Oct. 13, 1931. N. RANSOHOFF 1,826,822

TUMBLING MILL

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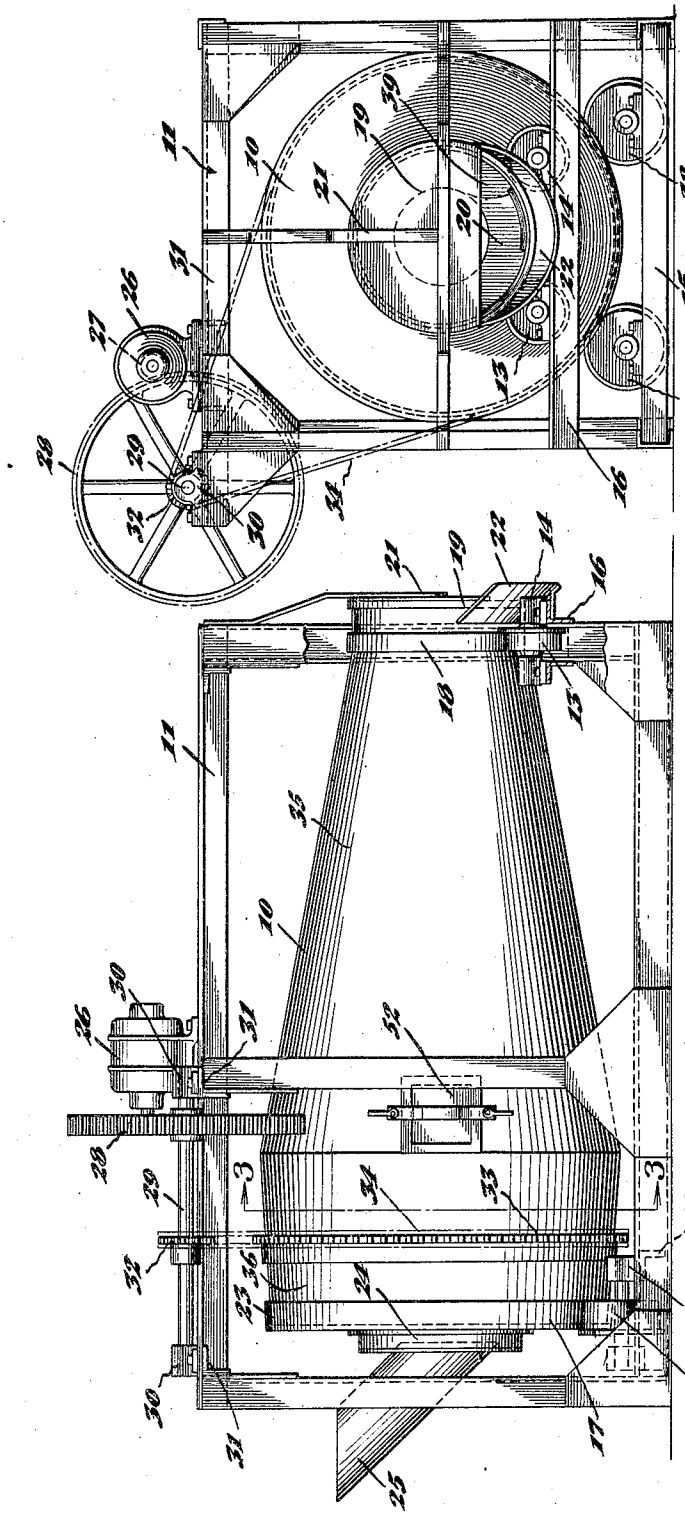


Fig. 2.

Fig. 1.

