Nov. 7, 1933. J. P. RUTH, JR 1,933,764

GRINDING MILL

Filed Oct. 28, 1931 2 Sheets-Sheet 1

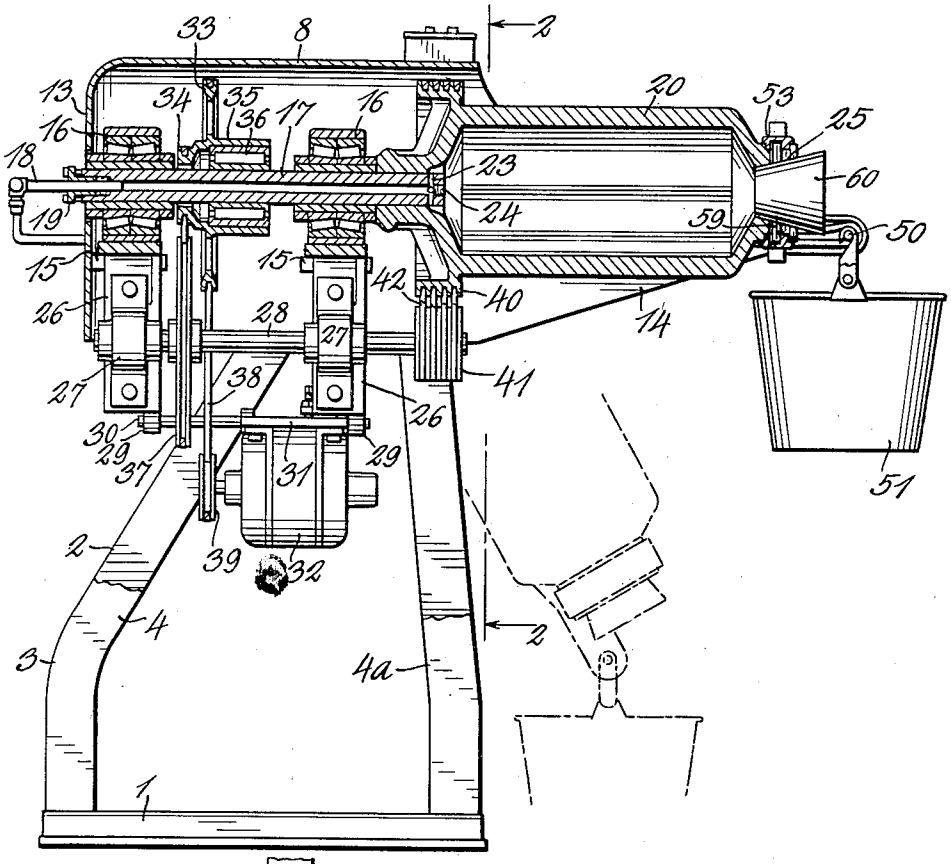


Fig. 1.

