Dec. 7, 1937. N. RANSOHOFF 2,101,196

TUMBLING MILL

Filed June 26, 1935 3 Sheets-Sheet 1

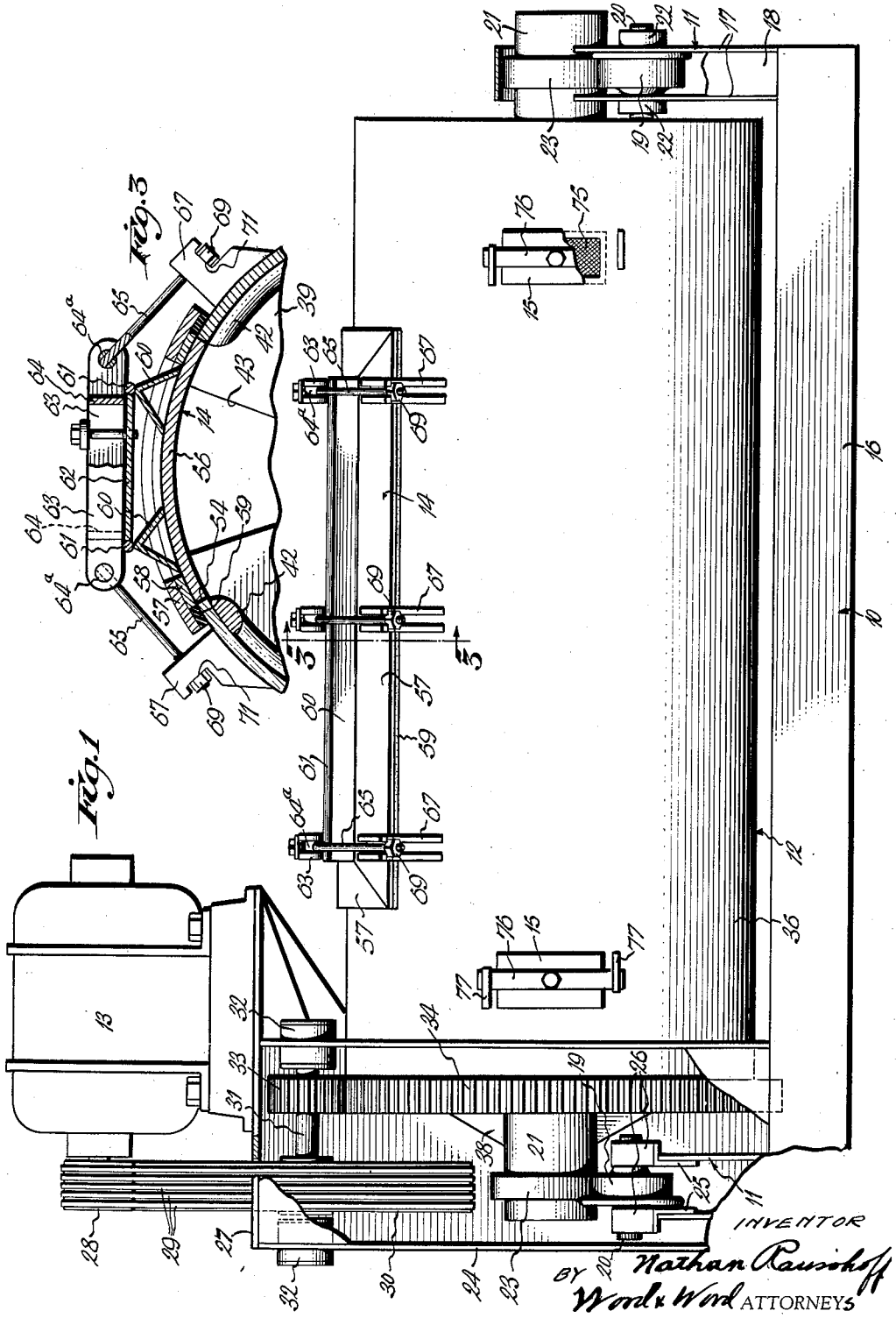


