Aug. 19, 1958 J. CRITES 2,848,170

WEAR COMPENSATING MEANS FOR PULVERIZING MILLS OF THE RING-ROLLER TYPE

Filed July 24, 1953 6 Sheets-Sheet 1

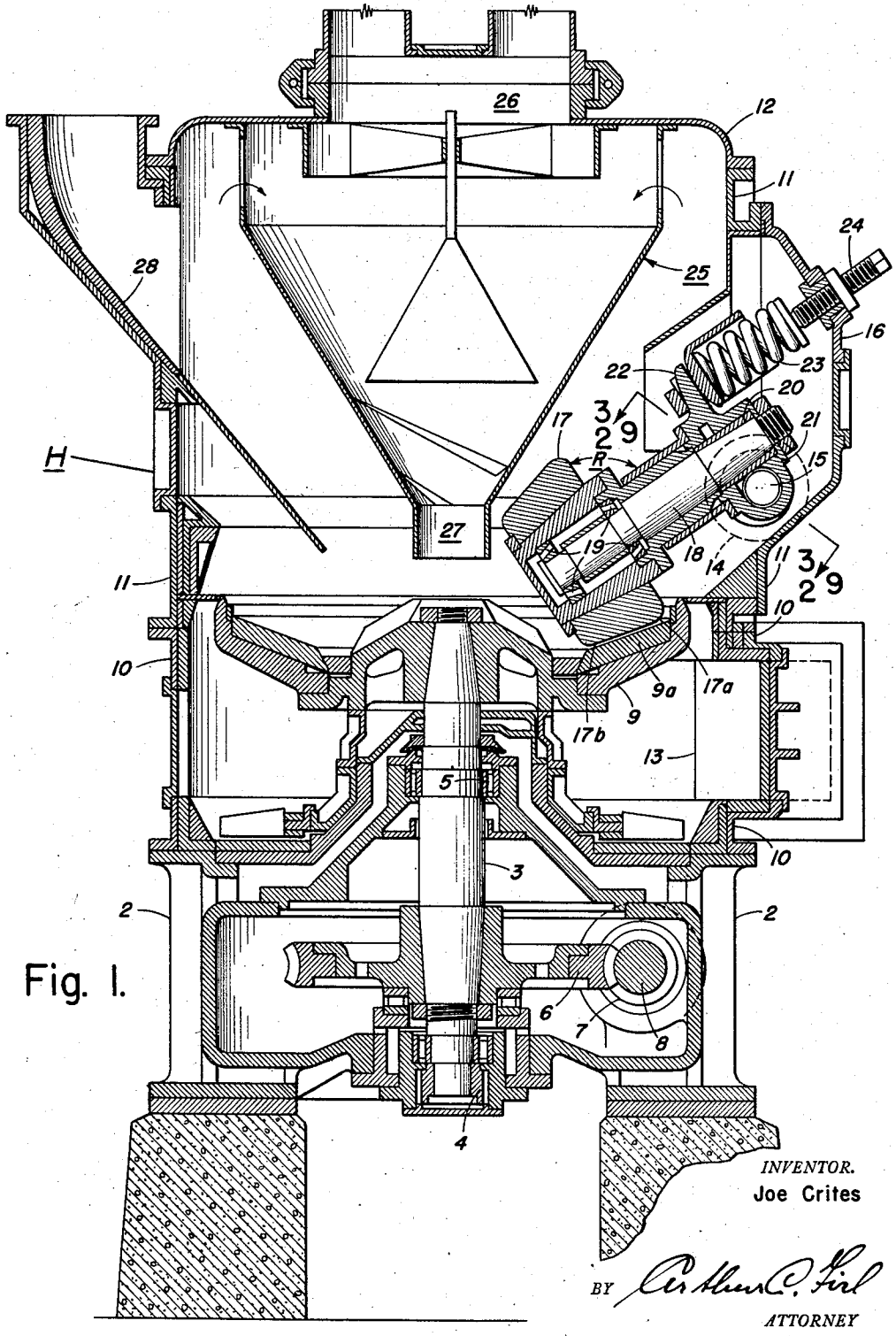



Fig. 1.

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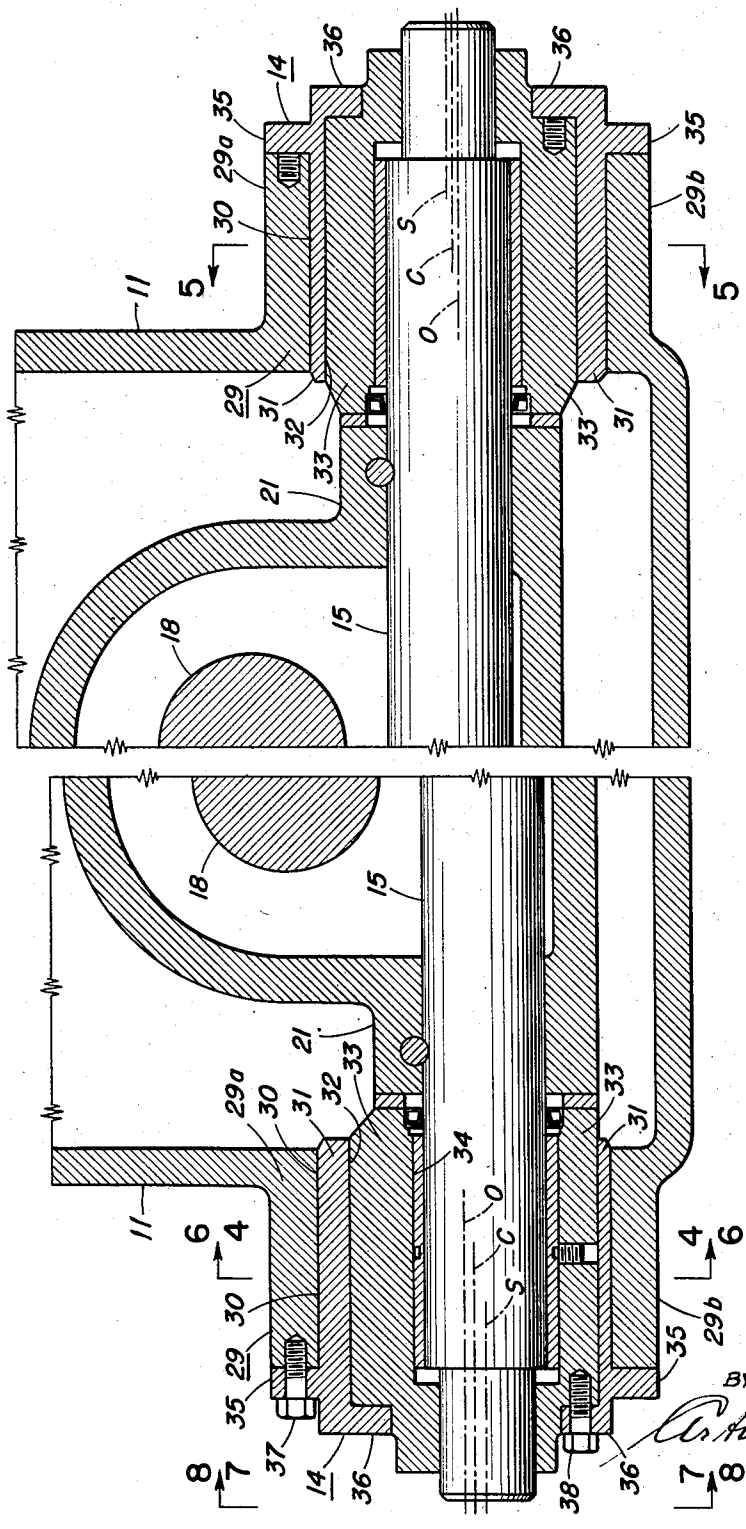