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TUMBLING MILL

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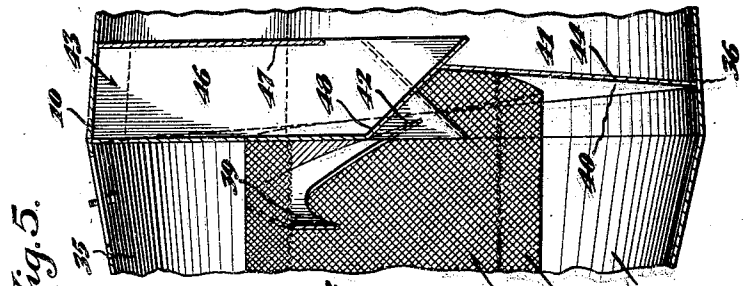


Fig. 5.

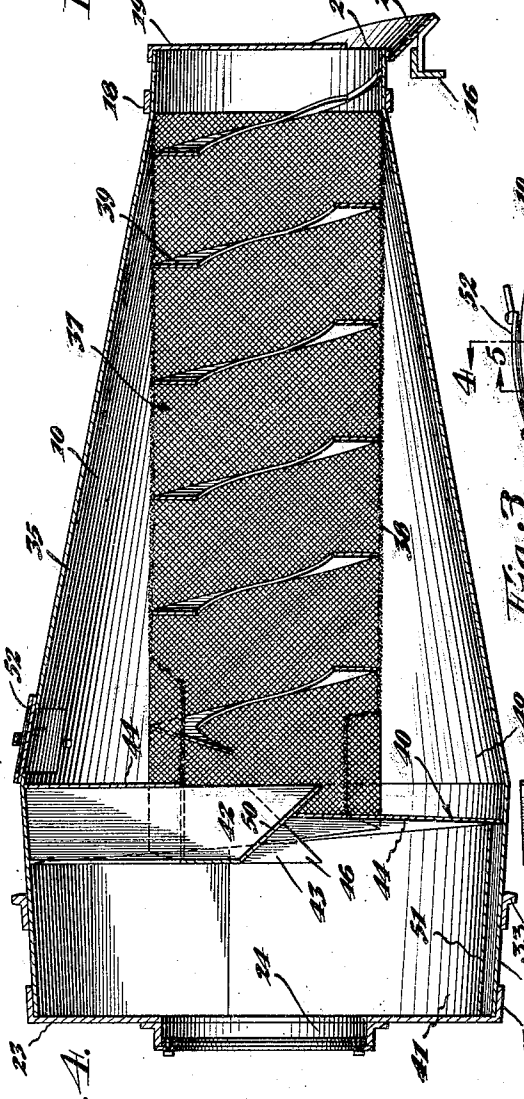


Fig. 4.

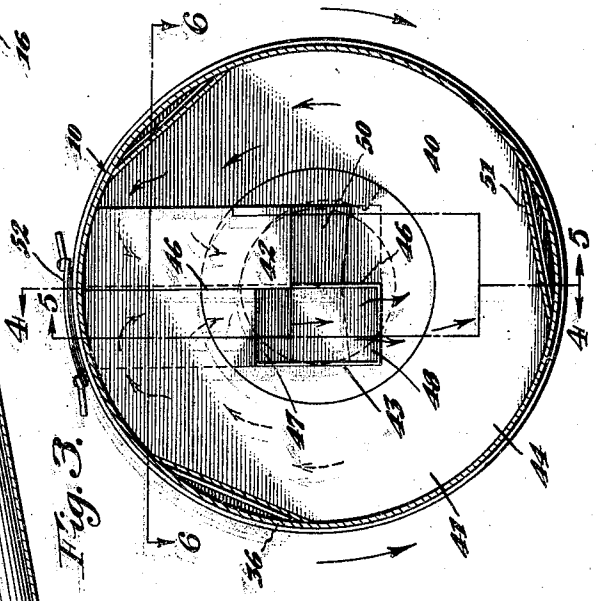


Fig. 3.