Fig. 1

Fig. 3

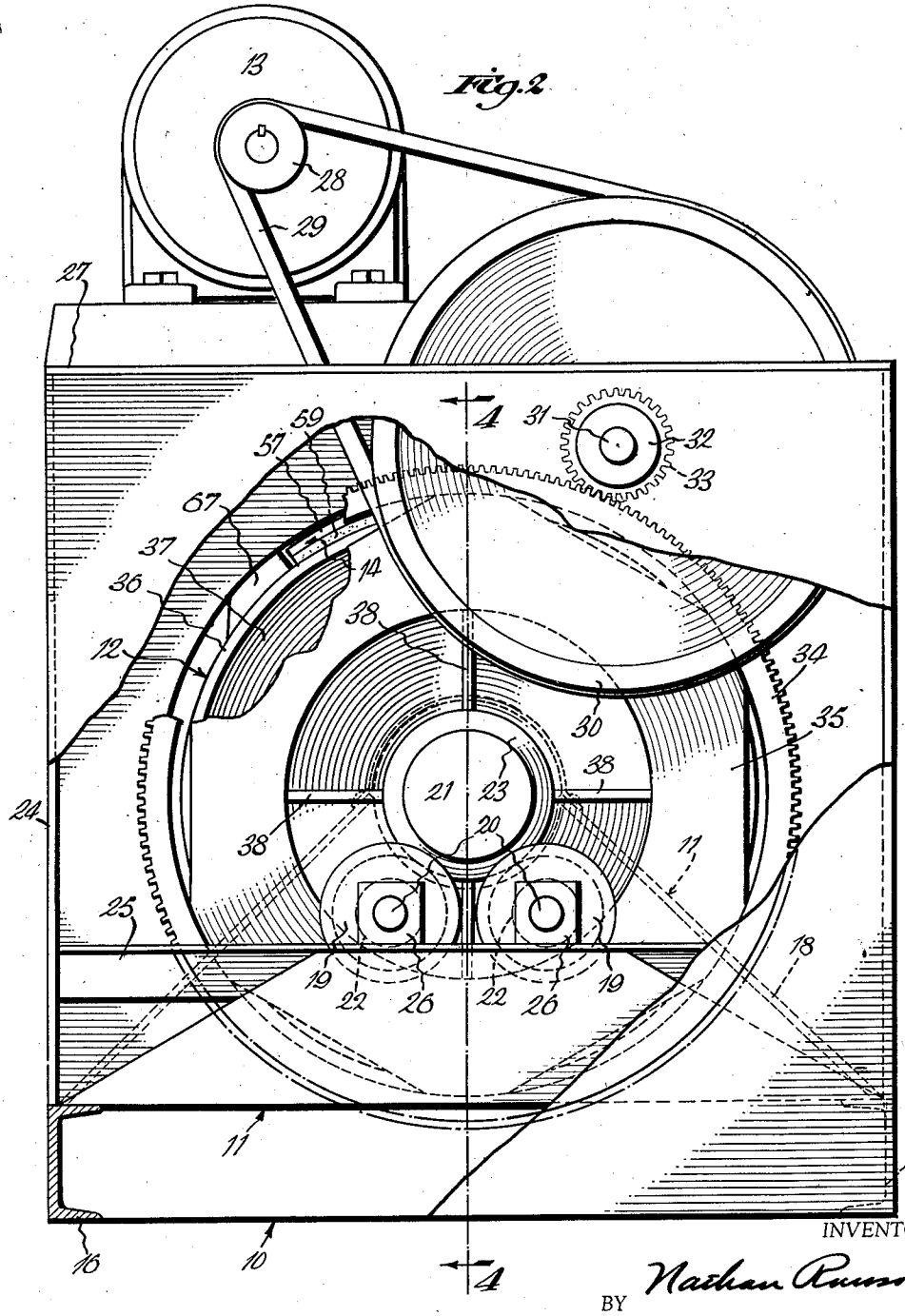
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Fig. 2