Fig. 3.




Fig. 2.

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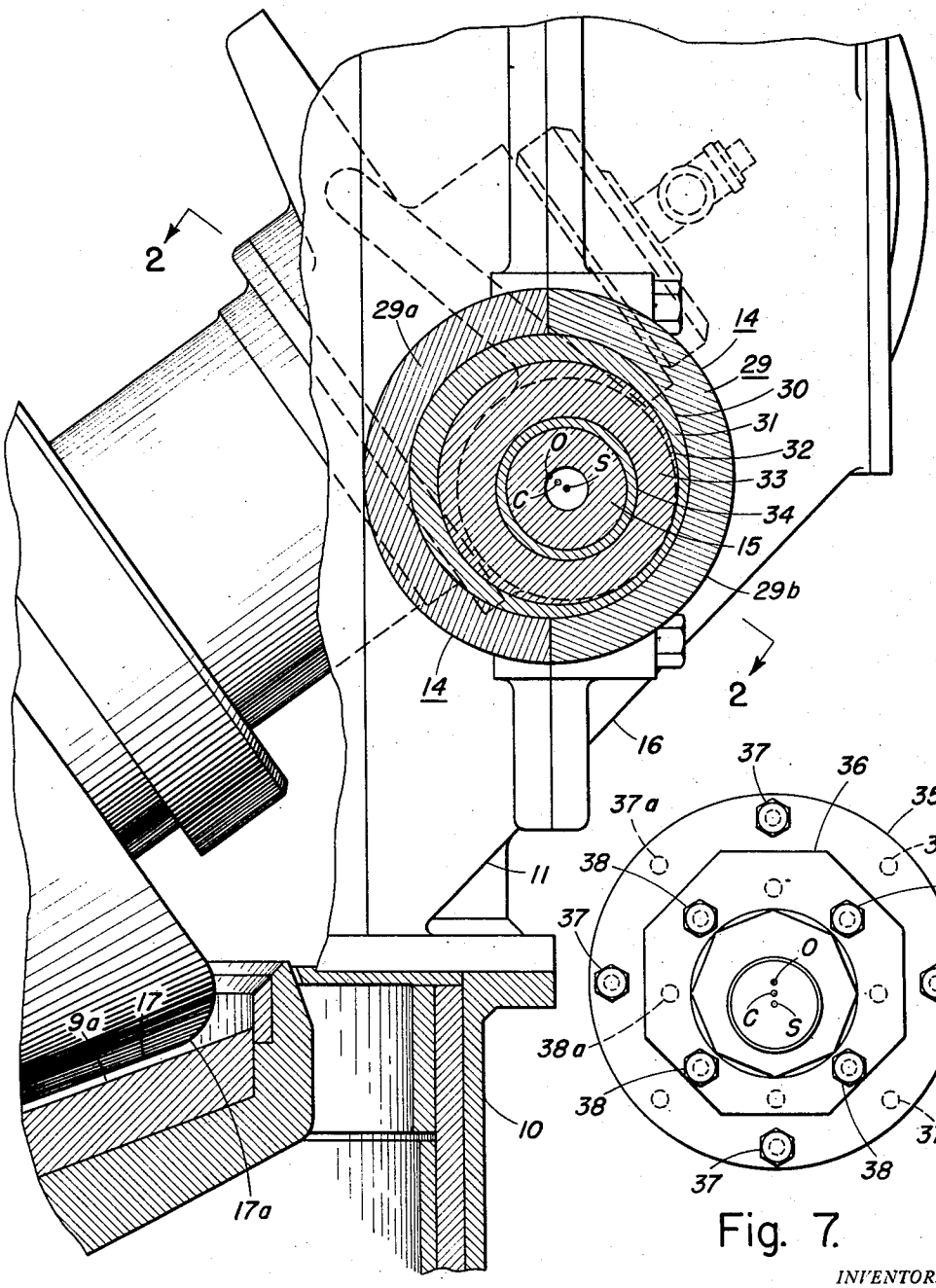



Fig. 4.




Fig. 7.

