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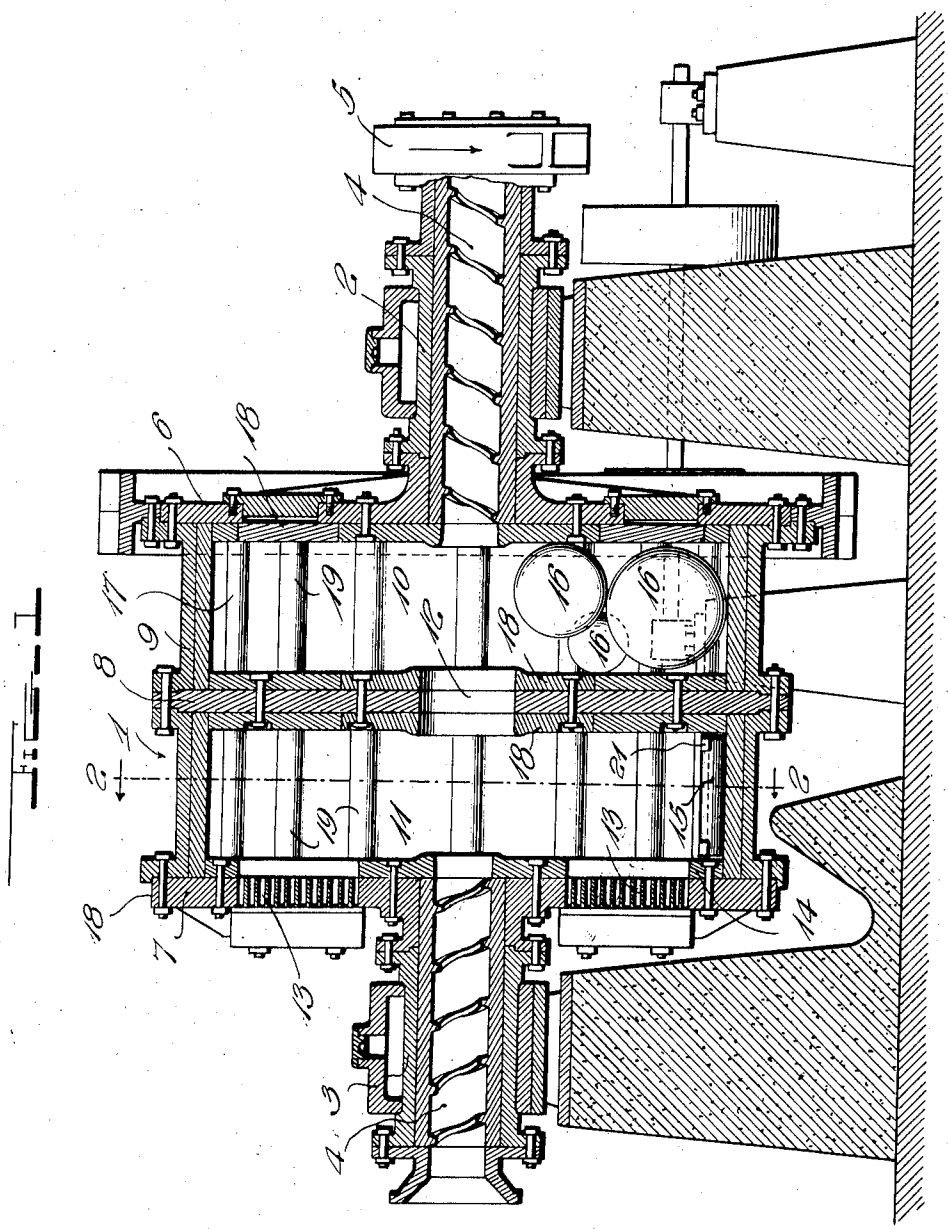
TWO COMPARTMENT BALL MILL.

APPLICATION FILED APR. 24, 1919.

1,335,269.