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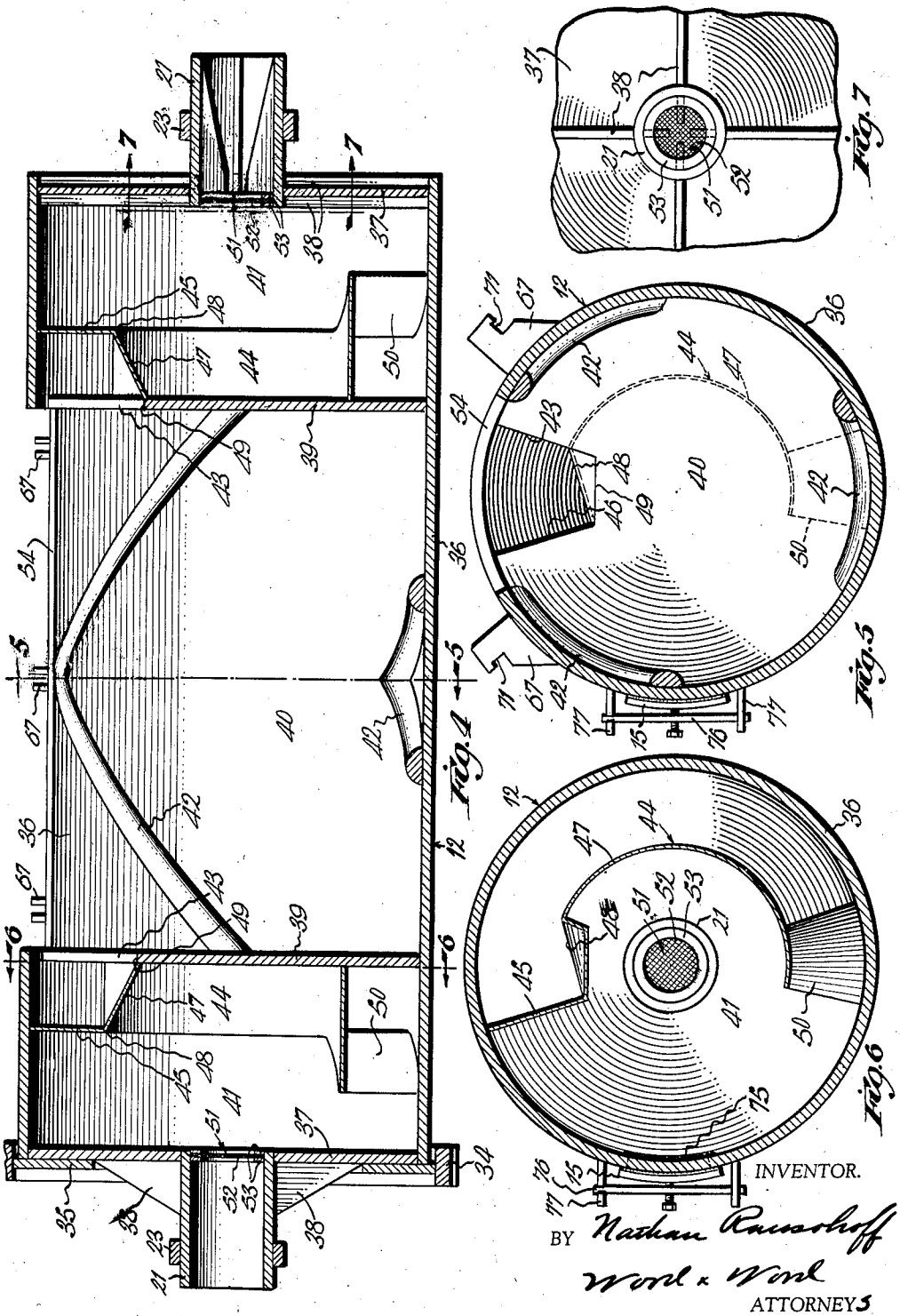


Fig. 4

Fig. 5

Fig. 7

Fig. 6

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2,101,196

TUMBLING MILL

Nathan Ranschoff, Cincinnati, Ohio

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7 Claims. (Cl. 51—164)

This invention relates to apparatus for cleaning or polishing objects such as castings, and is particularly directed to a tumbling mill of the character utilizing abrading elements and/or cleaning or polishing material in a tumbling chamber. This type of mill includes chambers for the castings or elements to be cleaned and the abrading elements respectively, with appropriate means for co-mingling the abrading elements with the castings, and separation of the same at will after a given tumbling operation.