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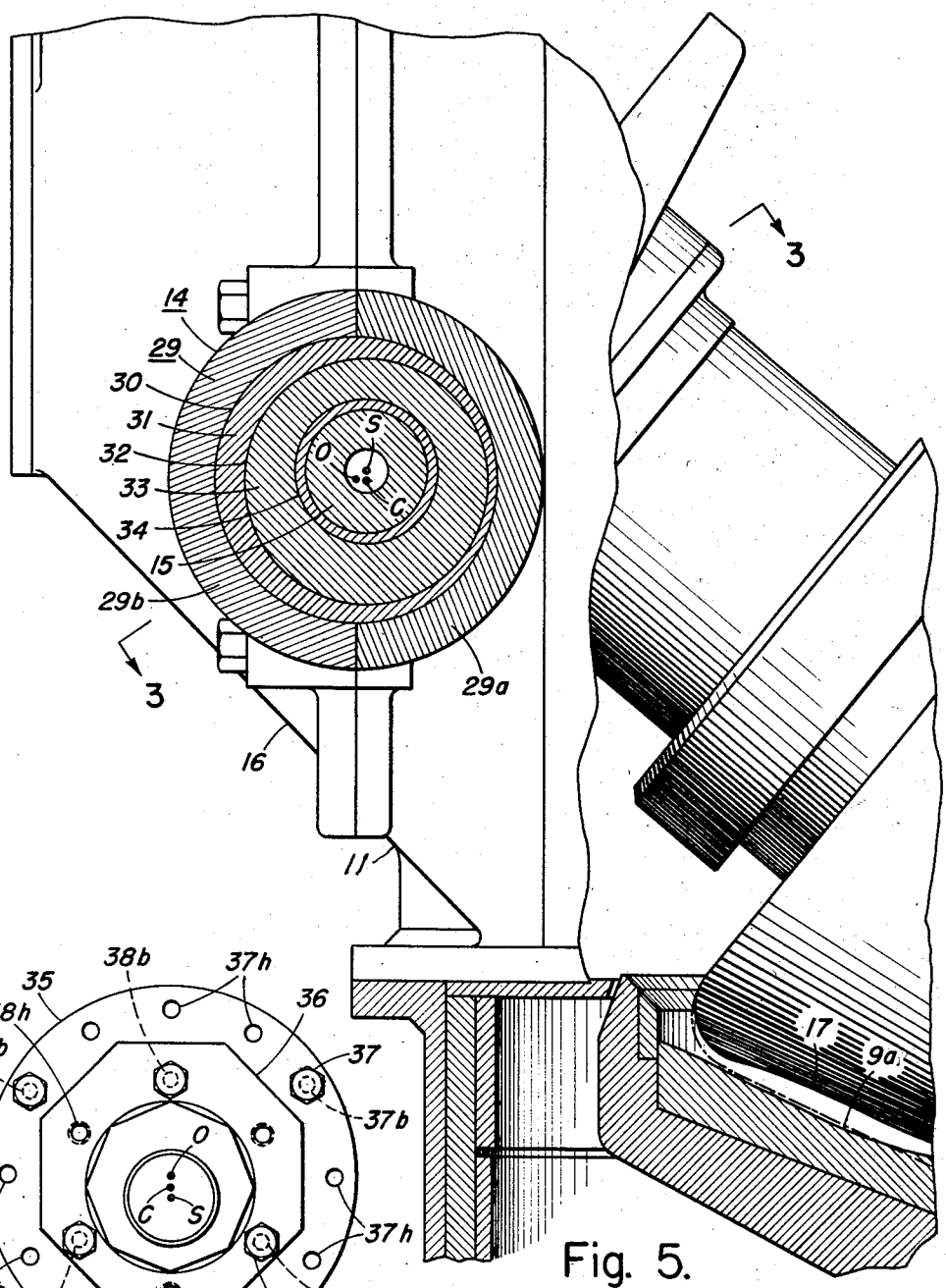



Fig. 5.




Fig. 8.

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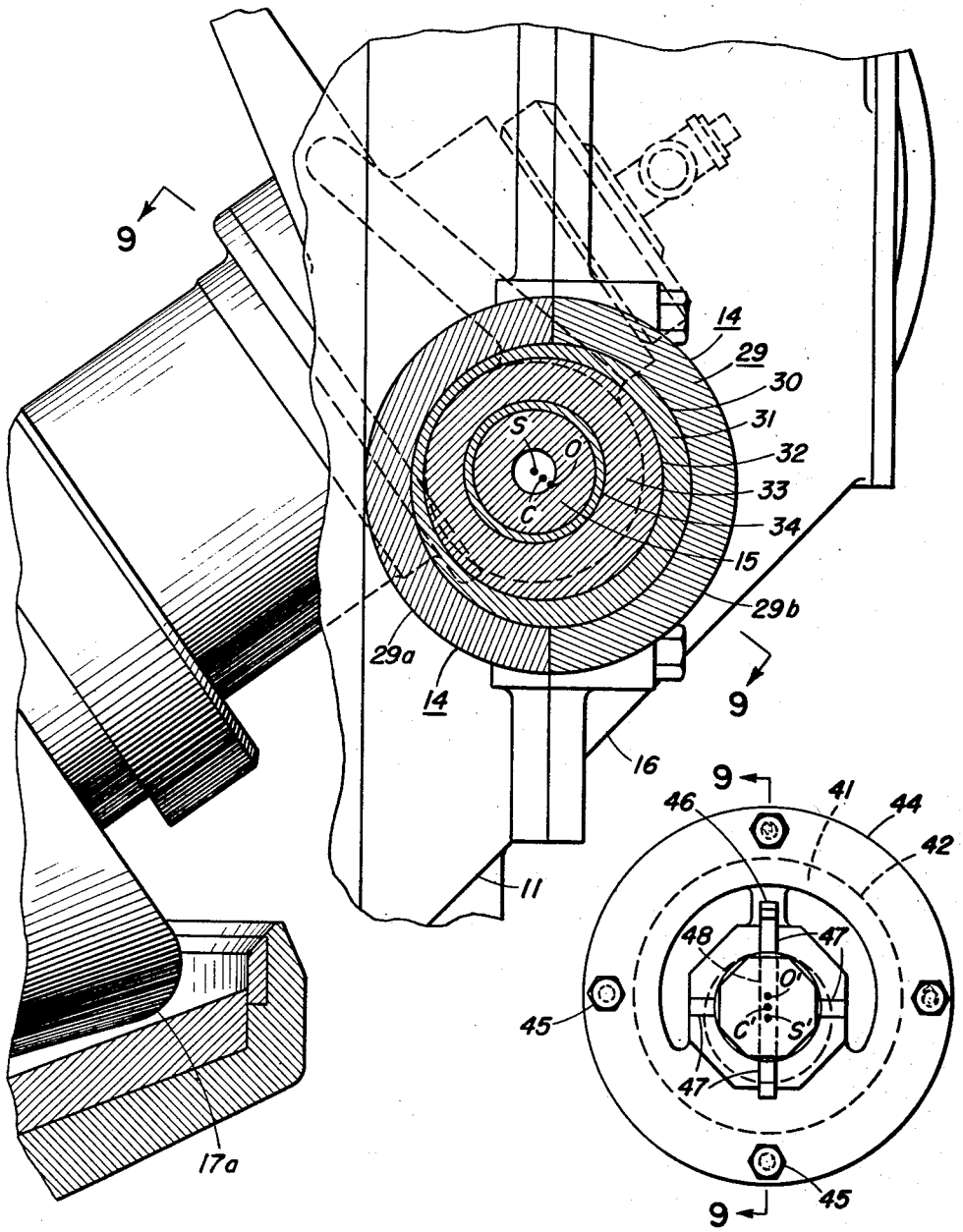



Fig. 10.