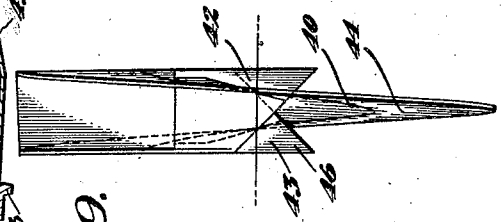


Fig. 9.

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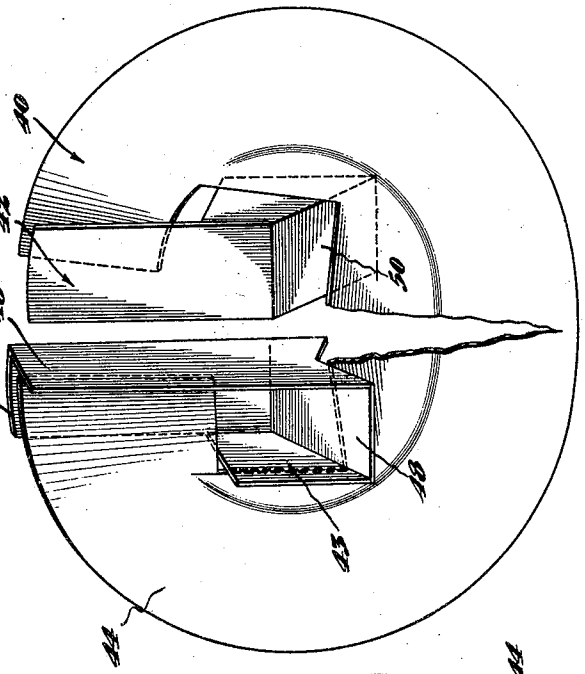
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TUMBLING MILL

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Fig. 8.



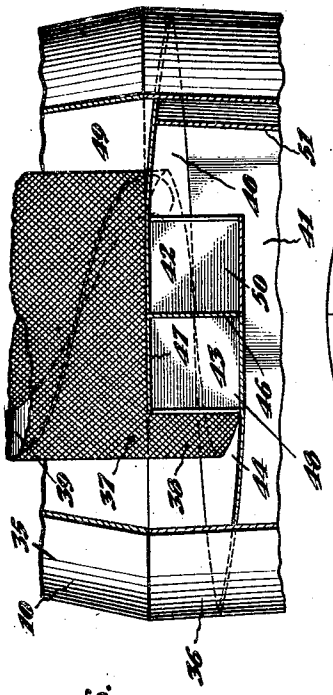


Fig. 6.

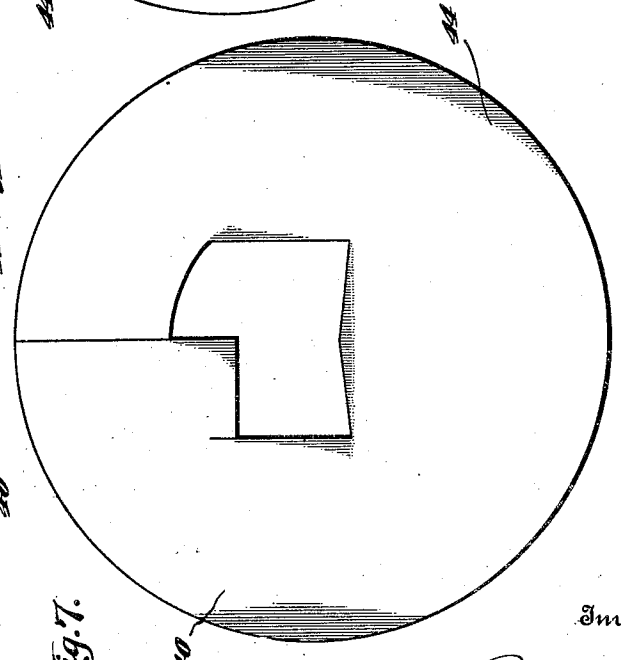


Fig. 7.