It is an object of the invention to provide a tumbling mill of this character in which improved valve or separator means is provided having the joint function of controlling the introduction of the abrading elements into the tumbling chamber and efficiently separating the abrading elements from the castings or cleaned objects after the polishing operation.

It is a further object of the invention to provide an operating and supporting mechanism for the tumbling cylinder for tumbling or agitating the co-mingled abrading elements and parts being cleaned and a reversible drive for the tumbling barrel effective for separating the abrading material or elements from the castings.

It is a still further object of the present invention to provide an efficient closure means for the entrance to the tumbling chamber which ties the sides of the barrel or cylinder together and thereby prevents bulging of the barrel at the point of the opening. Provision is also made for quick release and access to the finished castings or product of the mill, and which when in position has the advantage of providing for positive clamping and sealing of the opening.

It is a still further object of the invention to provide a tumbling barrel for a mill of this character, in which the function of the mill in separating the finished castings and abrading material is more quickly accomplished by the provision of a centrally located tumbling chamber and storage chambers for the abrading elements at each side of the tumbling chamber, in conjunction with which, means are provided for causing movement of the abrading elements in both directions from the center of the tumbling chamber and into the respective storage chambers upon the reverse rotation of the mill.

Other objects and certain advantages will be more fully apparent from a description of the accompanying drawings, in which:

Figure 1 is a side view of the complete mill, a portion of the casing being broken away to illustrate the driving mechanism.

Figure 2 is an end view of Figure 1, looking at the power delivery end of the mill and illustrating the mounting of the tumbling cylinder.

Figure 3 is a fragmentary sectional view taken on line 3—3, Fig. 1, detailing the closure means for the tumbling chamber.

Figure 4 is a sectional view taken on line 4—4, Fig. 2, illustrating the interior details of the tumbling cylinder.

Figure 5 is a sectional view taken on line 5—5, Fig. 4, further detailing the separator means for moving the abrading elements into the storage chambers.

Figure 6 is a sectional view taken on line 6—6, Fig. 4, detailing the scoop which transmits the abrading elements back and forth between the tumbling chamber and the storage chambers.

Figure 7 is a sectional view taken on line 7—7, Fig. 4, illustrating the structure of the head of the barrel.

Describing the mill in general, a base 10 is provided including bearing standards 11, one at each end thereof. A tumbling mill 12 is rotatably supported on said bearing standards. A reversible electric motor 13 is mounted on a framework at one end of the mill and includes a transmission mechanism having a driving connection to the rotatable barrel or cylinder. A discharge opening closed by means of a door or plate 14 provides access to the tumbling chamber. Also, closure means 15 are provided for the openings into the respective storage chambers for the abrading elements.

Referring to the details of the drawings, the base 10 is formed of peripheral channel iron elements 16 providing a rectangular frame. The bearing standards are formed of side plates 17 and spacer plates or uprights 18. A pair of rollers 19 are mounted on stub shafts 20. These shafts are disposed in the same horizontal plane and the associated rollers afford a cradle for the axial shaft extension 21 of the tumbling cylinder 12. The side plates have bearing members or hubs 22 welded thereto to provide broader support for the shafts 20.

The axial supporting extensions of the rotatable cylinder 12 are cylinders welded to the end plates of the cylinder. Each one includes a ring 23 welded thereto intermediate its length, which ring provides the rolling contact with the rollers. Each roller 19 includes an outer flange, which, by virtue of its engagement with the side of the ring 23, prevents longitudinal shifting of the tumbling cylinder.

