Sept. 20, 1932. J. CRITES 1,877,823

CENTRAL LUBRICATING SYSTEM FOR ROLLER MILL ROLLERS

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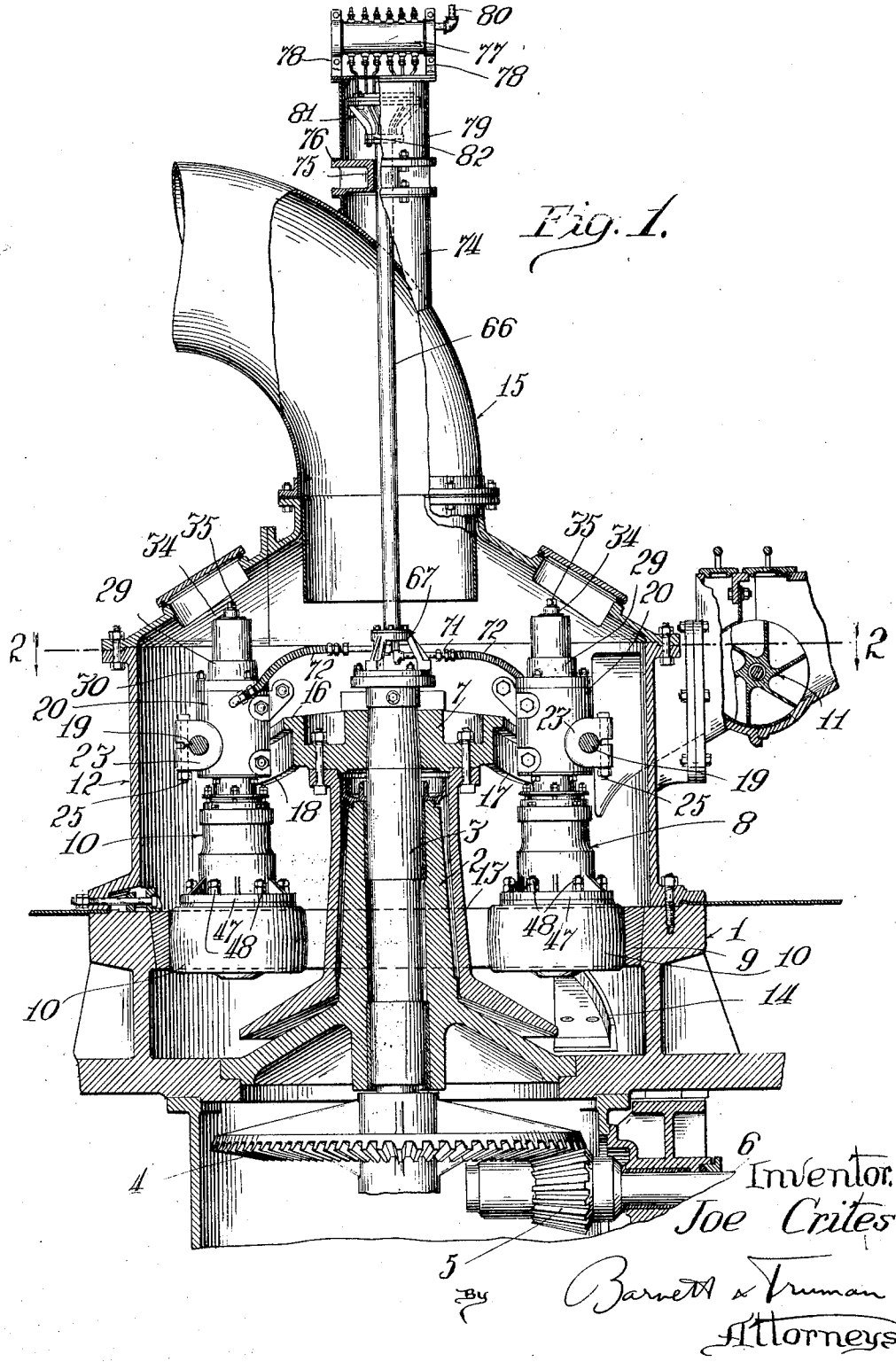


Fig. 1.