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Patented Oct. 13, 1931 1,826,822

UNITED STATES PATENT OFFICE

NATHAN RANSOHOFF, OF CINCINNATI, OHIO

TUMBLING MILL

Application filed October 23, 1928. Serial No. 314,481.

The invention relates to improvements in tumbling mills, and provides for the use of a cleaning or polishing material or abrading elements in a tumbling chamber, which, with the product, as casting to be cleaned, are discharged from the chamber as a mass into a revolving screen within the mill screening the cleaning or abrading material from the castings for returning the cleaning material to the tumbling chamber.

The invention is particularly directed to a mill providing a tumbling or cleaning chamber and an enclosed cylindrical conveyer screen extending from one side of the tumbling chamber for receiving the contents of the tumbling chamber. The enclosure for the screen provides a drum, collecting the screenings for return into the tumbling chamber. The contents of the tumbling chamber is discharged into the revolving screen and the screenings from the collecting drum into the tumbling chamber through chute devices intermediate the tumbling chamber and the screen with its collecting drum, the parts all combined and rotative as a unit, with the tumbler contents discharge, and screening recharge controlled by relative reverse mill rotation.

An object of the invention is to provide a tumbling mill with a tumbling chamber and a cylindrical conveyer screen housed by a collecting drum, the tumbling chamber and the screen with its collecting drum combined and revolving as a unit and relatively arranged, adapting the contents of the tumbling chamber to be discharged into the screen, and the screenings, as an abrading or cleaning material, collected in the drum for subsequent return into the tubular chamber for reuse. The contents of the tumbling chamber can be agitated and retained therein for a definite or desired period and discharged at will, preferably by a change in direction of mill rotation.

Another object is to provide a hopper or chute between the cleaning chamber and the discharge cylinder which receives the casting elevated by rotation of the tumbling chamber for discharging them from the tumbling chamber of large diameter into a concentrically related discharge cylinder of smaller diameter.

The invention further contemplates the use of chutes or hoppers between the cleaning and discharge ends of the barrel which enable the operator to tumble the castings as long as desired in the tumbling chamber by rotation in one direction, and to then reverse the direction of barrel rotation to discharge the castings. The respective chutes are designed to function in opposite directions of rotation, one providing for the discharge of the castings and the other providing for the return of the cleaning elements separated from the castings being discharged.

It is therefore another object of this invention to provide a tumbling mill in which the tumbling can be maintained for selected periods, and thereafter, the contents of the cleaning chamber discharged with the separation of products cleaned from the cleaning material, and the cleaning materials automatically returned to the cleaning chamber,

Another object is to provide a double ported partition construction between the cleaning chamber and the discharge chamber which permits immediate return of the cleaning elements into the cleaning chamber and retention of the castings in the cleaning chamber upon rotation in one direction, and which permits a quick discharge of the jacks and cleaned castings into the jack separating and casting discharge chamber upon reversal of barrel rotation.

Another object is to provide a discharge conveying tube leading from the cleaning chamber of a tumbling mill which separates the small cleaning elements and tailings from the cleaned castings as the castings are being moved to a point for discharge from the mill.

Another object is to provide a tumbling barrel incorporating the passageways and chamber arrangement herein described as a solid unitary rotatable structure in which there are no relatively movable parts, the element transforming functions set forth being controlled by changing direction of barrel rotation.

Other objects and certain advantages relate to the general fabrication and construction of

the mill and will be apparent from the description of the accompanying drawings forming a part of this specification, in which:

Figure 1 is a side elevation of a complete tumbling mill.

Figure 2 is a view of the discharge end thereof.

Figure 3 is a sectional view taken on line 3—3, Fig. 1, looking toward the ported partition between the tumbling chamber and the separating or product discharge chamber.

Figure 4 is a sectional view taken on line 4—4, Fig. 3, illustrating the tumbling chamber, the casting discharge tube, the jack or cleaning element return tube, and the partition between the tumbling chamber and the discharge and return tubes, the view being taken through the casting discharge port in the partition leading into the discharge tube.