Patented Mar. 30, 1920.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

FIG. 2

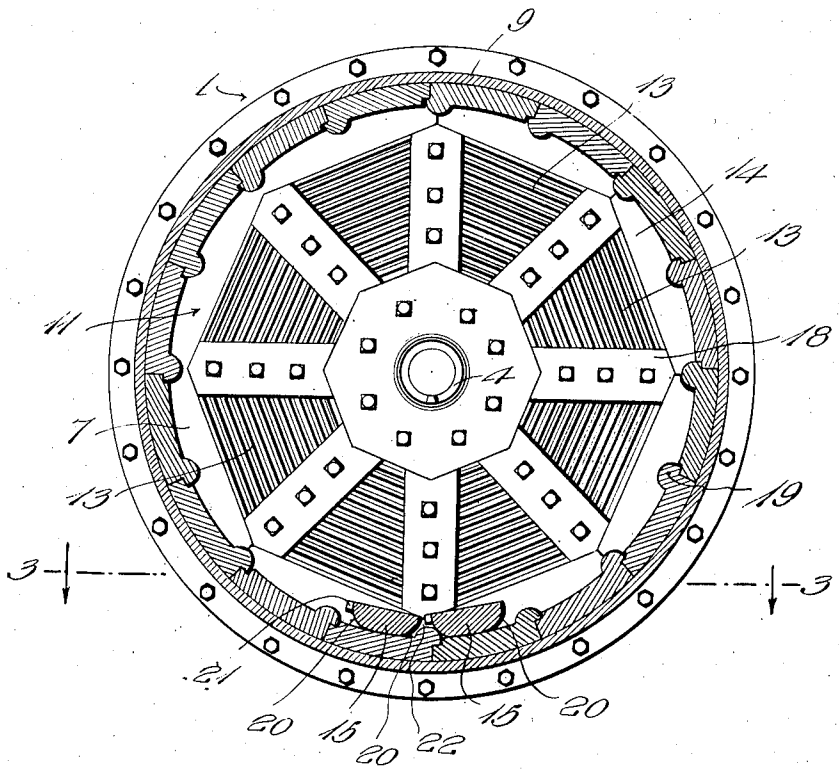
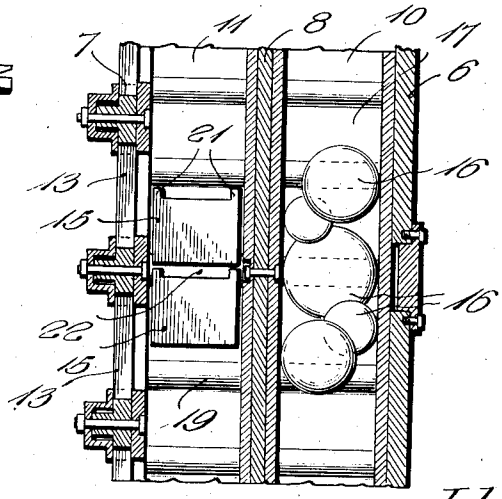


FIG. 3



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UNITED STATES PATENT OFFICE.

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TWO-COMPARTMENT BALL-MILL.

1,335,269. Specification of Letters Patent. Patented Mar. 30, 1920.

Application filed April 24, 1919. Serial No. 292,342.

To all whom it may concern:

Be it known that I, JOHN R. BALL, a citizen of the United States, residing at Durango, in the county of La Plata and State of Colorado, have invented certain new and useful Improvements in Two-Compartment Ball-Mills; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of ore grinding mills commonly known as ball mills. Heretofore, it has been common practice to provide a rotating cylinder divided by perforate partitions into a number of grinding compartments, the ore being ground by balls to a predetermined degree of fineness in each compartment and then discharged into the next, until it finally reaches the outlet.

The fact that balls are used in the final grinding compartment as well as in the others, and the particles of ore may freely fall through the spaces between the balls without being crushed to any appreciable extent by the latter, necessitates slow operation, and the principal object of my invention is, therefore, to provide sliding, gravity-operated mullers in the final grinding compartment to overcome this difficulty, and since these mullers produce a splashing action, the pulverized ore is washed through the screens instead of being forced therethrough by pressure, with the result that the life of the screen is greatly increased. In this connection, a still further object is to terminate the discharge screen in spaced relation with the wall of the rotating cylinder so that the end portion of the end wall which carries said screen forms a rim around the latter, the mullers being of less vertical thickness than the radial width of such rim, so that they do not wear upon the screen.

With the foregoing objects in view, the invention resides in the novel construction and association of parts hereinafter fully described and claimed, the descriptive matter being supplemented by the accompanying drawings which form a part of this application.

Figure 1 is a vertical longitudinal section of a mill constructed in accordance with my invention.

Fig. 2 is a vertical transverse section on the plane indicated by the line 2—2 of Fig. 1.

Fig. 3 is a detail horizontal section on the plane of line 3—3 of Fig. 2.