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Fig. 2.

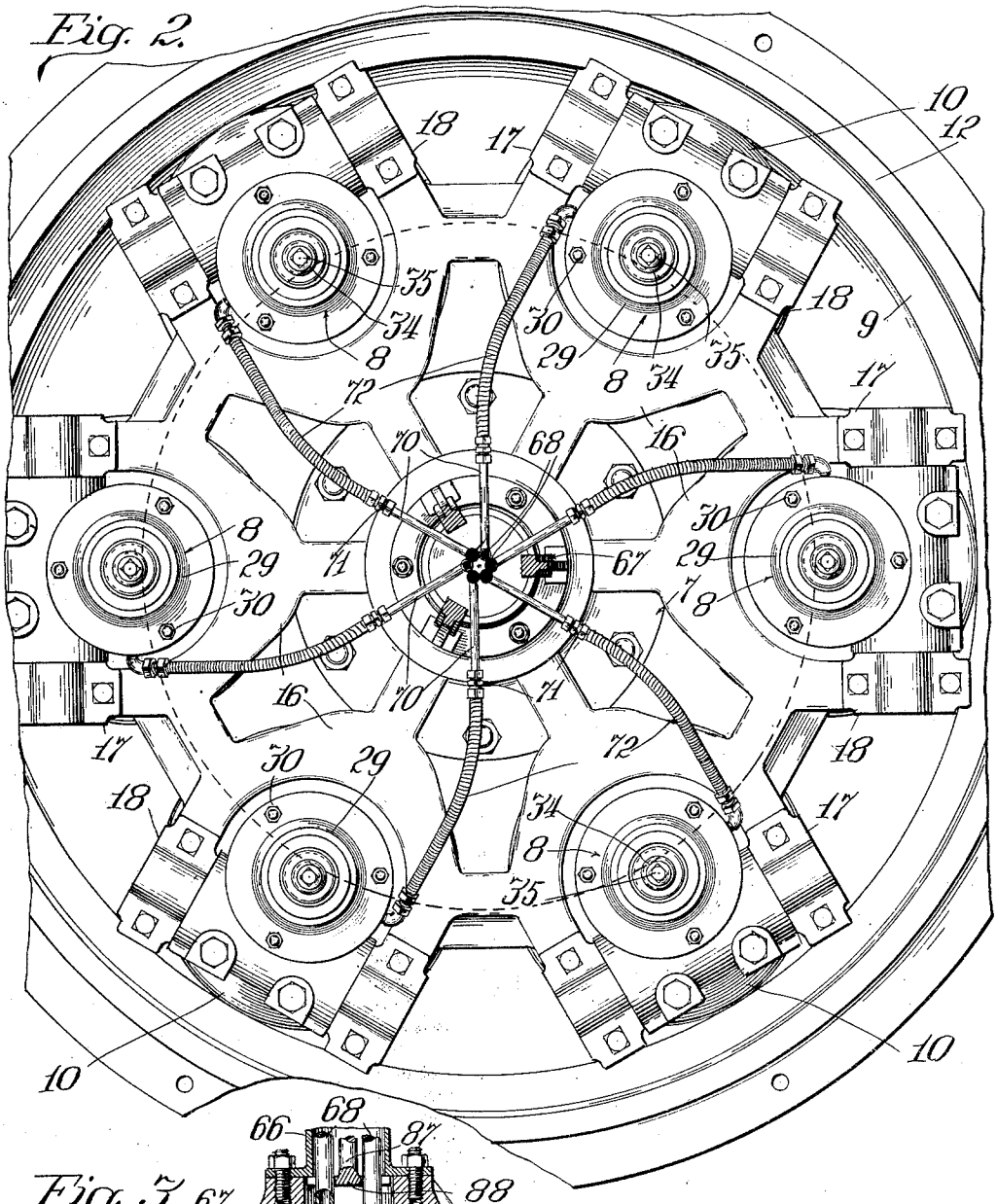


Fig. 3.