At the power end of the mill the bearing stand-

ard structure is varied. A drive housing and support is fabricated of plates 24 and includes angle iron cross pieces 25 to which the side plates of the journal are attached. The bearing members at this end are in the form of blocks 26 secured to the tops of the respective angle iron cross pieces. The electric motor 13 is bolted to the top 27 of the casing structure.

A belt pulley 28 is secured to the outer end of the motor shaft and the drive is carried from this pulley by means of belts 29, to a large pulley 30, fixed on a transmission shaft 31 journalled in bearing members 32 fixed in the side plates of the housing structure. A pinion 33, carried by this shaft 31, is in mesh with the ring gear 34 secured about the end of the cylinder. This ring gear is fixed about an end plate 35 or ring welded to the end plate of the cylinder.

The tumbling cylinder is fabricated of a main cylindrical portion 36, end plates or heads 37, and the cylindrical axial extensions 21 which rotatably support the cylinder. Reinforcing ribs 38 are radially disposed on each head for strengthening the head structure of the barrel. The parts mentioned are welded together.

Within the cylinder, partition plates 39 separate the cylinder into three chambers: an intermediate tumbling chamber 40 and end chambers 41 affording storage space for the abrading elements. The central or tumbling compartment includes a series of ribs 42 on its inner periphery. In this case there are three sets of ribs, located at approximately 120° apart. The ribs are formed of round stock cut in half to provide a flat side, and are bent to fit the curvature of the compartment wall. Each set of ribs provides a point or spear head. When the cylinder is rotated in the direction indicated by the spear head moving the spear heads forwardly the tendency is to spread the smaller elements, namely, the abrading elements, toward the ends of the compartment since these ribs provide inclined surfaces down which the abrading elements readily travel.

The mill is designed to clean or polish large castings. The separating plates forming the end walls of the tumbling compartment include openings 43. The opening of each plate is located at one side thereof; that is, adjacent the wall of the cylinder. The side edges of the openings are disposed on radial lines taken from the center of the partition plates.

Transfer tubes or scoops 44 are provided, one for each partition plate and within the respective storage chamber. These transfer tubes or scoops are generally circular; that is, as to their extent, and they lie along the inner periphery of the cylinder wall. They extend approximately half-way around the cylinder.

For the purpose of forming the tubes or transfer scoops, sheet metal is employed to provide two sides thereof, the other two sides being provided by the intersecting cylinder wall and partition wall. An end wall 45 is provided for each scoop, extended to one side edge 46 of the opening in the partition plate. The inner wall 47 of the scoop element is inclined inwardly from its general circumferential line and laterally to be attached to the lower edge 48 of the end wall and to the partition plate along the lower edge 49 of the opening. These parts are welded together.

It will therefore be seen that the ribs 42 are effective for pitching or throwing the abrading elements endwise of the tumbling compartment and into the discharge chutes through the openings in the partition plates.

It will be noted that the scoops are extended from the lateral intakes afforded in the partition plates in a direction affording a scooping action when the cylinder is rotated in reverse direction, that is, the direction where the ribs are effective for endwise displacement of the abrading elements heretofore described.

The other end of each scoop or transfer tube is flared as at 50 and is open for delivering the abrading elements to the storage chamber, the flaring being effective for scooping the elements when the mill is rotated in a forward direction for tumbling, the scooping action being effective for rapidly transferring the elements from the storage chambers to the tumbling compartment.

Each tubular axial extension or support hub 21 is open at its outer end and includes a screen 51 welded in position at its inner end. The screens are formed of a circular piece of screening 52 marginally bound between rings 53. Some suction means may be employed for drawing the dust and abrasive particles from the mill by way of one of the tubular extensions 21 or a blower may be employed for forcing air through the mill through the respective tubular axial extensions. If desired, liquid may be circulated through the mill by way of these axial openings.

