity having elevating mechanism and screening devices, all in simple and compact form. The power required to turn it is not particularly great. The mill need not be made of very large size and yet will have a considerable capacity. It is evident that if additional screening capacity is desired, the number of screens may be increased over that herein shown.

The particular construction of screens employed prevents the great bulk of material being ground from contacting with the sep-

arating or outer screens. The coarse inner screens make a preliminary separation, passing nothing but the finer material to the outer screen and not too coarse to pass through the fine screen, are immediately returned and deposited upon the grinding bars to be further ground.

What I claim as my invention is:

1. In a grinding mill, in combination, a revolubly mounted drum having screens placed in the peripheral portions thereof, a plurality of coaxial, axially-spaced rings within said shell and spaced inward therefrom, and grinding bodies loosely supported within said rings.

2. In a grinding mill, in combination, a revolubly mounted drum having screens placed in the peripheral portions thereof, a plurality of coaxial, axially-spaced rings within said shell and spaced inward therefrom at all points, material elevating flanges projecting inward from the outer shell, and grinding bodies loosely supported within said rings.

3. In a grinding mill in combination, a revolubly mounted drum, material elevating flanges projecting inwardly from the peripheral shell of the drum, a plurality of bar-supporting runways coaxial with and spaced inward from the peripheral shell and grinding bars loosely retained within said runways.

4. In a grinding mill in combination, a revolubly mounted drum, material elevating flanges projecting inwardly from the peripheral shell of the drum, a plurality of bar-supporting runways coaxial with and spaced inward from the peripheral shell, grinding bars loosely retained within said runways, and screens on the periphery of the drum for removing the material as pulverized.

5. In a grinding mill, in combination, a revolubly mounted drum, a series of grinding bars extending lengthwise the drum and widely separated rings, said rings having their inner surfaces concentric with and spaced inwardly from the shell of the drum and serving as supporting runways for the grinding bars.

6. In a grinding mill, in combination, a revolubly mounted drum, grinding bars loose within said drum, trackways for said bars spaced inward from the shell of the drum, material elevating vanes extending from the shell of the drum inwardly and a deflecting plate within the drum and extending over the central zone thereof to direct the material deposited thereon back upon the grinding bars.

7. In a grinding mill, in combination, a revolubly mounted drum, grinding bars loose within said drum, trackways for said bars spaced inward from the shell of the drum, material elevating devices carried by the shell of the drum, fixed feed conduit adjacent the axis of the drum and a deflecting plate supported within the drum in transversely inclined position above said feed conduit and adapted to deflect back upon the grinding bars material deposited thereon by the material elevating means.

8. In a grinding mill, in combination, a revolubly mounted drum, a series of grinding bars extending lengthwise the drum and a plurality of widely separated trackway rings extending peripherally within and turning with the drum, the inner surfaces of said rings constituting means for supporting the grinding bars inward from the shell of the drum, and screens located in the peripheral shell of the drum.

Signed at Seattle, Washington, this 23rd day of October, 1916.

JOHN W. COVER.