Fig. 6.

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Fig. 9.

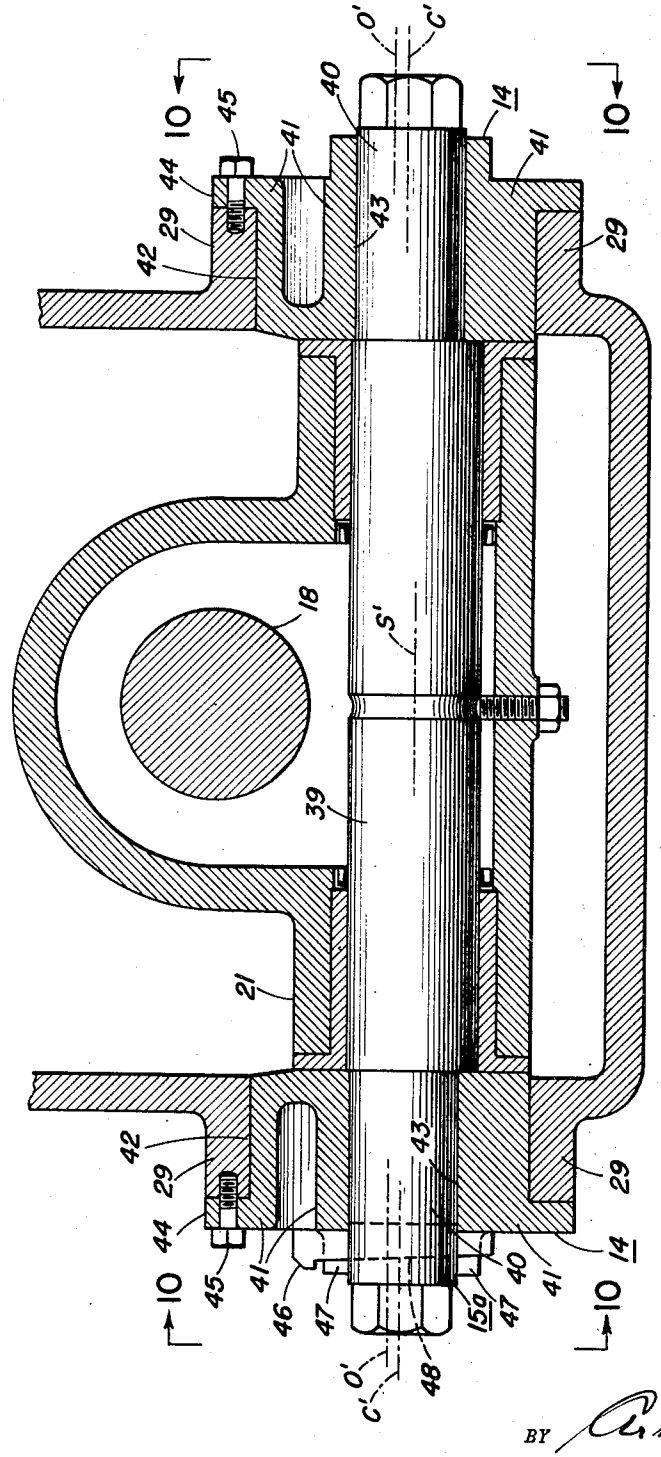
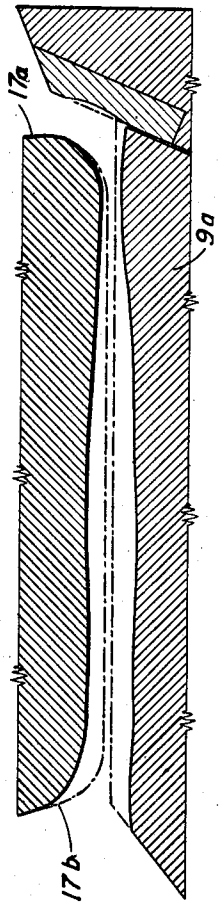



Fig. 11.




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BY Arthur O. Fiel

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United States Patent Office 2,848,170 Patented Aug. 19, 1958



2,848,170

# WEAR COMPENSATING MEANS FOR PULVERIZING MILLS OF THE RING-ROLLER TYPE

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Application July 24, 1953, Serial No. 369,979

11 Claims. (Cl. 241—117)

This invention relates to improvements in mills in which material is ground between a roll and a grinding ring and is particularly concerned with improved means to compensate for the wear in both the roll and the grinding ring.

In mills of the above type the roll and grinding ring when new are generally so adjusted that their nearest surfaces are substantially parallel. After a period of use these surfaces generally wear unevenly so that the surface of one end of the roll is farther from the ring surface than the surface of the other end. As a result, the effectiveness of grinding the material is undesirably diminished.

It is an object of this invention to provide novel means to adjust the roll of a roller mill to compensate for the wear of the grinding roll and ring.

Additional objects and advantages will become apparent from the following description of illustrative embodiments of the invention when read in conjunction with the accompanying drawings wherein:

Fig. 1 is a vertical cross section through a roller mill of the type known as a bowl mill.

Fig. 2 is a partial section taken on line 2—2 of Figs. 1 and 4, showing the roller trunnion assembly in a low position of adjustment.

Fig. 3 is a partial section taken on line 3—3 of Figs. 1 and 5, showing the roller trunnion assembly in an intermediate position of adjustment.

Fig. 4 is a cross section of the trunnion bearing taken on line 4—4 of Fig. 2.

Fig. 5 is a cross section of the trunnion bearing taken on line 5—5 of Fig. 3.

Fig. 6 is a cross section of the trunnion bearing taken on line 6—6 of Fig. 2, but showing the bearing in a high position of adjustment.

Fig. 7 is an end view of the trunnion shaft bearing taken on line 7—7 of Fig. 2 showing means for securing 64 different adjustment positions.