The products of the mill for example, cleaned castings or forgings, may be dumped from the central or tumbling compartment through a long opening 54 formed along one side of the tumbling compartment. Specifically, this opening is diametrically opposite to the open ends of the scoops which are within the storage chambers so that it is impossible for the abrading elements to be discharged when the cylinder is rotated to that position bringing the casting or product discharge opening to the bottom.

The discharge opening is closed by means of a cover plate or door 14. The door includes an arcuate plate 56 of the same circular contour as the barrel and fitting snugly within the opening. Frame strips 57 are secured around the outer margin of this element. These frame strips lie upon spacer strips 58 and overhang the aligned edges of the spacer strips and the main door element. Sealing strips 59 formed of leather or rubber are attached on the underside of the overhanging portions of the marginal strips and therefore engage the margin of the opening.

A door or lid clamping and barrel supporting means is provided associated with the door. For this purpose longitudinally disposed inverted angle iron strips 60 have their outer edges welded to the main plate of the door. Rods 61 are welded along the upper corners of these angle iron strips. Cross pieces 62 connect the rods. All of these parts are welded together.

Spaced bars 63 are employed set on edge and connected by cross pieces 64, adjacent each of the connecting pieces, of which there are three. These upright and spaced plates provide bifurcations across and within which rotatable pins 64a are mounted. Clamping or tie rods 65 connect the rotatable pins to spaced ears 67 fixed on the cylinder. These rods carry nuts 69 on their screw-threaded outer ends. The ears 67 include notches 71 providing seats for the nuts, in each case preventing displacement thereof. For opening the door it is simply necessary to loosen the nuts and remove the door.

The tie rods by virtue of their attachment to the closure structure above the plane of the

actual lid or door and connection to the cylinder below or in the plane of the door draw the door downwardly for sealing purposes and the sides of the barrel together against the lid for strengthening the barrel against bulging.

As heretofore stated, an opening is provided into each storage chamber. A screen 75 is placed across each of these openings. The closure door 15 provided for each opening is held in position by means of a latch bar 76 pivotally mounted centrally of the closure door and having its ends adapted to engage under hooks 77 mounted on the cylinder at opposite sides of the door. These doors may be left in position if the tumbling operation is dry or when a great deal of liquid is desirable within the mill. During the latter condition the water may pass in and out the axial openings heretofore described. However, should it be desirable to pass the cleaning liquid directly through the tumbling mill without accumulation therein the closure doors 15 may be removed and the liquid will then drain rapidly through the screened openings.

The operation of the mill is as follows. The hatch or cover plate 14 is removed after loosening the bolts. With the cylinder in position disposing the opening upward, the castings or parts to be cleaned are loaded into the tumbling chamber. The hatch is then fastened down by drawing up the bolts 68 the appropriate amount. The electric motor is then started, rotating the cylinder in anticlockwise direction, as viewed from the power end of the mill. This rotation is effective for scooping up the abrading elements in the storage chambers, passing them through the transfer tubes and delivering them to the tumbling chamber since this rotation moves the ribs in the opposite direction from that in which they are pointing. The effect is to move the abrading elements toward the center of the tumbling chamber. These elements being small they are moved more readily than the castings, and the result is that the valuable function of great agitation within the tumbling chamber is achieved.

The relative movements of the castings and abrading elements axially of the tumbling chamber, in addition to the tumbling caused by rotation, bring about cleansing of the castings much more quickly than in the previously designed types of mills. When the operator decides that the parts have been thoroughly cleansed, he reverses the motor. The abrading elements are then moved by the spear headed ribs toward the ends of the tumbling chamber where they are picked up or delivered into the transfer chutes. As heretofore stated, the chutes are then also rotating in a direction tending to scoop up the abrading elements from the tumbling chamber and move them to the storage compartments. After a period of reverse rotation sufficient to return the abrading elements, the operator stops the power with the hatch disposed upwardly and after removing the door rotates the cylinder to dispose the opening downwardly so as to dump the objects therefrom.

It will be understood that the castings cleaned will not pass through the openings in the partition plates in the normal operation of the mill. However, should it be desirable to clean smaller castings, appropriate gratings can be placed over these openings, which will not interfere with the passage of the abrading elements but will block the passage of the parts being cleaned.