In the drawings above briefly described, the numeral 1 designates a horizontal grinding cylinder rotatably mounted on trunnions 2 and 3, both of which are of tubular formation and are provided with helical internal conveyers 4. The trunnion 2 is provided with a spiral collecting head 5 and ordinarily ore is fed to the machine through said head and trunnion, but if such ore is sufficiently fine not to require preliminary grinding, it may be well to feed to the final grinding chamber by way of the trunnion 3. Preferably located centrally between the two end walls 6 and 7 of the cylinder 1 is a flat transverse partition 8 of circular formation with its peripheral edge suitably secured to the peripheral wall 9 of the cylinder, said partition dividing the cylinder into a preliminary grinding chamber 10 and a final grinding chamber 11. The trunnion 2 discharges into the chamber 10 and by means of a single central opening 12 in the partition 8, the two compartments 10 and 11 are placed in communication. The end wall 7 which forms one of the side walls of the final grinding chamber 11 is provided with a discharge screen 13 preferably formed of a number of sections suitably secured in place. The particular form of screen does not affect the present invention, is protected by a prior application, and need not, therefore, be described in detail. It may be set forth, however, that the screen terminates in spaced relation with the wall 9 so that the peripheral portion of the wall 7 forms a rim 14 around said screen, as is seen most clearly in Fig. 2, this rim serving to prevent the mullers 15 in the final grinding chamber 11 from wearing against the screen, since said mullers are of less vertical thickness than the radial width of the rim.

Crushing balls 16 are provided in the preliminary grinding chamber 10 for initially grinding the ore as it is discharged into such compartment from the trunnion 2, and in order to prevent these balls and the mullers 15 from wearing the permanent parts of the mill, the wall 9 is provided with a ribbed lining 17 and the partition 8 and the ends of the cylinder are lined at 18. The particular form of lining does not affect

the present invention and is protected by a prior application; it, of course, being understood that any adequate form of lining may well be used, but it is preferable that ribs 19 be provided thereon for coöperation with the balls and mullers.

The mullers 15 are preferably in the form of substantially flat rectangular blocks with their edges rounded at 20 for easy passage over the ribs 19, one edge of each muller being provided with two or more projecting lugs 21. These lugs space the several mullers apart to provide gaps 22 through which the ore may pass. As shown, the mullers are substantially equal in width to the compartment 11 so that they cannot be displaced therein, but must slide, as intended, in a circumferential direction.

In operation, the ore-laden slime is fed to the preliminary grinding chamber 10 by means of the hollow trunnion 2 or any other inlet which may be provided for this purpose, and the ore is initially ground by the balls 16, the ground ore rising toward the surface of the slime and passing freely through the single discharge opening 12 into the final grinding compartment 11. In this compartment, the mullers 15 operate upon the ore and reduce it to the required degree of fineness, and since these mullers will move bodily with the cylinder 1 until they slide down the cylinder wall by gravity, they produce a splashing action in the slime which washes the ground ore through the screen 13 instead of forcing it therethrough by pressure, as occurs when using balls in the final grinding compartment wear upon the screen is thus prevented, which would otherwise take place not only by forcing the ore therethrough, but by the action of the balls against said screen. Since the mullers 15 contact against the rim 14 and not against the screen, there is no danger of wearing the latter and consequently its life is greatly lengthened. In addition to the above mentioned advantages for the mullers 15, they grind the ore more effectively than the ordinary balls commonly used in the final grinding chamber.

From the foregoing taken in connection with the accompanying drawings, it will be seen that although the improved mill is of comparatively simple and inexpensive nature, it will be highly efficient and desirable and will overcome difficulties heretofore experienced, being much more rapid in operation and less subject to over feeding, due to the provision of the central opening 12 in the partition 8 which allows the free discharge of the ground material from the preliminary into the final grinding chamber, and the mullers 15.

Since probably the best results are obtained from the details disclosed, they may well be followed, but within the scope of the invention as claimed minor changes may well be made and screens of any required form or mesh may be used. Also, it will be understood that the machine may be used not only for grinding ores, but for cement and numerous other materials, and it has been found that grinding may be done to an unusual degree of fineness.

I claim:

1. In a mill of the type described, a rotary grinding chamber mounted on a horizontal axis, said chamber being provided at one end with an ore inlet and at its opposite end with an outlet screen for the pulverized ore, gravity-operated, freely sliding mullers in said grinding chamber, said mullers operating on the peripheral wall of said grinding chamber and each occupying substantially the full width of said wall, said mullers being capable of independent movement, and means carried by one muller to abut the next muller and form an intervening space when the two come together.

2. In a mill of the class described, a rotary cylinder mounted on a horizonal axis and provided with ore inlet and discharge means, and a pair of freely sliding mullers in said cylinder operating against the peripheral wall thereof and capable of independent movement, one of said mullers having projecting lugs rigidly carried thereby to abut the other muller and form an intervening space when the two come together.

In testimony whereof I have hereunto set my hand.

JOHN R. BALL.