Fig. 8 is an end view of the trunnion shaft bearing taken on line 8—8 of Fig. 2 but showing means for securing 72 different adjustment positions.

Fig. 9 is a partial section (similar to Figs. 2 and 3) taken on line 9—9 of Figs. 1 and 10 showing a roller trunnion shaft assembly embodying another form of the invention.

Fig. 10 is an end view of the trunnion shaft bearing taken on line 10—10 of Fig. 9.

Fig. 11 is a partial longitudinal section through the roll, showing the unevenness of wear of the surface of the roll and that of the grinding ring after many hours of operation.

The invention as herein disclosed is, by way of example, applied to a mill of the type known as the bowl mill. The mill housing generally designated as H in Fig. 1 comprises a base 2 within which is mounted a vertical shaft 3 supported in bearings 4 and 5, and having secured to its lower end worm wheel 6 which engages worm 7 mounted on motor driven shaft 8. Rotation of



shaft 8 accordingly rotates bowl 9 which is mounted on the upper end of the shaft 3. Bowl 9 is equipped with grinding ring 9a fabricated of wear resisting material.

Mounted on the base 2 are superimposed housing portions 10 and 11. The uppermost portion 11 is capped by a cover 12 and the middle portion 10 has an opening 13 in the peripheral wall thereof for the admission of air into the mill. Supported within upper portion 11 is bearing assembly 14. This bearing of which enlarged sections are shown in Figs. 1, 2, 3, 4, 5, 6 and 9 rotatably supports roller assembly R on trunnion shaft 15. Access to and removal of roller assembly R from the housing is had through an opening in housing 11 which is closed by cover 16.

There may be one or more roller assemblies R, depending on the size of the mill. In the illustrative embodiment of Fig. 1 but one of three such assemblies is shown. Each roller assembly R includes a roller 17 rotatably supported by bearings 19 on roller shaft 18 which is mounted within the tapered portion 20 of an arm 21, see Fig. 1. The arm 21 in turn is mounted on the trunnion shaft 15 and has a projection 22 against which one end of a spring 23 bears to urge the arm 21 and therewith the shaft 18 and the roller 17 in a counterclockwise direction about the axis of the trunnion shaft 15. A set screw 24 passing through the cover 16 bears against the other end of the spring 23 to vary its compression and to limit the gap between the roller 17 and the grinding ring 9a.

Attached to the underside of cover 12 is a classifier 25 through which the material laden air is directed on its way to the mill outlet 26 and within which classifier the insufficiently pulverized material is separated. The air and sufficiently fine material entrained by the air pass through outlet 26 while the insufficiently fine material is returned through the bottom outlet 27 of classifier 25 into the bowl 9 to be further pulverized.

A chute 28 is fastened to the housing 11 and extends from a material feeder, not shown, downwardly and inwardly into the mill to a point adjacent the bottom outlet 27 of the classifier 25. The material to be ground is delivered via this chute 28 onto the central portion of the bowl 9 adjacent the rejected material deposited in the bowl through outlet 27 of the classifier. The rotation of bowl 9 causes the material in the bowl to move radially outward onto the grinding ring 9a while it rotates with the bowl. When the material reaches the roller 17 it is ground between roller 17 and ring 9a.

It has been found that both the roller 17 and the ring 9a do not wear uniformly, one end of the roller's face departing from the ring more than the other. This unequal wear increases the average gap between roller and ring and thereby reduces the efficiency of grinding.

Heretofore it was necessary to remove the roll 17 and ring 9a when the ring and roll were partly worn because of loss in grinding capacity by the mill. By means of the invention this wear is compensated for resulting in prolonging the useful life of the roll and the ring approximately three fold.

According to the invention, novel means are provided to adjust the angularity of the contact face of the roller 17 with respect to the face of the ring 9a, so that the two surfaces again become approximately parallel, whereby the original high grinding efficiency is restored. This adjustment is accomplished without removing the roller assembly R from the mill.

Originally, with new rollers 17 and ring 9a, the axis of the trunnion shaft 15 may be placed in a low position as shown in Figs. 2 and 4. The roller 17 will then have its contact surface aligned approximately parallel to the surface of ring 9a. After considerable use the roller 17 and ring 9a may wear to a surface approximately as

shown in Figs. 5 and 11. Here it will be noted that greater wear is experienced by the inner portions of the contact surfaces of the roller and ring, namely those which are closer to the mill's axis. The dashed and dotted line shows the original roller surface.

Figs. 2 and 4, 3, 5 and 6 show one form of the invention for raising and lowering the trunnion shaft **15**, thereby tilting the roller **17** for the purpose of parallelly aligning the adjacent surfaces of the worn roller **17** and ring **9***a*. To serve that end each bearing assembly **14** comprises an outer split sleeve **29**, one half **29***a* of which (see Fig. 4) is part of the upper mill housing **11** and the other half **29***b* is fastened to the cover **16**. The inner cylindrical bore of split sleeve **29** slidingly fits the outer cylindrical surface **30** of a first eccentric sleeve **31** whose inner cylindrical surface **32** is eccentric with respect to its outer surface **30**. The center O of the outer cylindrical surface **30** remains stationary when sleeve **31** is rotated within the split sleeve **29**, but the center C of the inner eccentric cylindrical surface **32** will rotate about center O in a circuit of radius OC. A second eccentric sleeve **33** is slidingly fitted within sleeve **31** and has an inner surface **34** eccentric with surface **32** of sleeve **31**. Said inner cylindrical surface **34** has a center S which also is the center of shaft **15**. When the first eccentric sleeve **31** is rotated through 180 deg. above center O, center C will move from the low position shown in Fig. 4 (below center O) to the high position shown in Fig. 6 (above center O). Sleeve **33** and shaft **15** when fixed therein will change position in a like manner. Thus the shaft **15** may be moved from a low to a high position thereby increasing the angle of inclination between the roller axis and grinding surface of ring **9***a*. The outer portion **17***a* of the roller **17** may accordingly be raised with respect to the inner portion **17***b* (see Figs. 1 and 11). Accordingly the center S of shaft **15** will move in a circle having a radius OS and about the center O.

