

D. J. VELCHEFF
BALL MILL DISCHARGE TROMMEL

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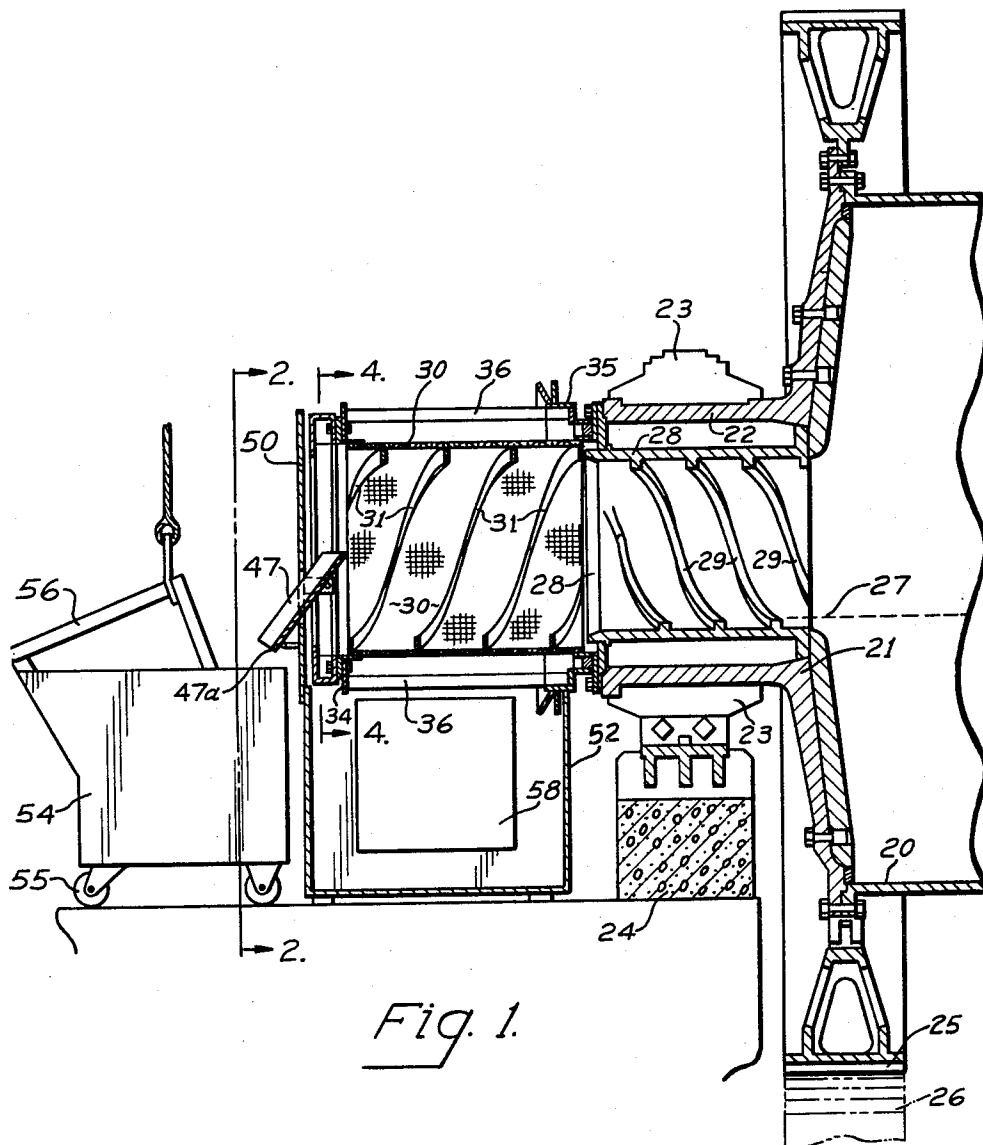


Fig. 1.

INVENTOR
DONALD J. VELCHEFF

BY
Meyer, Baldwin, Doran & Egan
ATTORNEYS.