Having described my invention, I claim:

1. In a tumbling mill, a rotatably mounted cylinder, reversible means for rotating said cylinder, said cylinder having partitions therein dividing it into a central tumbling chamber and storage chambers at the respective ends for abrading or burnishing elements, means within the tumbling chamber for moving the burnishing or abrading elements from the center thereof outwardly against the partitions upon one direction of rotation of the cylinder, and scoop elements connecting the central chamber with each end chamber, said scoops effective for transferring the burnishing or abrading elements from the central chamber to the end chambers when said cylinder is being rotated in said direction of rotation.

2. In a tumbling mill, a rotatably mounted cylinder, reversible means for rotating said cylinder, said cylinder including partitions therein dividing it into a central tumbling chamber and storage chambers for burnishing or abrading elements, a series of ribs formed on the inner surface of the tumbling chamber, said ribs of spear head form and pointing circumferentially, means in the partitions for transferring the burnishing or abrading elements from the storage chambers to the tumbling chamber, or vice versa, whereby upon rotation of the cylinder in the direction indicated by the spear head ribs the abrading or burnishing elements are moved toward the ends of the tumbling chamber from the center thereof and pass into the storage chambers through the transfer means.

3. In a tumbling mill, a rotatably mounted cylinder, reversible means for rotating said cylinder, said cylinder including partitions therein dividing it into a central tumbling chamber and storage chambers for burnishing or abrading elements, a series of ribs formed on the inner surface of the tumbling chamber, said ribs of spear head form and pointing circumferentially, a scoop-like transfer tube mounted on each partition and providing a passageway between the central chamber and the respective storage chambers for transferring the burnishing or abrading elements from the storage chambers to the tumbling chamber, or vice versa, whereby upon rotation of the cylinder in the direction indicated by the spear head ribs the abrading or burnishing elements are moved toward the ends of the tumbling chamber from the center thereof and pass into the storage chambers through the transfer tubes.

4. In a tumbling mill, a frame including a base and a bearing standard at each end thereof, a cylinder including tubular axial extensions rotatively journalled on said respective bearing standards, said tubular axial extensions entering the interior of said cylinder and providing for fluid circulation therethrough, screens disposed across said tubular axial extensions, said cylinder including a tumbling chamber, and means therein for separating abrading elements from objects being cleaned and collecting the abrading elements at the respective ends of the cylinder.

5. In a tumbling mill, a frame including a base and a bearing standard at each end thereof, a cylinder including tubular axial extensions rotatively journalled on said respective bearing standards, said tubular axial extensions entering the interior of said cylinder permitting fluid circulation through said cylinder, said cylinder including a central tumbling chamber, storage chambers for abrading elements at each side of said tumbling chamber, and means in said cylinder for separating the abrading elements from

objects being cleaned and collecting the abrading elements in the storage chambers.

6. In a tumbling mill, a rotatively mounted tumbling cylinder having a tumbling chamber therein, said cylinder including an opening into said tumbling chamber, a closure plate for said opening adapted to fit snugly therein and of the same contour as the contour of the cylinder, cross members on said closure providing attachment portions beyond the plane of the cylinder, said cylinder including attaching lugs, and draw bolts connecting said attachment portions to said lugs for drawing the closure plate into position in the opening and for supporting the sides of the cylinder adjacent the closure plate against bulging.

7. In a tumbling mill, a rotatively mounted tumbling barrel having a tumbling chamber therein, said cylinder including an axially extended opening for said tumbling chamber, a closure plate for said opening adapted to fit snugly therein and of the same contour as the contour of the cylinder, cross members on said closure providing bifurcated attachment portions beyond the plane of the cylinder, said cylinder including attaching lugs, bifurcated cross pins in said bifurcated portions and lugs, and draw bolts connecting said cross pins of adjacent attachment portions and lugs for drawing the closure plate into position in the opening and for supporting the sides of the cylinder adjacent the closure plate against bulging.

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