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Fig. 4.

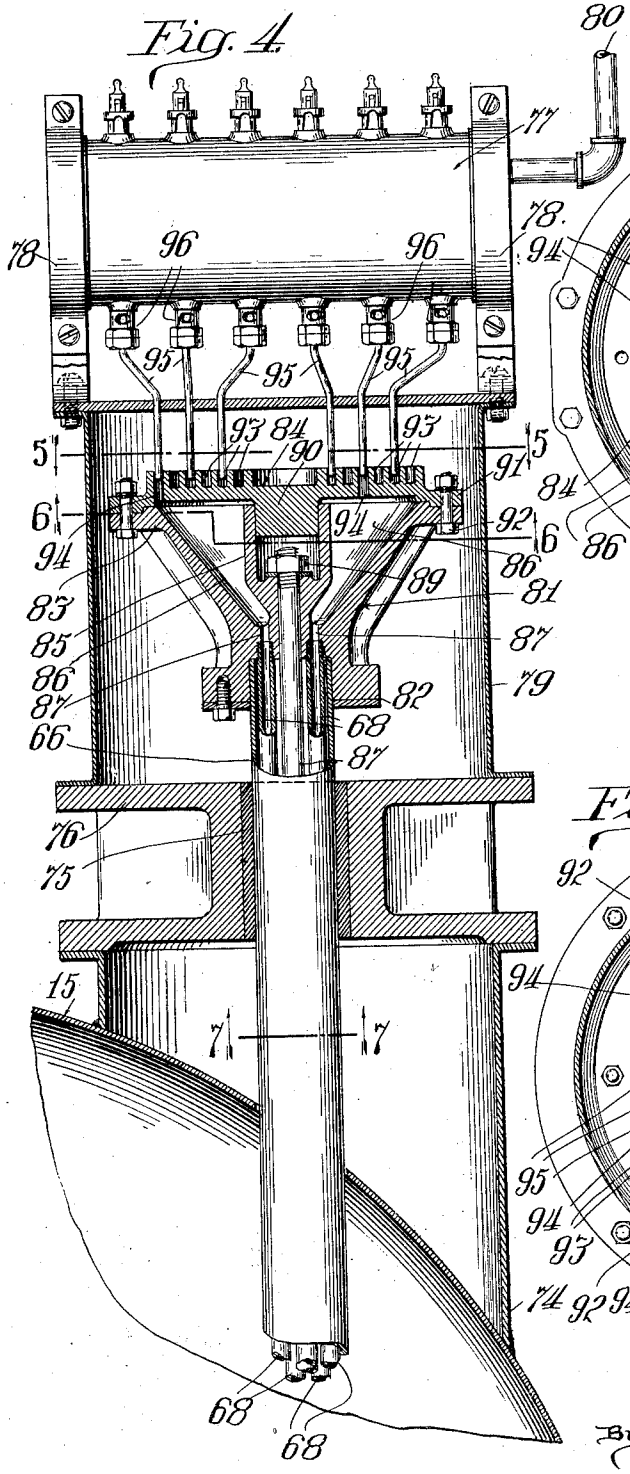


Fig. 6.

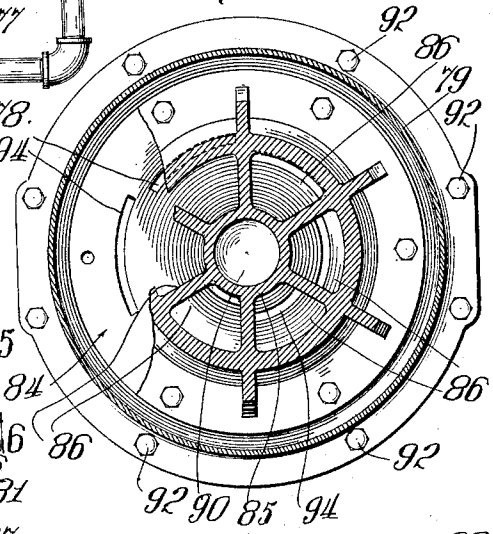


Fig. 7.