April 27, 1965

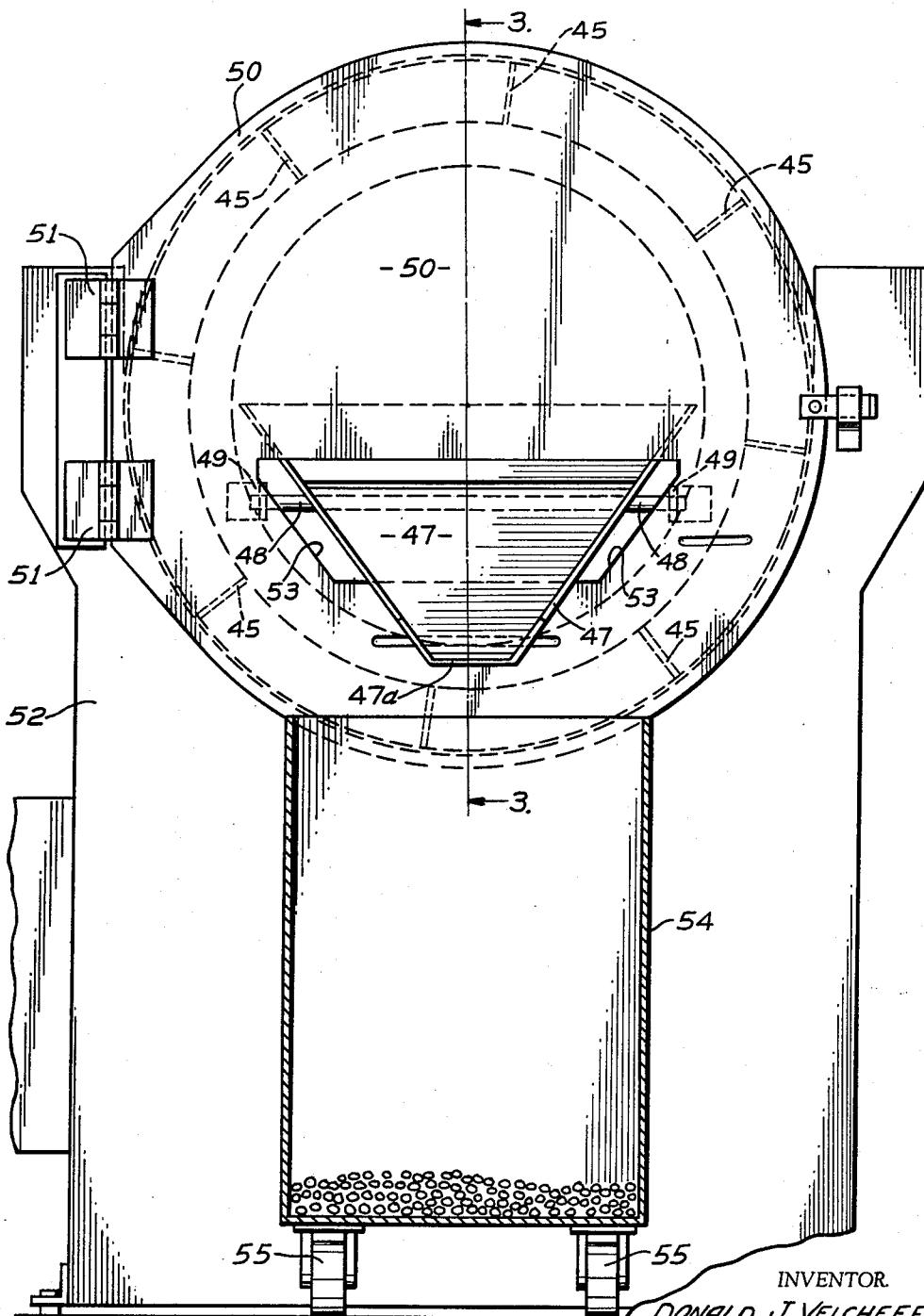
D. J. VELCHEFF

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BALL MILL DISCHARGE TROMMEL

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4 Sheets-Sheet 2



INVENTOR

DONALD J. VELCHEFF

BY

Fig. 2. *Meyer, Baldwin, Doran & Egan*

ATTORNEYS.