If rotating sleeve **31** only through about 90 deg. (instead of 180 deg.) from the low position shown in Fig. 4, then the roller **17** will be displaced transversely of the ring **9***a* by a distance which approximates OS or the radius of the circle in which the shaft center S moves. This displacement may be permissible within certain limits of wear of roller **17** and ring **9***a*, but under conditions of greater wear a larger eccentric movement of the shaft **15** will be required. Such larger adjustment may cause an excessive transverse displacement of the roller **17** with respect to the ring **9***a*.

To meet these conditions the invention as earlier described provides a second sleeve **33** whose outer cylindrical surface fits into the inner surface **32** of first sleeve **31**, and has an inner cylindrical surface **34** which is eccentric with respect to the outer cylindrical surface. The center C of the outer cylindrical surface of second sleeve **33** remains stationary when the latter is rotated within the first sleeve **31** (provided sleeve **31** remains stationary). But the center S of the inner eccentric cylindrical surface **34** will rotate about center C in a circle having a radius CS. By rotating the first eccentric sleeve **31** to move the center C in one direction and rotating the second eccentric sleeve **33** to move the center S in the opposite direction the two eccentricities may be made to offset each other in the direction of the axis of roller **17**. When the two eccentricities of sleeves **31** and **33** are made about the same (when radius OC about equals radius CS), the axis S of the trunnion shaft **15** may be made to travel up and down along a line (approximately parallel to line **2—2**) without causing any substantial movement of the roller **17** transversely of the grinding ring **9***a*. This desirable result permits a greater radius of the eccentric circles OC, CS and therefore a compensation for greater wear of roller **17** and ring **9***a*. By so combining the movements of the two eccentric sleeves **31**, **33** the total movement of shaft **15** becomes the sum of the diameters of the eccentric circles or two times (OC plus CS) (Figs. 4 and 6).

Figs. 3 and 5 show an intermediate position of the shaft **15**, the center C having been raised from its position shown in Fig. 4 to a level with center O by means of rotating sleeve **31** and the center S having been raised above center O by means of rotating sleeve **33**. By so raising the horizontal shaft **15**, the roller shaft **18** has been tilted counterclockwise thereby tilting the roller **17** to bring its surface when worn as illustrated in Fig. 11 to a position approximately parallel to the worn surface of the grinding ring **9***a*. Note that the center S (Fig. 5) has moved on a line almost normal to the axis of the roller thereby avoiding any substantial movement of the roller **17** transversely of the grinding ring **9***a*.

Means are provided to adjustably position and lock both eccentric sleeves **31**, **33** with respect to the split sleeve **29** and with each other as will now be described.

One such means, shown in Figs. 2 and 7, comprises providing sleeve **31** with radially outwardly extending flange **35** and a radially inwardly extending flange **36**. Stud bolts **37**, **38** (Figs. 2, 7 respectively fasten the outer flange **35** to the hub **29** and the inner flange **36** to the inner sleeve **33**.

Fig. 7 shows four stud bolts **37** placed around the flange **35** at angles of 90 deg. on a circle about the center O. Four stud bolts **38** are placed around the flange **36** at angles of 90 deg. on a circle about the center C. Both eccentric sleeves **31** and **33** may thereby be fastened in the low and high positions shown respectively in Figs. 4 and 6, or in two more positions at right angles thereto. Additional threaded holes **37***a*, **38***a* are provided respectively in the split sleeve **29** and in sleeve **33** for reception of the studs **37**, **38** to provide intermediate rotational positions for the sleeves **31**, **33**. The shaft **15** will accordingly be held by the sleeves **31**, **33** in either its low or high position or in any one of the sixty-two additional various intermediate positions.

Fig. 8 is similar to Fig. 7 except that the sleeves **31** and **33** may now be fastened in the low and high positions of the shaft **15** shown respectively in Figs. 4 and 6, or in any one of the seventy additional intermediate positions. For this purpose twelve stud bolts holes **37***h* are placed around flange **35** spaced at angles of 30 deg. and on a circle about the center O. Six stud bolt holes **38***h* are placed around the flange **36** spaced at angles of 60 deg. on a circle about the center C. Threaded holes in the split sleeve **29** and in the sleeve **33** are provided in alignment with some or all of the stud holes **37***h*, **38***h* for the reception of the studs **37**, **38** (three here shown in each sleeve **29** and **33**).

Obviously only some of the sixty-four positions of Fig. 7 and the seventy-two positions of Fig. 8 will preferably place the center S of shaft **15** on or near a line normal to the axis of roll **17**, as discussed herein above, to substantially avoid radial displacement of the roll with respect to center to rotation of bowl **9**. By providing a greater number of equally spaced holes in flanges **35** and **36** a greater number of positions could of course be made available. However the adjustment possible in the Fig. 7 or the Fig. 8 arrangement appears sufficiently flexible to meet any practical need.

Fig. 9 shows another embodiment of the invention wherein the trunnion shaft **15***a* has a middle portion **39** which is eccentric with respect to its end or bearing portions **40** within the bearings **14**. A sleeve **41** has an outer cylindrical surface **42** fitting into a cylindrical bore in split sleeve **29** and has an inner cylindrical surface **43** which serves as a bearing for shaft end **40**. The inner cylindrical surface **43** (having center C) of each sleeve **41** is eccentric with respect to the outer cylindrical surface **42** (having center O'). As explained hereinabove in connection with description of sleeves **31**, the rotation of sleeve **41** in split sleeve **29** will in like manner cause the shaft **15***a* to move up or down with respect to the

sleeve 29. Also the rotation of the shaft 15*a* will cause the inner eccentric portion 39 to move up or down. The two movements of the eccentric centers of the sleeve 41 and of the shaft portion 39 may be made to combine in a similar manner as the movements of sleeves 31 and 33 as earlier set forth herein. In Fig. 10, which is similar to Fig. 7, the flange 44 of sleeve 41 is provided with stud bolts 45 which fasten the sleeve 41 to the split sleeve 29. A key 46 passes through slots 47 in a boss extending from the sleeve 41 and passes through a keyway 48 cut diametrically through the end of a shaft 15*a*, thereby locking the sleeve and shaft against relative rotation. In this embodiment there are four stud bolts 45 placed around the flange 44 at angles of 90 deg. on a circle about the center O' of the cylindrical surface 42 of sleeve 41, and there are two slots 47 at right angles to one another, all as shown. By rotating the shaft 15*a* to cause the center S' of the middle shaft portion 39 to move in one direction and rotating the sleeve 41 to cause its eccentric center C' to move in the opposite direction, the axis S' of the shaft portion 39 may be made to travel in a substantially straight line because the two eccentricities of the shaft portion 39 and of the sleeve 41 may be made to offset each other. The center S' of the trunnion shaft portion 39 may therefore be made to travel substantially up and down along a line about at right angles to the roller shaft 18 so as to avoid any substantial movement of the roller 17 transversely of the ring 9*a*. Obviously, where conditions permit, the eccentric sleeve 41 may be omitted and the eccentric portion 39 of shaft 15*a* be alone used to raise or lower the hub 21 of the roller shaft 18 and therewith tilt the roller 17.