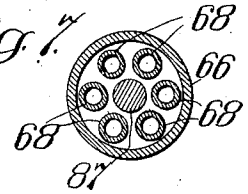
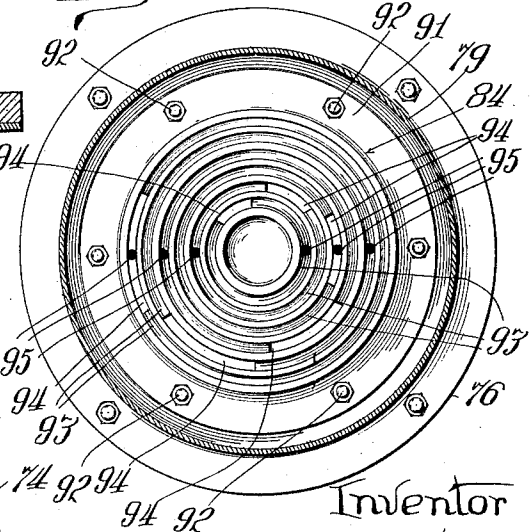


Fig. 5.



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Fig. 8.

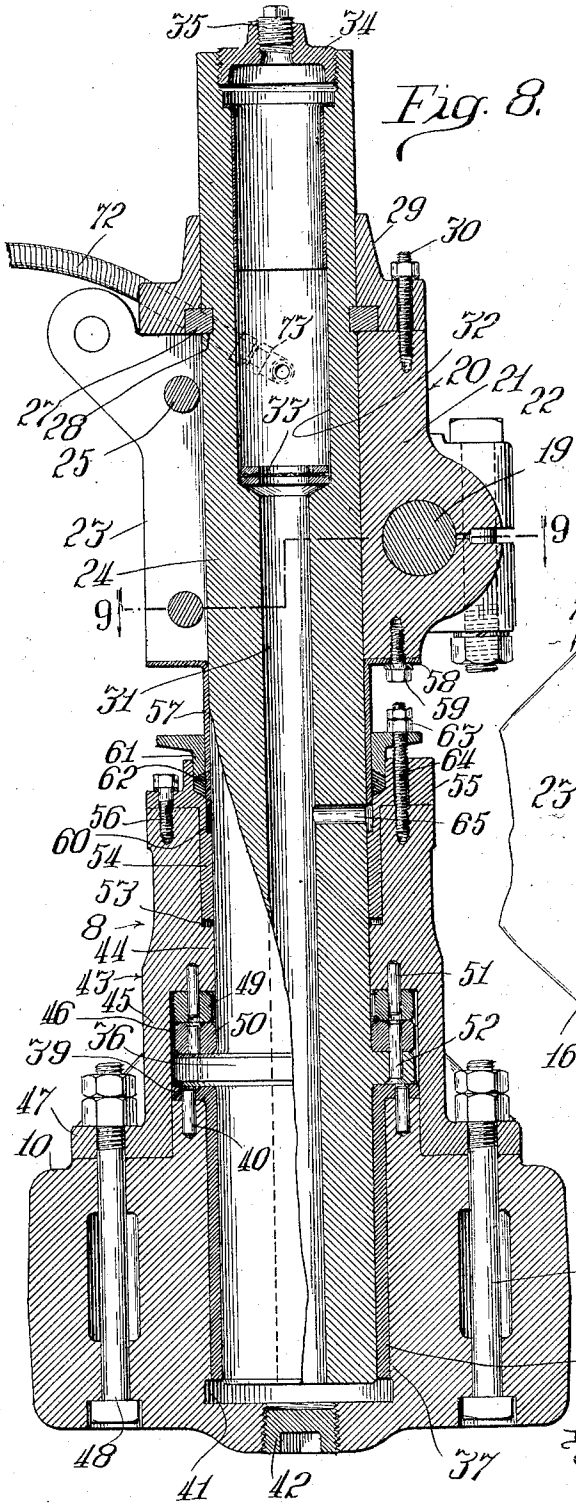
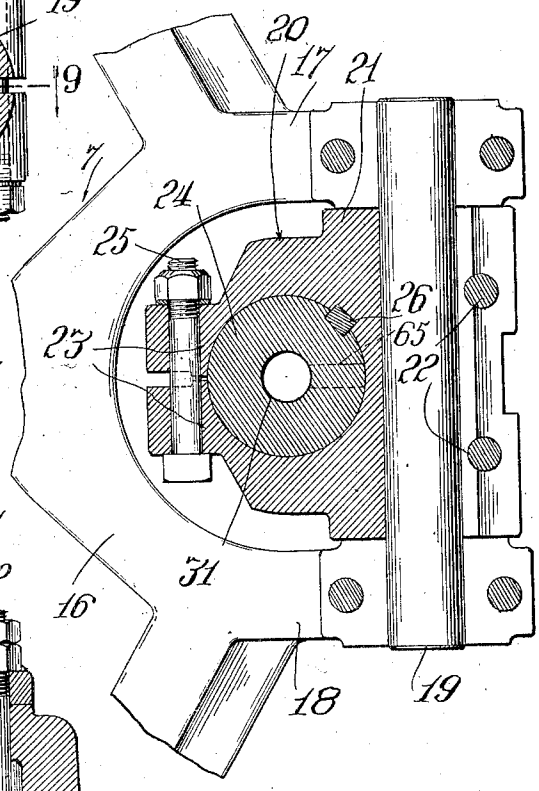