April 27, 1965

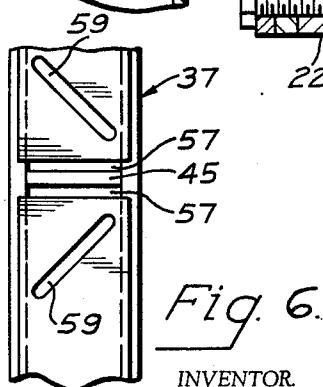
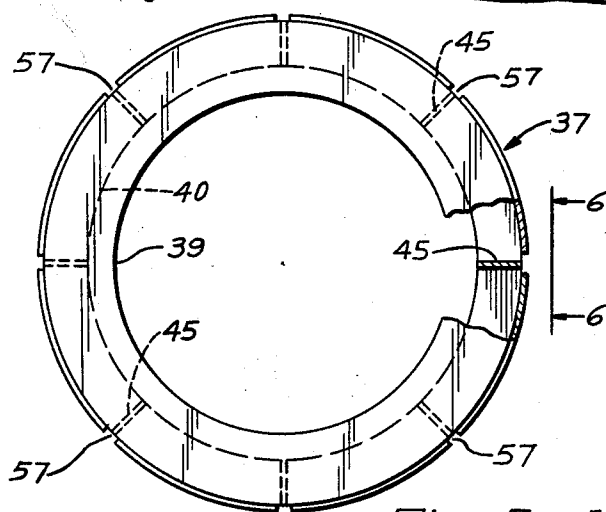
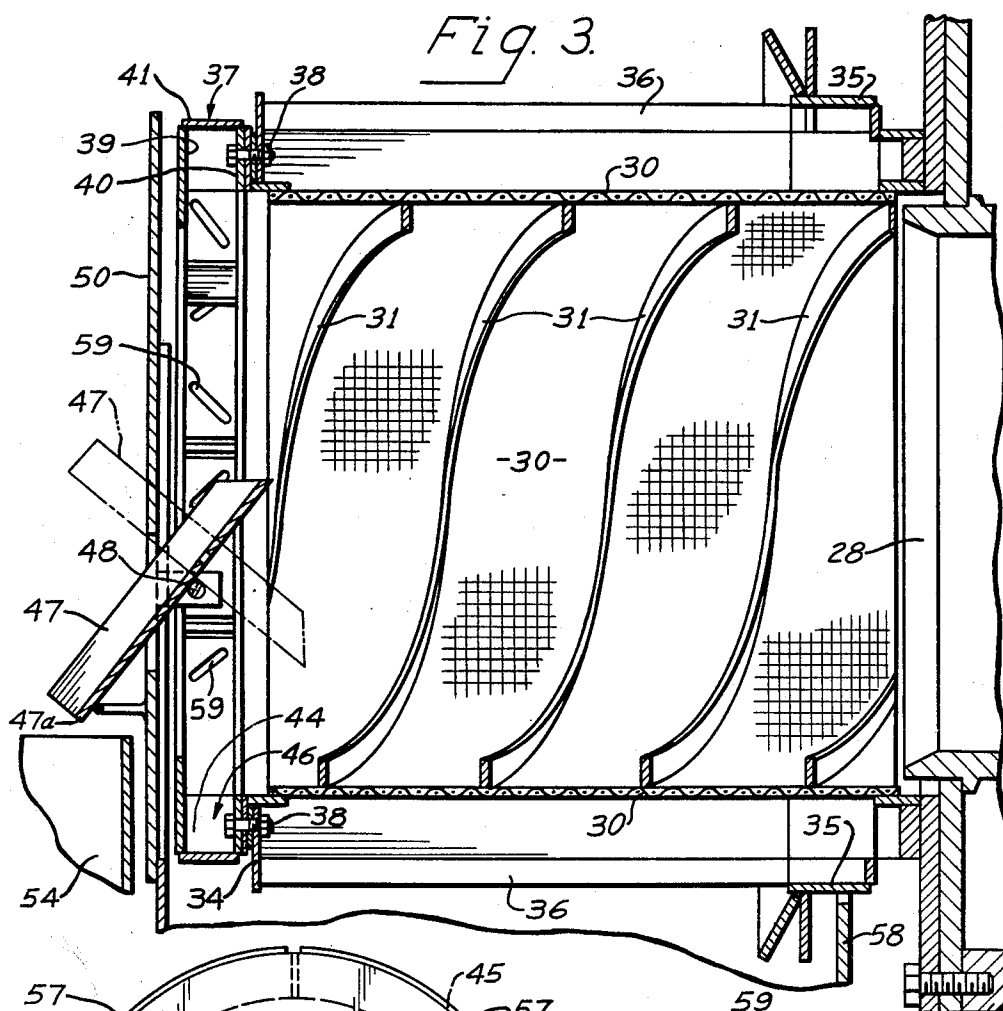
D. J. VELCHEFF

3,180,581

BALL MILL DISCHARGE TROMMEL

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INVENTOR.