The radial arm projection 22 on arm 21 of the roller assembly R (see Fig. 1) will move up and down with the adjustment of the trunnion shaft 15 and is so placed that its surface bearing against the end of the spring 23 will remain substantially normal to the movement of the shaft 15 for any adjusted position thereof. No substantial adjustment of the spring 23 with respect to the arm 22 is therefore necessary when a change is made in the position of the shaft 15.

According to the invention an adjustment in the angularity of the adjacent face of a roll 17 with respect to the grinding surface of ring 9*a* to thereby compensate for wear so as to bring them into an approximately parallel relation, may be accomplished without the removal of the roller assembly R or spring 23 from the mill. Furthermore a substantially gas tight seal is maintained around the trunnion shaft bearing, permitting the mill casing to be maintained under pressure.

While I have shown and described the invention applied to a mill known as the "bowl mill," it is to be understood that it may be applied to other roller mills of the type in which material is ground between a roller and a grinding ring, and while the preferred embodiment of the invention has been shown and described it is to be understood that such showing is merely illustrative and not restrictive and that variations and modifications may be made therein without departing from the spirit and scope of the invention.

I claim:

1. In a pulverizing mill having a grinding ring and a grinding roll, the grinding surface of the ring being in parallel relation with the grinding surface of the roll when comparatively new but subjected to unequal wear through use thereby destroying said parallel relation, the combination of a shaft on which said roll is mounted for rotation about the axis thereof, a trunnion shaft operatively connected to said roll shaft transversely thereto and supporting said roll shaft at a point remote from said roll, a bearing supporting said trunnion shaft at a predetermined distance from the said grinding surface of said grinding ring, the axis of said roll shaft forming an acute angle with the said grinding surface of said ring, and means for altering both said predetermined distance and said angle, whereby the non-parallel relation of the said worn grinding surfaces is adjusted to approximate parallel relation thereof.

2. In a pulverizing mill having a grinding ring and a grinding roll, the grinding surface of the ring being in parallel relation with the grinding surface of the roll when comparatively new but subjected to unequal wear through use thereby destroying said parallel relation, the combination which comprises a shaft on which said roll is mounted for rotation about its axis, a trunnion shaft mounted on said shaft at a point remote from said roll and at right angles to said roll shaft, bearing means for rotatably supporting said trunnion shaft at a predetermined distance from said ring's grinding surface, the axis of said roll shaft forming an acute angle with said ring's grinding surface, said bearing means including a cylindrical sleeve rotatably mounted in said bearing means and having an inner bearing surface for said trunnion shaft, and an outer cylindrical surface cooperating with said bearing means, said inner shaft bearing surface being eccentric with respect to said outer cylindrical surface and means to selectively fasten said sleeve to said bearing means in various rotational positions, whereby upon rotation of said sleeve in said bearing means said trunnion shaft may be moved generally up and down and said angle and said predetermined distance may be increased or decreased and the adjacent grinding surfaces of said bowl and said roll may be varied from their original parallel relation to compensate for any uneven wear of said surfaces to thereby re-establish approximately a parallel relation of said worn surfaces.

3. In a pulverizing mill having a grinding ring and a grinding roll, the grinding surface of the ring being in parallel relation with the grinding surface of the roll when comparatively new but subjected to unequal wear through use thereby destroying said parallel relation, a shaft on which said roll is mounted for rotation about the axis thereof, a trunnion shaft rotatably connected to said roll shaft at right angles thereto supporting said roll shaft at a point remote from said roll, the combination which comprises bearing means supporting the ends of said trunnion shaft at a predetermined distance from said ring's grinding surface, the axis of said roll shaft forming an acute angle with said ring's grinding surface, said end portions being eccentric with respect to said trunnion shaft's middle portion, whereby by rotating said trunnion shaft the middle portion thereof is moved in a direction normal to the axis thereof and said angle and said distance is increased or decreased and the non-parallel relation of the aforesaid worn grinding surfaces is adjusted to approximate parallel relation thereof.

4. In a pulverizing mill having a grinding ring and a grinding roll, the grinding surface of the ring being in parallel relation with the grinding surface of the roll when comparatively new but subjected to unequal wear through use thereby destroying said parallel relation, a shaft on which said roll is mounted for rotation about the axis thereof, a trunnion shaft rotatably connected to said roll shaft at right angles thereto and supporting said roll shaft at a point remote from said roll, the combination which comprises bearing means supporting the ends of said trunnion shaft at a predetermined distance from said ring's grinding surface, the axis of said roll shaft forming an acute angle with said ring's grinding surface, said end portions being eccentric with respect to said trunnion shaft's middle portion, and an eccentric sleeve cooperating with said bearing means for moving said trunnion shaft in a direction normal to the axis thereof, and for increasing or decreasing said angle and said predetermined distance, whereby the non-parallel relation of the worn grinding surfaces is adjusted to approximate parallel relation thereof.

5. In a pulverizing mill, a casing, a bowl shaped mem-

ber having a grinding surface adjacent its periphery, a vertical shaft on which said bowl is mounted axially for rotation within the plane of the bowl, at least one roll mounted on said casing by supporting means, said roll being so supported by said means that its original grinding surface nearest the bowl is substantially parallel to said bowl's original grinding surface, said roll rotating upon contact with the material being ground against said bowl's grinding surface when said bowl is rotated, means to rotate said bowl, means urging said shaft and roll toward said grinding surface, said roll supporting means comprising a shaft on which said roll is mounted for rotation about its axis, a member in which said roll shaft is mounted, a trunnion shaft mounted in said member for rotation therein at a point remote from said roll and at right angles to said roll shaft, bearings mounted on said casing for supporting the ends of said trunnion shaft at a predetermined distance from said bowl's grinding surface, the axis of said roll shaft forming an acute angle with said bowl's grinding surface, the middle portion of the trunnion shaft supporting said member being eccentric with respect to its shaft ends, and means to selectively fasten said trunnion shaft in various rotational positions, said eccentricity of said trunnion shaft providing upon rotation means for moving said member in direction generally at right angles to said roll shaft and for increasing or decreasing said angle and said predetermined distance, whereby the adjacent grinding surfaces of said bowl and said roll may be varied from their original substantially parallel relation to compensate for any uneven wear of said surfaces to thereby re-establish approximately parallel relation of said worn surfaces.