Figure 5 is a fragmentary sectional view taken on line 5—5, Fig. 3, through the cleaning element return port in the partition.

Figure 6 is a sectional view taken on line 6—6, Fig. 3, showing the arrangement of the port elements relative to the spiral ring forming the partition.

Figure 7 is a front view of the spiral ring or disk constituting the partition.

Figure 8 is an exploded view illustrating the hopper-like port elements and the partition.

Figure 9 is a side elevation of the partition removed from the mill.

As disclosed in the drawings, the cylindrical tumbling barrel 10 of the mill is rotatably mounted within a rectangular framework 11 of skeleton form, fabricated of structural iron. The respective ends of the barrel are cradled or mounted for rotation on pairs of spaced flanged rollers, a pair of forwardly disposed rollers indicated at 12 and a rear pair indicated at 13. The shafts of these rollers are journaled in bearings 14 mounted on cross rails, a forward pair of cross rails 15 and a rear pair 16.

Each pair of rails 15 and 16 is spaced apart longitudinally and horizontally, with the respective rollers disposed therebetween, and the bearings 14 on the cross rails at each side of the respective rollers for mounting the roller shafts.

The flanges of the rollers are outwardly disposed and the roller surfaces are in engagement with hoops 17 and 18 formed of strap iron, front and rear respectively, these hoops being secured around the cylindrical barrel. The forward hoop is constituted by the flange of a barrel end closure cap 23. The outwardly disposed flanges of the rollers engage respective hoop edges and maintain the barrel against longitudinal displacement.

The rear end of the barrel terminates in a straight portion presenting a plain open end. A closure for this end is provided being secured to the frame with the barrel rotating relative thereto. This closure means at the discharge end comprises a cap 19 fitting over the end of the barrel and having the lower portion of its face cut away providing a casting discharge opening 20. The cap is secured to the frame by means of a T-shaped strap 21 attached to the cap and the frame. The cap is thus disposed in a stationary relation relative to the rotating tumbling barrel, the flange of the cap encompassing the plain rotating cylinder rear edge. A chute 22 is secured to the rearmost cross rail 16 relative to the discharge opening for properly directing the discharge from the barrel.

The intake end of the barrel is closed by means of the cap 23 attached to and rotative with the barrel, having a concentric intake opening 24 therein. A feed hopper 25 is suitably secured to the frame and disposed in the intake opening.

The power for rotating the barrel is derived from a motor 26 mounted on the frame, its pinion 27 driving a large gear 28 mounted on a horizontally disposed shaft 29 journaled longitudinally of the frame in bearings 30 secured to the top cross rails 31 of the frame. A sprocket gear 32 is secured to the shaft 29, and a ring gear 33 is secured about the barrel adjacent the sprocket gear 32, these gears being in driving connection through a sprocket chain 34. The motor 26 is of the reversible type for the purposes of imparting rotation to the barrel in either direction.

The barrel is conical in both directions, one conical portion 35 decreasing toward the discharge end and the other 36 toward the intake end. A straight tube 37 made up of wire mesh 38, formed about a spiral conveyor 39, is rotatably secured with the barrel throughout the length of the long conical portion 35. This tube 37 is supported at its rear end in the straight rear portion of the barrel and at its forward end is attached to a partition 40. The partition 40 is provided between the respective oppositely inclined conical portions and provides a large tumbling chamber 41 toward the forward end of the straight tube, this chamber defined by the extent of the conical portion 36. The tumbling chamber may be a straight tube provided with longitudinal wedge strips inclined toward the discharge end thereof. The partition 39 is provided with a pair of port chutes, respectively casting discharge 42 and cleaning element intake 43.