DONALD J. VELCHEFF

BY

BY
Meyer, Baldwin, Doran & Egan
ATTORNEYS.

ATTORNEYS.

April 27, 1965

D. J. VELCHEFF

3,180,581

BALL MILL DISCHARGE TROMMEL

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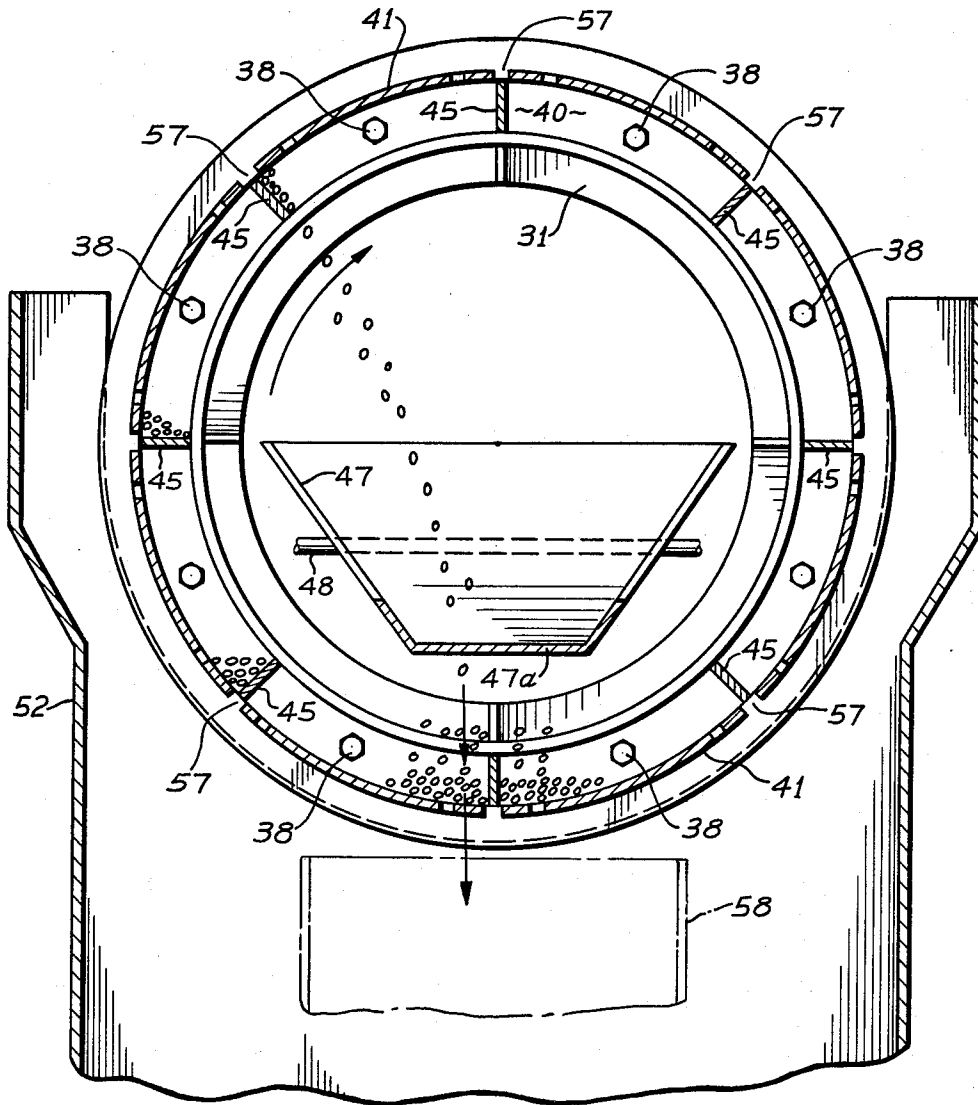


Fig. 4.

INVENTOR

DONALD J. VELCHEFF

BY

Mayer, Baldwin, Doan & Egan
ATTORNEYS.

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3,180,581

BALL MILL DISCHARGE TROMMEL

Donald J. Velcheff, Silver Bay, Minn., assignor to Reserve Mining Company, Silver Bay, Minn., a corporation of Minnesota

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3 Claims. (Cl. 241-79)

The invention relates to grinding mills, such as ball mills or the like, and more particularly relates to novel and improved means for automatically intercepting and removing the oversize product at the discharge end of such mill. Merely as an example, the invention will be described in its application to the grinding of ore in any one of several steps, in each step of which there is utilized a ball mill equipped with my improved oversize discharge interceptor.