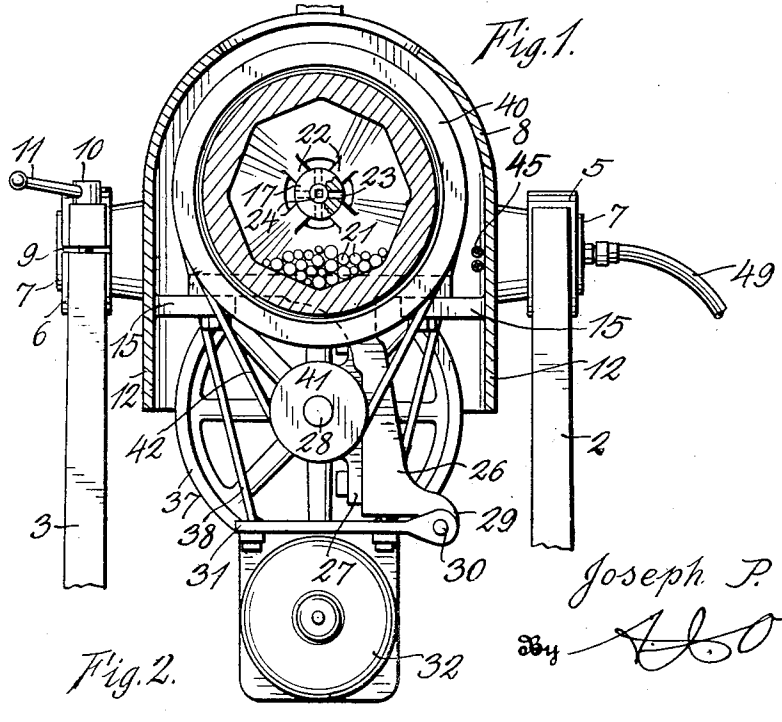


Fig. 2.

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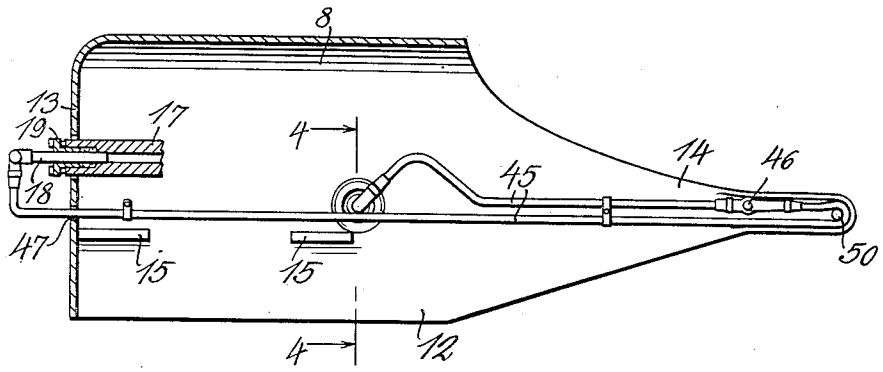


Fig. 3.

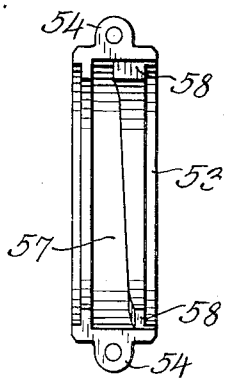


Fig. 7.

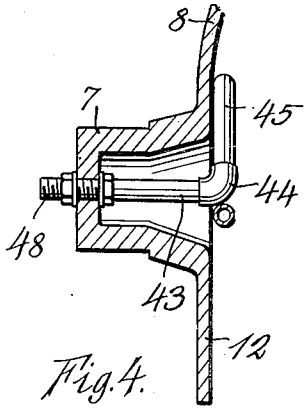


Fig. 4.

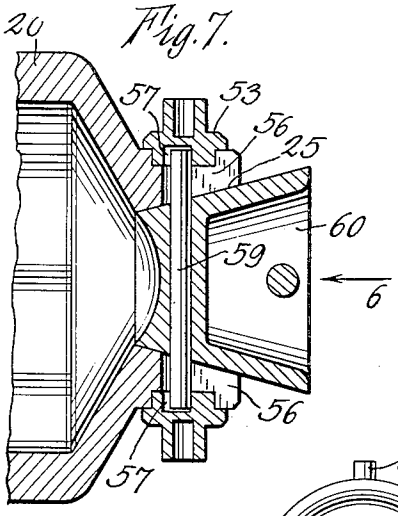


Fig. 5.

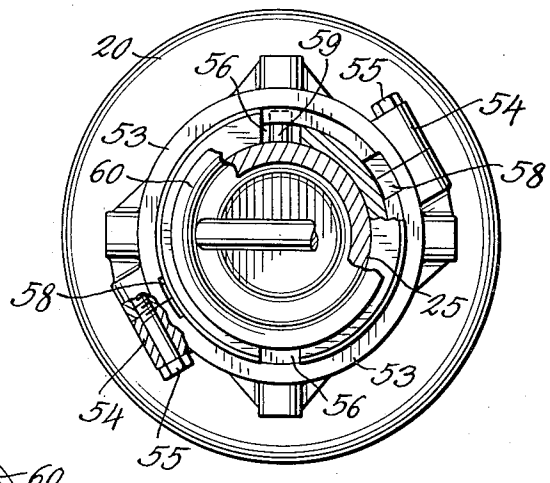


Fig. 6.