Fig. 9.



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UNITED STATES PATENT OFFICE

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CENTRAL LUBRICATING SYSTEM FOR ROLLER MILL ROLLERS

Application filed February 6, 1928. Serial No. 252,223.

This invention relates to a new and improved central lubricating system for the bearings of the several rollers of a pulverizing mill of the general type shown, for example, in the patent to Raymond et al. 1,573,191, granted February 16, 1926. In a mill of this type, a plurality of pulverizing rollers are pivotally suspended in a circular series from a frame or spider which rotates about a vertical axis, the rollers swinging out by centrifugal force against the inner surface of a fixed circular bull ring, whereby the material caught between the ring and rollers is pulverized. Means is provided for suspending each individual roller from the spider so that it may rotate about its own axis, and a self-contained lubricating system is usually provided for supplying lubricant to the bearings which rotatably support the roller. According to the present invention, means are provided for distributing lubricant from a single central reservoir (which in the preferred form of the invention is stationary and located outside of the mill) to the several bearings of each individual roller.

The principal object of the invention is to provide an improved central lubricating system for a pulverizing mill of this type, as disclosed and claimed hereinafter.

Another object is to provide improved means for distributing lubricant from a stationary reservoir to a plurality of movable oil-distributing conduits, more particularly to a plurality of conduits which rotate about a common axis.

Another object is to provide an improved method of lubricating the bearings of the several rollers of a pulverizing mill of the type referred to herein.

Other objects and advantages of this invention will be more apparent from the following detailed description of one approved form of the apparatus.

In the accompanying drawings:

Fig. 1 is a central vertical section through the assembled mill and lubricating apparatus.

Fig. 2 is a plan view, on a larger scale, of the rotating assembly in the mill, the upper cover of the mill and the lubricating means being removed, the view being taken substantially on the line 2—2 of Fig. 1.

Fig. 3 is a detail view of the distributing means positioned above the spider within the mill, the view being a central vertical section.

Fig. 4 is a view on a larger scale, mostly in central vertical section, of the distributing means outside of the mill for delivering oil from the central reservoir to the several distributing conduits.

Fig. 5 is a horizontal section taken substantially on the line 5—5 of Fig. 4.

Fig. 6 is a horizontal section, taken substantially on the line 6—6 of Fig. 4, and looking in the direction of the arrows.

Fig. 7 is a horizontal section, taken substantially on the line 7—7 of Fig. 4.

Fig. 8 is a longitudinal vertical section through one of the pulverizing roller assemblies.