In a ball mill, for example, the previously crushed ore, within a preferred size range, is tumbled with hardened steel balls, the ore being introduced at a charging end and being caused to progress towards a discharge end. At said discharge end the damp material is moved through a rotating, cylindrical trommel screen through which screen the properly sized ground product falls on a conveyor or through a conduit, ready for the next comminution step. The still oversize lumps which are too large to fall through the trommel screen openings, are moved to an end opening, where, in the normal practice in the art, they fall into a box or bin. This receptacle must be kept from overflowing, and it has been customary for the ball mill operator to periodically shovel the oversize lumps into a cart which is later emptied into a return conveyor to the same or a similar mill for recirculation through the grinding circuit.

A mill operator usually controls the slurry density in known manner, but it requires fairly constant observation, and attention, to control certain effective factors, and any time spent in clearing the oversize permits a possible unobserved or uncontrolled variation in one or other of the aforesaid factors, so that it is most desirable to devise means for automatically clearing the oversize from the discharge trommel without requiring any attention from the mill operator. In this way a single operator has more time for his function of controlling the uniformity of the slurry density and he can more efficiently maintain a check on a plurality of mills.

An object of the present invention, therefore, is to automatically clear the oversized lumps of ore at the grinding mill discharge end, and direct them into receptacles of larger than usual capacity, which receptacles are adapted to be readily removed while being replaced by similar units.

Other objects and advantages will be apparent from a study of the following specification, in conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical sectional view taken axially through the discharge end of a ball mill.

FIG. 2 is a vertical sectional view taken on the line 2-2 of FIG. 1.

FIG. 3 is a sectional view of a portion of FIG. 1, but somewhat enlarged.

FIG. 4 is a sectional view taken on the line 4-4 of FIG. 1.

FIG. 5 is an elevational view of my improved pickup trommel ring with part of the front flange broken away to reveal internal structure.

FIG. 6 is a fragmentary side edge view of the trommel ring as it would be seen from the position of the line 6-6 of FIG. 5.

The embodiment of the invention shown in the drawings comprises pick-up and discharge means affixed on the left end of a ball mill 20, the discharge end of which

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is shown in FIGS. 1 and 3. The ball mill is the usual generally cylindrical drum having an end wall 21 provided with an axially extending hub 22 rotatable in bearings 23 on a base 24. Similar bearing and support means are provided for the charging end (not shown) of the mill. The mill has a large ring gear 25 which is in mesh with a driving pinion 26 for rotating the mill assembly. The gears, pinions, motors, gear reduction devices, etc., used for driving purposes are conventional and need not be here shown.

The tumbling slurry, at a level at least as high as the dotted line 27 in FIG. 1 flows into and through the discharge neck 28 which is provided with an internal helical flange 29.

The slurry flows through neck 28 and into a cylindrical trommel screen 30 which likewise is provided with a helical internal flange 31.

The trommel screen 30 is supported within a cage consisting of end rings 34 and 35 which are connected by struts 36. The trommel screen 30, the end rings 34 and 35, the neck 28 and the hub 22 are all attached to the grinding mill, and rotate therewith. It will be noted that the respective helices 29 and 31 are oppositely inclined, for the following reason. The rotation of the mill is in such direction that the helix 29 opposes any tendency of the upper level balls in the mill to escape through neck 28, without opposing gravity flow of slurry. The helix 31 assists gravity flow of the slurry through the trommel, permitting the undersize to fall through.

Supported on the discharge end of the cage is an elevating ring or annulus 37 which is attached to end ring 34 by bolts 38. It has two radially extending parallel wall flanges 39 and 40 connected by an outer peripheral wall 41, to thereby afford a radially inwardly opening channel 44. This channel is interrupted at spaced points by partitions 45, best seen in FIG. 5, connected to the opposite walls 39 and 40. It can be noted that any oversize lumps carried through the trommel 30 will drop into the annulus 37 as indicated by the arrow 46 (lower left of FIG. 3) and since the annulus is rotating with the mill, the partitions 45 will carry the lumps upwardly (FIG. 4) until they have reached the critical height to cause them to drop by gravity out of the annulus, hereinafter termed an elevator ring. As they drop they are intercepted by a spout shaped chute 47 which is pivotally carried on a pintle or rod 48 which is rotatable in end brackets 49. The brackets are mounted on a cover 50 swingable on hinges 51 carried on the machine frame 52 (FIG. 2) and the chute has a discharge tip end 47a extending outwardly through an opening 53 (FIG. 2) in the cover. The chute directs the oversize lumps into a cart 54 (FIGS. 1 and 2) which is movable on casters 55 but which may also be removed by means of an overhead crane (not shown) which picks up the cart by means of a bail 56.