The body of the partition is formed by a split spiral ring 44, (see Figures 7 and 8), this ring having its outer edge secured to the interior wall of the barrel by any suitable means such as welding. The pair of chutes 42 and 43 respectively, casting discharge and cleaning element return are secured to the ring in the following arrange-

ment by any conventional means such as welding. The chutes are vertically mounted at each side of the split in the ring having their abutting sides disposed on a center line of the ring coincident with the split therein. The chutes may vary in size, as a large casting discharge chute and a small jack return chute.

The return chute provides a side wall 46 and a back 47, the back being disposed on the side of the ring toward the separating chamber. A split end of the ring is secured to the upper portion of the forward edge of the side wall and the lower end of the chute protrudes through the central opening of the ring toward the tumbling chamber side thereof, the floor 48 of the chute being inclined in this direction.

When the barrel is rotated in an anti-clockwise direction (see Figure 8) the cleaning elements, being toward the lower end of the conical separating chamber 49 and against the ring, dropped by gravity upon rotation through the space between the rear side of the chute and the ring and upon continued rotation are acted upon by gravity to the extent of being directed laterally through the base end of the chute into the tumbling chamber.

The casting discharge chute is of the same formation as the cleaning element return chute except that the side wall of the return chute forms the side wall of the casting discharge chute. The relation of this casting discharge chute, however, is in reverse direction, the base end 50 thereof extending through the center opening of the ring and being disposed toward the rear of the barrel or into the end of the discharge cylinder. The central opening of the ring is suitably cut to fit snugly around the hoppers and to be welded thereto.

Rotation of the barrel in the clockwise direction (see Figure 8) causes the castings and cleaning elements within the tumbling chamber to fall by gravity into the discharge chute and thence into the discharge cylinder. The action of the elements in either direction of barrel rotation is to be directed by gravity to a position at one side of the ring and from this position in the base of the barrel to be moved by gravity and directed by a respective chute toward the center of the ring and outwardly therethrough to the other side of the ring.

The general operation of the mill is as follows:

The operator introduces the castings into the cleaning chamber through the hopper at the forward end of the machine, the cleaning elements being disposed therein. The barrel is then rotated in an anti-clockwise direction as viewed from the forward end of the barrel until the castings have been suitably cleaned by contact with the cleaning elements. Any cleaning element which may have been left in the separating chamber will have been reintroduced into the tumbling chamber through the before-described chute which functions in this direction of rotation.

As the cleaning operation has been completed the power is reversed with the result that the castings and cleaning elements are scooped into the discharge chute and deposited within the forward end of the discharge cylinder, the center of this cylinder being coincidental with the center of the ring and with the barrel.

At this time the castings and cleaning elements move along the discharge cylinder, this movement being induced by rotation of the spiral with the result that the cleaning elements are sifted through the screen wall of the cylinder and drop down into the conical separating chamber. The castings are conveyed to the extreme end of the barrel and discharged through the discharge opening. Due to the taper of the cone of the barrel, the cleaning elements move to a zone adjacent the ring and immediately upon a cleaning rotation of the barrel are returned to the cleaning or tumbling chamber.

An arrangement and use of the present mechanisms is intended to be applicable to those instances in which very little cleaning is necessary and there is no need to tumble a batch of castings over a definite long period. The operator feeds the castings into the device in a continuous stream with the barrel rotating in a clockwise direction, in which direction the discharge chute of the present conception will be functioning to permit passage of the castings into the casting discharge and cleaning element separating cylinder.

In order to further actuate the elements within the cleaning chamber, a series of flat plates 51 are secured to the inner wall of the tumbling chamber, these plates causing the elements to be carried slightly up the rotating wall and then dropped, resulting in a thorough intermingling and contacting of the cleaning elements and castings. A door 52 is provided opening into the separating chamber adjacent the disk for the purpose of removing accumulated tailings.