Fig. 9 is a horizontal section, on an enlarged scale, taken substantially on the line 9—9 of Fig. 8.

The invention is here shown as applied to a roller pulverizing mill comprising a base or supporting framework 1 from which rises a central pedestal 2, in which is journaled the main central driven shaft 3. Shaft 3 is rotated by means of a beveled gear 4 fixed to its lower end and meshing with a bevel pinion 5 on a drive shaft 6. Mounted on the upper end of shaft 3 is the spider 7 from which are suspended the pulverizing rollers indicated generally at 8. In the present example, there are six of these rollers hung at equally spaced intervals about the periphery of the spider 7 so that they may rotate on their own axes and also swing in vertical planes passing through the axis of the shaft 3. When the assembly is rotated, the rollers swing outwardly by centrifugal force against the fixed bull ring 9, the pulverizing rollers 10 rolling along the inner surface of this bull ring to pulverize the material which is introduced by any suitable feeding means such as 11, mounted in the enclosing housing 12. A rotating skirt or shield 13 is suspended from spider 7 between the rollers and the pedestal 2, and a plurality of plows 14 carried by this skirt help to feed

the material up between the rollers 10 and bull ring 9 so that it may be pulverized. The pulverized material is drawn off in suspension in air through the outlet pipe 15 connected with the top of casing 12.

There are several approved ways in which the pulverizing rollers may be rotatably suspended from the spider 7, one approved example being shown in Figs. 8 and 9, and disclosed more in detail and claimed in the copending application of Vogel, Serial No. 252,237 filed February 6, 1928. Referring to Figs. 8 and 9 (in connection with Figs. 1 and 2), the spider 7 is formed with a plurality of outwardly projecting yokes 16, each of which comprises a pair of parallel arms 17 and 18 in which are pivotally mounted the ends of the trunnion shaft 19. The rocker 20 comprises two split collars positioned at right angles to one another, the collar 21 being clamped about the trunnion shaft 19 by means of bolts 22 and the collar 23 being clamped about the upper portion of roller supporting shaft 24 by means of bolts 25. A key 26 fitting mating grooves or recesses in the collar 23 and shaft 24 prevents relative rotation between the shaft 24 and the rocker 20. A split ring 27 is adapted to fit partially within an annular groove 28 in shaft 24, the projecting portion of ring 27 resting against the upper surface of the rocker 20. A collar 29 which surrounds the shaft 24 and is secured to the upper end of rocker 20 by bolts 30, fits over the projecting portion of ring 27, whereby longitudinal movement of shaft 24 through the rocker 20 in either direction is prevented.

A passage 31 for oil or other lubricant extends axially throughout the length of shaft 24, the upper portion of this passage being enlarged at 32 to form a lubricant reservoir, at the lower end of which is placed the oil-screen 33. The upper end of chamber 32 is closed by the screw plug 34, in which is placed a smaller plug 35 which may be removed for the insertion of lubricant.

An outwardly projecting roller-supporting collar 36 is formed on shaft 24 at a point intermediate its length, in the example here shown this collar being positioned nearer the lower end of the shaft than the upper end. The pulverizing roller 10 is hollowed out at 37 to surround the lower end of shaft 24, and in this chamber 37 is secured the bushing 38 adapted to rotatably engage the shaft. An outwardly projecting flange 39 at the upper end of bushing 38 overlaps the upper surface of roller 10 and is secured thereto by pins 40. The upper surface of flange 39 is adapted to engage the lower surface of collar 36, the cavity 37 within the roller 10 extending beneath the lower end of shaft 24 at this time to form a lubricant receiving well 41. A screw-plug 42 in the bottom of roller 10 permits access to well 41 when necessary.

The supporting sleeve or housing 43 has an intermediate portion 44 fitting about the shaft 24, from which the skirt 45 projects downwardly in spaced relation to the shaft to provide an annular chamber 46 above the collar 36. The outwardly projecting flange 47 at the bottom of skirt 45 engages the upper surface of pulverizing roller 10 and is secured thereto by means of a series of bolts 48, whereby the roller is suspended from the housing 43. A pair of thrust rings 49 and 50, which carry the load, are positioned in the annular chamber 46, the thrust ring 49 being secured by pins 51 to the housing 43, and the ring 50 being secured by pins 52 to the upper surface of collar 36.