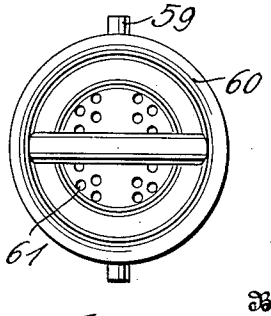


Fig. 8.

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UNITED STATES PATENT OFFICE

1,933,764

GRINDING MILL

Joseph P. Ruth, Jr., Denver, Colo., assignor to The Ruth Company, Denver, Colo., a corporation of Colorado

Application October 28, 1931. Serial No. 571,486

5 Claims. (Cl. 83—9)

This invention relates to improvements in mills of the type employed for grinding or for use in laboratories for the purpose of assaying and for the purpose of working out a proper method for separating the metals from the nonmetallic parts.

In testing laboratories connected with mines, it is necessary to grind samples of ores for the purpose of conducting proper experiments thereon and for this purpose ball or bar mills have been provided which are of sufficient size to handle ore samples, but which are much smaller than the mills ordinarily employed in the mine for grinding large quantities of ore.

It is an object of this invention to produce a bar mill of a simple and substantial construction that shall be especially well adapted for use in laboratories, and which shall be so designed that the ore can readily be introduced into the mill and discharged therefrom when it has been ground.

Another object of this invention is to produce a bar mill of the type specified which shall be so constructed that it can be very readily cleaned when the grinding operation is over and which shall be entirely self-contained.

The above and other objects that may become apparent as this description proceeds are attained by means of a construction and an arrangement of parts that will now be described in detail and for this purpose reference will be had to the accompanying drawings in which the preferred embodiment of the invention has been illustrated, and in which:

Fig. 1 is a vertical longitudinal section through the improved bar mill;

Fig. 2 is a section taken on line 2—2, Fig. 1;

Fig. 3 is a section of the housing taken in the same plane as Fig. 1, but showing the other parts removed;

Fig. 4 is a section through one of the trunnions taken on line 4—4, Fig. 3;

Fig. 5 is a section through the discharge opening of the cylindrical drum showing a closure in place and the means by which this closure is secured to the drum;

Fig. 6 is a view partly in section, looking in the direction of arrow 6 in Fig. 5;

Fig. 7 is an inside view of one of the two parts of the clamping ring; and

Fig. 8 is a view looking into the outer end of a closure plug showing the same provided with openings.

In the drawings reference numeral 1 designates a base that is adapted to rest on a floor and extending upwardly from opposite sides of this base are two supports that have been indicated by reference numerals 2 and 3. These supports are substantially identical and are each composed of two members 4 and 4a as indicated in Fig. 1. The upper ends of the supports are provided with bearings 5 and 6 in which the trunnions 7 that project from opposite sides of the housing 8 are journalled. Bearing 6 is formed with an opening or slot 9 and the two parts on opposite sides of this slot are held together by means of a clamping screw 10 that has a handle 11 by means of which it can be turned. By means of the clamping screw the housing can be held in adjusted position or when this clamping screw is loosened, the housing can be tilted about the axis of the trunnions. The housing that has been shown in the drawings is open at the bottom and has a substantially U-shaped cross section as shown in Fig. 2. The two parallel side walls to which the trunnions are attached have been designated by reference numeral 12. One end of the housing is closed by transverse wall 13 (see Figs. 1 and 3) and the opposite ends of the side walls extend forwardly so as to form supporting brackets 14 in the manner shown quite clearly in Fig. 3. Projecting inwardly from the inner surfaces of the side walls are two pairs of lugs 15. These lugs are preferably cast integral with the housing, but do not extend the entire distance across the same. Supported on the upper surface of each pair of lugs is a bearing 16. This bearing is preferably a cone or roller bearing of the type illustrated in Fig. 1. A tubular shaft 17 extends through the bearings and has one end extending through an opening in the end closure 13. A pipe 18 projects into the opening in the shaft at the rear end thereof and the connection is made watertight by means of a stuffing box 19. Secured to the other end of the tubular shaft is a drum 20. This drum is hollow and its inner surface is formed by eight straight surfaces so that the cross section of the same is substantially an octagon as shown in Fig. 2. It is, of course, not material whether the inner surface of the drum is formed from eight surfaces or more or less, but it is desirable to have the cross section of the opening polygonal. Located within the drum are a large number of steel bars 21. The end of the drum that is connected to the shaft 17 is provided with four or more inwardly extending lugs 22, as shown in Fig. 2, and the shaft has a number of diametrical openings 23 that communicate with the center opening therein. A plug 24 closes the inner end of the axial opening in the shaft. The outer end of the drum has a conical opening 25, to which reference