6. In a pulverizing mill, a casing, a bowl shaped member having a grinding surface adjacent its periphery, a vertical shaft on which said bowl is mounted axially for rotation within the plane of the bowl, at least one roll mounted on said casing by supporting means, said roll being so supported by said means that its original grinding surface nearest the bowl is substantially parallel to said bowl's original grinding surface, said roll rotating upon contact with the material being ground against said bowl's grinding surface when said bowl is rotated, means to rotate said bowl, means urging said shaft and roll toward said grinding surface, said roll supporting means comprising a shaft on which said roll is mounted for rotation about its axis, a member in which said roll shaft is mounted, a trunnion shaft mounted in said member for rotation therein at a point remote from said roll and at right angles to said roll shaft, bearings mounted on said casing supporting the ends of said trunnion shaft at a predetermined distance from said bowl's grinding surface, the axis of said roll shaft forming an acute angle with said bowl's grinding surface, the middle portion of the trunnion shaft supporting said member being eccentric with respect to its shaft ends, and means to selectively fasten said trunnion shaft to said casing in various rotational positions, said eccentricity of said trunnion shaft providing upon rotation means for moving said member in direction generally at right angles to said roll shaft and for increasing or decreasing said angle and said predetermined distance, whereby the adjacent grinding surfaces of said bowl and said roll may be varied from their original substantially parallel relation to compensate for any uneven wear of said surfaces to thereby re-establish approximately parallel relation of said worn surfaces.

7. In a pulverizing mill, a casing, a bowl shaped member having a grinding surface adjacent its periphery, a vertical shaft on which said bowl is mounted axially for rotation within the plane of the bowl, at least one roll mounted on said casing by supporting means, said roll being so supported by said means that its original grinding surface nearest the bowl is substantially parallel to said bowl's original grinding surface, said roll rotating upon contact with the material being ground against said bowl's grinding surface when said bowl is rotated, means to rotate said bowl, means urging said shaft and roll toward said grinding surface, said roll supporting means comprising a shaft on which said roll is mounted for rotation about its axis, a member in which said roll shaft is mounted, a trunnion shaft mounted in said member for rotation therein at a point remote from said roll and at right angles to said roll shaft, bearings mounted on said casing supporting ends of said trunnion shaft at a predetermined distance from said bowl's grinding surface, the axis of said roll shaft forming an acute angle with said bowl's grinding surface, the middle portion of the trunnion shaft supporting said member being eccentric with respect to its shaft ends, and means to selectively fasten said trunnion shaft to said member in various rotational positions, said eccentricity of said trunnion shaft providing upon rotation means for moving said member in direction generally at right angles to said roll shaft and for increasing or decreasing said angle and said predetermined distance, whereby the adjacent grinding surfaces of said bowl and said roll may be varied from their original substantially parallel relation to compensate for any uneven wear of said surfaces to thereby re-establish approximately parallel relation of said worn surfaces.

8. In a pulverizing mill, a casing, a bowl shaped member within said casing having a grinding surface adjacent the inner periphery of said bowl, means for rotating said bowl about a vertical axis thereof, a grinding roll mounted above said grinding surface in operative relation therewith, means supporting said roll from said casing so that the grinding surface thereof is substantially parallel to said bowl's grinding surface, means to rotate said bowl and said roll upon contact with the material being ground against said bowl's grinding surface, the parallel relation of said bowl's and roll's grinding surface being destroyed after substantial use of said mill, the combination which comprises a shaft on which said roll is mounted for rotation about the axis thereof, a trunnion shaft mounted on said roll shaft at a point remote from said roll and transversely to the axis of said roll shaft, bearing means cooperating with said casing for supporting said trunnion shaft at a predetermined distance from said bowl's grinding surface, the axis of said roll shaft forming an acute angle with said bowl's grinding surface, said bearing means including two cylindrical sleeves rotatably mounted within each other and in said bearing means each having an inner cylindrical surface and an outer cylindrical surface, said inner cylindrical surfaces being eccentric with respect to said outer cylindrical surfaces, and means to selectively fasten said sleeves to said bearing means in various rotational positions, whereby upon rotation of said sleeves in said bearing means said trunnion shaft may be moved generally up and down, said angle and said predetermined distance increased or decreased and the adjacent grinding surfaces of said bowl and said roll may be varied from their original parallel relation to compensate for any uneven wear of said surfaces to thereby re-establish an approximate parallel relation of said worn surfaces.

9. In a pulverizing mill having a grinding ring and a grinding roll, the grinding surface of the ring being in parallel relation with the grinding surface of the roll when comparatively new but subjected to unequal wear through use thereby destroying said parallel relation, the combination of a shaft on which said rolls is mounted for rotation about the axis thereof, a trunnion shaft operatively connected to said roll shaft transversely thereto and supporting said roll shaft at a point remote from said roll, a bearing supporting said trunnion shaft at a predetermined distance from said grinding surface of said ring, the axis of said roll shaft forming an acute angle with the said grinding surface of said ring, first eccentric means rotatably cooperating for imparting a displacing motion to the pivot center of said trunnion

shaft, and second eccentric means rotatably cooperating with said first eccentric means to controllably adjust the vertical component and extend the horizontal component of said displacing motion and increase or decrease said angle and said distance; whereby the non-parallel relation of the worn grinding surfaces is adjusted to approximate parallel relation thereof.

10. Apparatus as defined in claim 9 in which said first eccentric means comprise a first eccentric sleeve rotatably cooperating with trunnion shaft and bearing and said second eccentric means comprise a second eccentric sleeve rotatably cooperating with said first sleeve and bearing.

11. Apparatus as defined in claim 9 wherein said first eccentric means comprise the provision on said trunnion



shaft of an eccentric pivot cooperating with said bearing and said second eccentric means comprise an eccentric sleeve rotatably cooperating with said eccentric pivot and with said bearing.

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