The upper end of sleeve or housing 43 is hollowed out at 53 to receive the bushing sleeve 54 which has an enlarged head 55 secured to the upper end of sleeve 43 by a series of screw bolts 56. A sleeve or bushing 57 of chromium plated metal surrounds the shaft 24 and has an outwardly projecting flange 58 at its upper end secured by screw bolts 59 to the lower surface of rocker 20. The lower end of sleeve or bushing 57 projects partially into a correspondingly shaped annular recess 60 formed in the bushing 54. An annular gland 61 projects into a correspondingly shaped recess in the head 55 of bushing 54 to engage a packing ring or gasket 62. By adjusting the nuts 63 on a series of screw bolts 64, the gland 61 may be forced down to expand the packing ring 62 and force same into sealing engagement with the bushing 57 on the non-rotatable shaft 24. The hard metal sleeve 57 protects the shaft 24 from the wear of the gasket 62 and gland 61. It will be noted that the lower end of sleeve 57 does not project to the bottom of annular space 60 in bushing 54, so that an annular oil collecting chamber remains beneath the sealing ring or gasket 62, this space being connected by a radial passage 65 with the lubricant conduit 31 in the shaft 24.

In operation, the oil or other lubricant in reservoir 32 and conduit or passage 31 will flow down into the well 41, and thence will work its way up along the bearing surface between bushing 38 and shaft 24. This upward movement of the oil film around the shaft 24 is caused partly by the pressure of the head of oil in conduit 31, partly by the centrifugal action of the oil in well 41, and is perhaps aided by capillary action. This oil film will travel up around the collar 36 between the thrust rings 49 and 50, and up between shaft 24 and bushing 54 into the oil collecting chamber 60. When the roller is at rest, oil will flow out from central passage 31 through passage 65 to initially lubricate the sealing means and bushing 54. When the roller is in rotation and oil is passing up around shaft 24, the outward flow of oil through passage 65 will be partially counteracted and there will

ordinarily be no appreciable movement of oil through this passage. A very small amount of this oil will escape past the sealing gasket 62 and gland 61. The object of this sealing means is to prevent the excessive loss of oil or other lubricant, but it is desirable that there be a slight outflow of oil in order to prevent excesisve wear of the gasket and gland and combat the entrance of dust through this joint.

It will be noted that each roller assembly, such as has just been described by way of example, has a self-contained lubricating system, carrying its own supply of lubricant, which must be replenished by removing the plug 35 and inserting the lubricant while the machine is at rest. The present invention relates to a central lubricating system whereby lubricant may be continuously and automatically distributed to the several roller units of the mill while the mill is in operation, so that the supply of lubricant in each roller assembly will be automatically replenished as it is used. In the form of the invention here illustrated, a tubular shaft or housing 66 is mounted coaxially with and in vertical extension of the main driven shaft 3, by means of a frame or bracket 67 secured to the upper end of shaft 3. Shaft 66 houses and supports a plurality of tubular oil conduits or pipes 68, one for each of the roller assemblies 8. By means of a suitable fixture 69, horizontal pipe 70, and connections 71, a flexible pipe or conduit 72 is connected with the lower end of each of the vertical conduits 68. The other end of flexible conduit 72 is provided with suitable connections 73 tapped into one side of the reservoir 32 in the upper end of shaft 24.