will be made hereinafter. Secured to the under surface of lugs 15 are downwardly extending brackets 26. These brackets have each a vertical surface and to this vertical surface a bearing 27 is secured. A counter shaft 28 is journalled in bearing 27. The lower ends of brackets 26 have downwardly extending ends 29 that are perforated for the reception of a supporting shaft 30. Supported on the shaft 30 is a plate 31 to the under surface of which a motor 32 is secured. Mounted for rotation on the main shaft is a duplex pulley having a pulley 33 of large diameter and a pulley 34 of smaller diameter. These two pulleys are preferably formed from a single casting and are provided with a hub 35 within which is located a roller bearing 36. The duplex pulley is freely rotatable on the main shaft in the manner quite apparent from Fig. 1. The counter shaft carries a large pulley 37 and the belt encircles this pulley and the small pulley 34. A belt 38 encircles the large pulley 33 and the drive pulley 39 on the motor shaft. The inner end of drum 20 is provided with a multiple pulley 40 which in the example shown in the drawings has four grooves and the corresponding end of shaft 28 has a multiple grooved pulley 41. Belts 42 connect pulleys 40 and 41. It is now apparent that when the motor is operating it will first transmit motion to the duplex pulleys 33 and 34 and this will be transmitted to pulley 37 by means of a belt and from pulley 41 at the front end of shaft 28, the power is transmitted to the drum by means of the belts 42. It is also evident that the drum will be rotated at a much slower speed than the motor and therefore the arrangement of pulleys and belts illustrated is merely a speed reducing mechanism and can be replaced by some equivalent means such as gears or a worm drive, although the means illustrated in the drawings is believed to be the most desirable for this purpose.

Referring now to Fig. 4, it will be seen that trunnion 7 has a pipe 43 extending axially therethrough. This pipe terminates in an elbow 44 and connected to the other end of this elbow is a pipe 45 that extends to the front of the bracket 14 where it is provided with a valve 46. After passing the valve, the pipe is returned to the rear of the housing where it passes through an opening 47 and is then connected with pipe 18 in the manner shown in the drawings. The end of the pipe indicated by reference numeral 48 in Fig. 4 is connected to a source of water under pressure by means of a hose 49. When valve 46 is open, water will flow through these pipes and after passing through the opening in shaft 17 will enter the interior of the drum. The front end of each of the brackets 14 is provided with a pin 50 on which a bucket 51 can be supported in a manner shown in Fig. 1. The outer surface of wall 25 is provided with a circular groove 52 in which a two-part ring 53 is located. This ring is made up of two parts of the shape shown more particularly in Fig. 7, where the under surface of one of these parts has been illustrated. Each half of the clamping ring is provided with outwardly extending ends 54 that are connected by means of bolts 55. Wall 25 is also provided with two diametrically located slots 56. The inner surface of each of the ring portions 53 is provided with a cam groove 57 and there is also a notch 58 through the front wall of these grooves so that the flexible pin 59 that extends through the closure 60 can be passed inwardly through the notches 56 and thence through the cut out portions 58 and into the cam grooves. By turning ring 53, the closure will be forced inwardly against the conical surface of the opening in the manner shown in Fig. 5. When the grinding is taking place, a closure like that shown in Fig. 5 is used, but this can be replaced by one having openings 61 as shown in Fig. 8.