Having described my invention, I claim:

1. A tumbling mill, comprising, a rotatable barrel having an intake end and a discharge end, said barrel providing a tumbling chamber of full barrel diameter toward the intake end of the barrel, an inner conveying cylinder concentrically mounted within the barrel and extending from the tumbling chamber to the discharge end of the barrel, a chute between the tumbling chamber and the inner end of the inner cylinder for directing the contents of the tumbling chamber into the inner cylinder, and a chute connecting the discharge end of the barrel, which

surrounds the inner conveying cylinder, to the tumbling chamber.

2. A tumbling mill, comprising, a rotatable barrel having an intake end and a discharge end, said barrel conically formed from an intermediate point to the discharge end, a partition within said barrel at the termination of the conical portion forming a tumbling chamber toward the forward end of the barrel, a screen tube having a spiraled interior concentrically mounted within the barrel and extending from the partition to the discharge end of the barrel, said partition of split spiral ring form, a chute mounted at each side of the split of the spiral ring, the intake end of one of said chutes being disposed toward the tumbling chamber, and the discharge end disposed toward the mouth of the screen tube, and the other of said chutes having its intake opening disposed toward the barrel portion exteriorly adjacent the screen tube and its discharge end disposed toward the tumbling chamber.

3. A tumbling mill, comprising, a rotatable barrel having intake and discharge openings at relatively opposite ends, said barrel of conical form from an intermediate point to the discharge end, a partition within said barrel at the termination of the conical portion forming a tumbling chamber toward the forward end of the barrel, a screen tube having a spiraled interior extending from the partition to the discharge end of the barrel, said partition of split spiral ring form, a chute mounted adjacent the split of the spiral ring, the intake end of said chute being disposed toward the tumbling chamber through the offset, and the discharge end disposed through the center of the partition toward the mouth of the screen tube.

4. A tumbling mill, comprising, a rotatable barrel having intake and discharge openings at relatively opposite ends, a partition within said barrel dividing the interior into a tumbling chamber and a discharge chamber, a conveying tube extending from the partition through the discharge chamber, said partition of split spiral ring form, a chute mounted adjacent the split of the spiral ring, the intake end of said chute being disposed toward the tumbling chamber, and the discharge end disposed toward the mouth of the conveying tube.

5. A tumbling mill, comprising, a rotatable barrel having intake and discharge openings at relatively opposite ends, a partition intermediate of the length of said barrel dividing the same into a tumbling chamber and a separating chamber, a conveying tube having a screen body extending from the partition through said separating chamber, said partition of split ring form, a pair of chutes mounted adjacent the split of the ring, the intake end of one of said chutes being disposed toward the tumbling chamber, and the discharge end being disposed toward the mouth of the screen tube, and the other of said chutes having its intake opening disposed toward the separating chamber and its discharge end disposed toward the tumbling chamber.

6. A tumbling mill, comprising, a rotatable barrel, a partition intermediate of the length of said barrel dividing the same into a tumbling chamber and a separating chamber, said partition of split spiral ring form, the porting of the partition comprising, a pair of chutes mounted adjacent the split of the ring, the intake end of one of said chutes being disposed laterally of the partition and into the tumbling chamber, and the discharge end entering into the separating chamber, and the other of said chutes having its intake opening disposed laterally of the partition and toward the separating chamber and its discharge end entering into the tumbling chamber.

7. A tumbling mill, comprising a rotative drum interiorly partitioned to constitute a tumbling chamber and an adjacent collecting chamber, a cylindrical screen within the collecting chamber, the partition dividing said tumbling chamber from the collecting chamber and the screen having chutes formed thereupon for respectively discharging the contents of the tumbling chamber into the screen, and the screenings from the collecting chamber into the tumbling chamber.

8. A tumbling mill, comprising a rotative drum interiorly partitioned to constitute a tumbling chamber and an adjacent collecting chamber, a cylindrical conveyer screen within the collecting chamber, and chutes for respectively discharging the contents of the tumbling chamber into the screen, and the screenings from the collecting chamber into the tumbling chamber.

In witness whereof, I hereunto subscribe my name.

NATHAN RANSOHOFF.