In order to permit the mill to continue to run for a brief period while a full cart is being replaced by an empty one, the chute 47 can be flipped to the dotted line position in FIG. 3, whereupon the oversize lumps will be directed inwardly into the trommel. This expedient need be resorted to only for a brief period, and it prevents the oversize material from being discharged onto the floor.

The elevator ring 37 is provided with slots 57 in its peripheral wall to allow seepage of excess water into the mill discharge outlet which is shown at 58 in FIG. 1 and which need not be more fully described. The normal mill output which falls through the trommel screen 30 also passes out through the discharge outlet 58.

The peripheral wall of the elevator ring is shown as being provided with slots 59 (FIG. 6) although this is optional.

From a consideration of the structure described herein

it is apparent that interception and removal of over-sized fragments of the work load proceed automatically until the cart 54 is filled, at which time another cart may be substituted immediately. The elevator ring and chute interceptor eliminate laborious clearing of the hitherto customary catch boxes and leaves the operator free to observe and control the mill operation, with particular attention to the slurry density leaving by the mill outlet.

The ring or annulus 37 may be considered as of U-shaped or channeled sectional contour, having a circumferential outer wall 41 and two opposed parallel side walls 39 and 40. The partitions 45 which form weirs or partitions across the inwardly opening channel carry the material upwardly as the annulus rotates, as hereinabove previously described.

What is claimed is:

1. Rotatable grinding mill discharge means including a cylindrical trommel having a discharge end opening towards which a slurried ground agglomerate is advanced as the mill and trommel rotate, said trommel having screen wall means through which under-sized material falls and upon which oversized material is advanced to said discharge end, a channeled annulus fixed at said discharge end opening, and rotating with said trommel and having a circumferential outer wall, and two opposed parallel side walls extending radially inwardly part way to the axis of rotation to leave a central opening in registry with the trommel discharge opening, a plurality of partitions spaced around the channel, each partition being disposed transversely across the channel whereby, when the annulus rotates, oversized material moving from the trommel into the annulus is carried around and upwardly by said partitions as each partition successively moves upwardly and then inclines inwardly beyond the horizontal, and a chute in fixed position within the trommel central opening, and in the general vertical plane of the trommel, so as to intercept such dropping material and guide it outwardly and downwardly beyond said plane of the annulus, said chute being pivotally mounted to permit reversal of its position whereby to return oversized material into the trommel.

2. Rotatable grinding mill discharge means including a

cylindrical trommel having a discharge end opening towards which a slurried ground agglomerate is advanced as the mill and trommel rotate, said mill having a discharge neck axially aligned with and connected to said trommel, said trommel having internal helical flanges extending inwardly from its inner wall surface and tending to direct material towards its discharge end, said discharge neck also having internal helical flanges running in a direction counter to that of the flanges in the trommel, said flanges in the discharge neck extending inwardly from its inner wall surface and tending to restrain escape of grinding elements from the grinding mill, a channeled annulus fixed at said discharge end opening, and rotating with said trommel and having a circumferential outer wall, and two opposed parallel side walls extending radially inwardly part way to the axis of rotation to leave a central opening in registry with the trommel discharge opening, a plurality of partitions spaced around the channel, each partition being disposed transversely across the channel whereby, when the annulus rotates, oversized material moving from the trommel into the annulus is carried around and upwardly by said partitions as each partition successively moves upwardly and then inclines inwardly beyond the horizontal, and a chute in fixed position within the trommel central opening, and in the general vertical plane of the trommel, so as to intercept such dropping material and guide it outwardly and downwardly beyond said plane of the annulus.

3. Apparatus as defined in claim 2 wherein said chute is pivotally mounted to permit reversal of its position whereby to return oversized material into the trommel as desired.

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J. SPENCER OVERHOLSER, *Primary Examiner*.