When the mill is to be used, the ore is introduced into the drum and mixed with a suitable quantity of water after which the opening is closed and the motor started, whereupon the drum is rotated and the ore is ground by the action of the bars. After the ore has been ground to the requisite fineness, the machine is stopped and the solid plug replaced by one like that shown in Fig. 8. A bucket 51 is then attached to the pins 50 and the clamping screw 10 loosened whereupon the parts can be rotated about the axis of the trunnions to the dotted line position shown in Fig. 1. If the motor is now operated the drum is rotated and by opening valve 46, water can be introduced into the drum so as to thoroughly wash and clean the same.

From the above description it is evident that the bar mill described above is of a substantial and simple construction and that it has been so designed that it can be very conveniently operated.

Having described the invention what is claimed as new is:

1. A machine of the class described comprising, in combination, a base, two spaced supports extending upwardly therefrom, a housing located between the supports, trunnions extending outwardly from opposite sides of the housing, one of the trunnions being hollow, a hollow main shaft located in the housing, a conduit extending from the hollow trunnion to the outer end of the opening in the shaft, a hollow drum secured at the inner end of the shaft, the opening in the shaft being in communication with the interior of the drum, the free end of the drum having an opening, a closure for the opening in the drum, a motor carried by the housing, and means comprising a speed reducing mechanism for transmitting power from the motor to the drum.

2. A machine of the class described comprising, in combination, a base, two spaced supports extending upwardly therefrom, a housing located between the supports, trunnions extending outwardly from opposite sides of the housing, a main shaft located in the housing, a hollow drum secured at one end to one end of the shaft, the free end of the drum having an opening, a closure for the opening, a motor carried by the housing, means for rotating the drum, the sides of the housing having brackets that extend beyond the free end of the drum, and a supporting device attached to the ends of the bracket.

3. A rod mill of the class described, comprising, in combination, a base having two spaced supports, an elongated housing provided on opposite sides with trunnions, the supports having bearings for the trunnions, the housing having a U-shaped cross section with the open side down, the vertical sides of the housing having two pairs of inwardly projecting lugs, a bearing secured to each pair of lugs, a shaft mounted for rotation in the bearings, an elongated hollow drum secured to one end of the shaft and extending outwardly from the housing, two other bearings supported from the two pairs of spaced lugs and located below the first mentioned bearings, a shaft journalled in the bearings below the lugs, a motor attached to the last mentioned bearings, a

double idler pulley rotatably supported on the first mentioned shaft, said idler comprising a large and a small pulley, a belt for transmitting power from the motor to the large pulley, a large pulley on the second shaft in line with the small pulley on the first shaft, a belt for transmitting power from the small pulley on the first shaft to the large pulley on the second shaft, the end of the drum that is attached to the shaft having a multiple pulley formed integral therewith, a similar multiple pulley on the second shaft belts connecting the multiple pulleys.

4. A machine of the class described comprising, in combination, a base having two spaced uprights provided with bearings, a housing located between the uprights and provided with trunnions for cooperating with the bearings, one trunnion being hollow, a hollow shaft carried by the housing and mounted for rotation, a cylindrical grinding drum secured at one end of the hollow shaft so as to be rotated thereby, and means for feeding liquid through the hollow trunnion, through the shaft and into the drum while the latter is rotating about its axis.

5. A machine of the class described, comprising, in combination, a base having two spaced uprights provided with bearings, a housing located between the uprights and provided with trunnions for cooperating with the bearings, one trunnion being hollow, a hollow shaft carried by the housing and mounted for rotation, a cylindrical grinding drum secured at one end of the shaft so as to be rotated thereby, means comprising a pipe for feeding liquid through the shaft and into the drum while the latter is rotating about its axis, said pipe extending through the hollow trunnion and into the opening in the shaft, and means for tilting the drum with respect to a horizontal plane.

JOSEPH P. RUTH, JR.