The upper portion of tubular shaft 66 and the conduits carried thereby extends up through the lower portion of outlet pipe 15, and a sheet metal housing 74 mounted on the bend thereof, and is journaled at 75 in a bearing plate 76 supported at the top of housing 74. An oil reservoir 77 is supported by brackets 78 at the top of a sheet metal housing 79 mounted on bearing plate 76 in extension of the housing 74. The oil in reservoir 77 may be replenished through the single supply pipe 80. An oil distributing head 81 is carried by its lower end 82 at the top of tubular shaft 66, and has an upper outwardly flared portion 83 which carries the distributing plate 84. The head 81 is formed with an inner cup-shaped member 85, between which and the outer walls of the head are formed a plurality of similar oil cups or funnels 86, the lower end of each of which drains at 87 into one of the conduits 68. A bracing and strengthening rod 87 extends centrally through the tubular shaft 66 and is formed with a head 88 at its lower end bearing against the lower end of the tubular shaft and perforated for the passage of the several pipes 68, and a nut 89 is secured on the upper end of rod 87 within the cup 85 to hold the assembly firmly in place. The distributing plate 84 has a downwardly projecting centering stud 90 which fits within the cup 85, and an outer flange 91 which is secured to the upper outer edge of head 81 by a series of bolts 92. On the upper surface of plate 84 are formed a plurality of concentric circular channels 93 one for each of the cups or chambers 86 and conduits 68. Where each of these channels 93 passes over an allotted one of the cups 86, the plate 84 is slotted at 94 so that the channel communicates with the cup and all oil that collects in the channel will drain into this particular cup and thence drain into one of the pipes 68. A plurality of drip pipes 95 extend down from reservoir 77, each drip pipe having its lower end projecting into an allotted one of the channels 93, as shown in Fig. 4. Since the channels 93 are circular, it will be obvious that the distributing assembly may rotate while the drip pipes 95 remain stationary. The sight oil feeders 96 are adapted to permt a restricted flow of oil to continuously pass through each of the pipes 95 and drip into one of the grooves 93. This flow is so restricted, and the capacity of the grooves 93 is such that the oil delivered into one of these grooves will flow out through slot 94 into the cup 86 without overflowing the channel 93.

The operation of this system should be apparent from the detailed description which has been given. All that is necessary is to maintain a supply of oil within reservoir 77. This oil will continuously flow through drip pipes 95 into the respective channels 93, and each channel will deliver the oil deposited therein into one of the cups 86 which drains into one of the upright tubular conduits 68. Since each conduit 68 is connected by means of a flexible conduit 72 with one of the roller assemblies, the oil will be delivered to the reservoir 32 within the roller-supporting shaft 24, and thence flow between the bearing surfaces as already described.

I claim:

1. In a pulverizing mill, the combination with a frame rotating about a vertical axis, a bull-ring, a plurality of pulverizing rollers suspended from said frame so that they may swing out by centrifugal force against the bull-ring, means comprising a plurality of bearings for rotatably supporting each roller from the frame, and a mill housing enclosing all of these parts, of a tubular shaft secured to the frame and extending upwardly through the top of the housing in line with the axis of rotation of the frame, a plurality of conduits in the tubular shaft, one for each roller, a flexible conduit leading from each

of the last mentioned conduits to the bearings of one of the rollers, a stationary reservoir positioned outside the housing for holding a supply of lubricant, and means also outside the housing for automatically distributing oil from the reservoir to each of the conduits in the tubular shaft.

2. In a pulverizing mill, the combination with a frame rotating about a vertical axis, a bull-ring, a plurality of pulverizing rollers suspended from said frame so that they may swing out by centrifugal force against the bull-ring, means comprising a plurality of bearings for rotatably supporting each roller from the frame, and a mill housing enclosing all of these parts, of a tubular shaft secured to the frame and extending upwardly through the top of the housing in line with the axis of rotation of the frame, a plurality of conduits in the tubular shaft, one for each roller, a flexible conduit leading from each of the last mentioned conduits to the bearings of one of the rollers, a stationary reservoir positioned outside the housing for holding a supply of lubricant, a head mounted at the top of the tubular shaft and containing a plurality of chambers, one chamber draining into each conduit in the shaft, a distributing plate on the head formed with a plurality of concentric circular channels, one for each chamber and each channel having an opening for draining into its particular chamber, and a plurality of drip pipes one for each channel leading from the reservoir, each pipe positioned to drain into its channel.

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