J. C. CLARK.

GRINDING MILL.

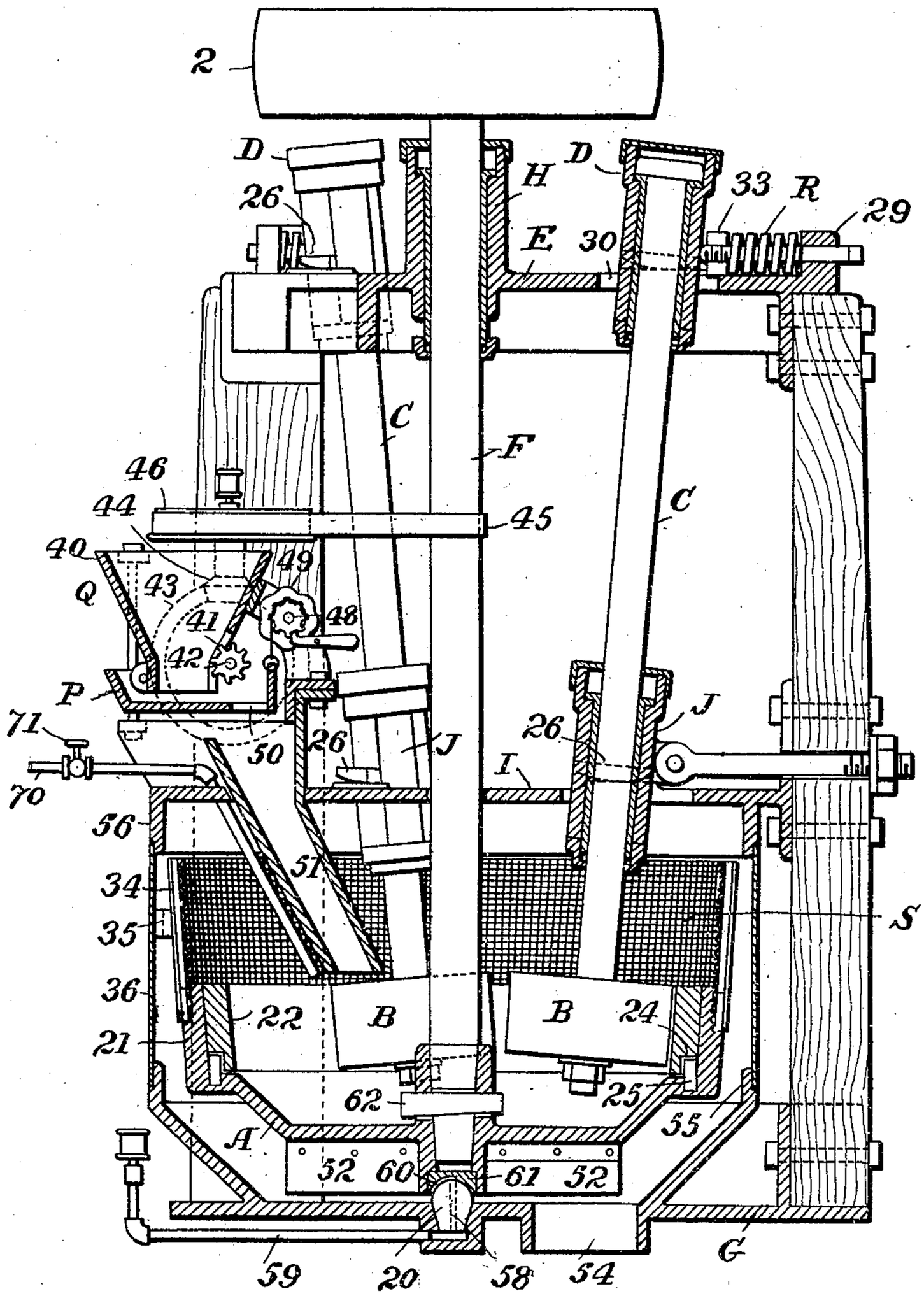
APPLICATION FILED NOV. 28, 1908.

940,513.

Patented Nov. 16, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



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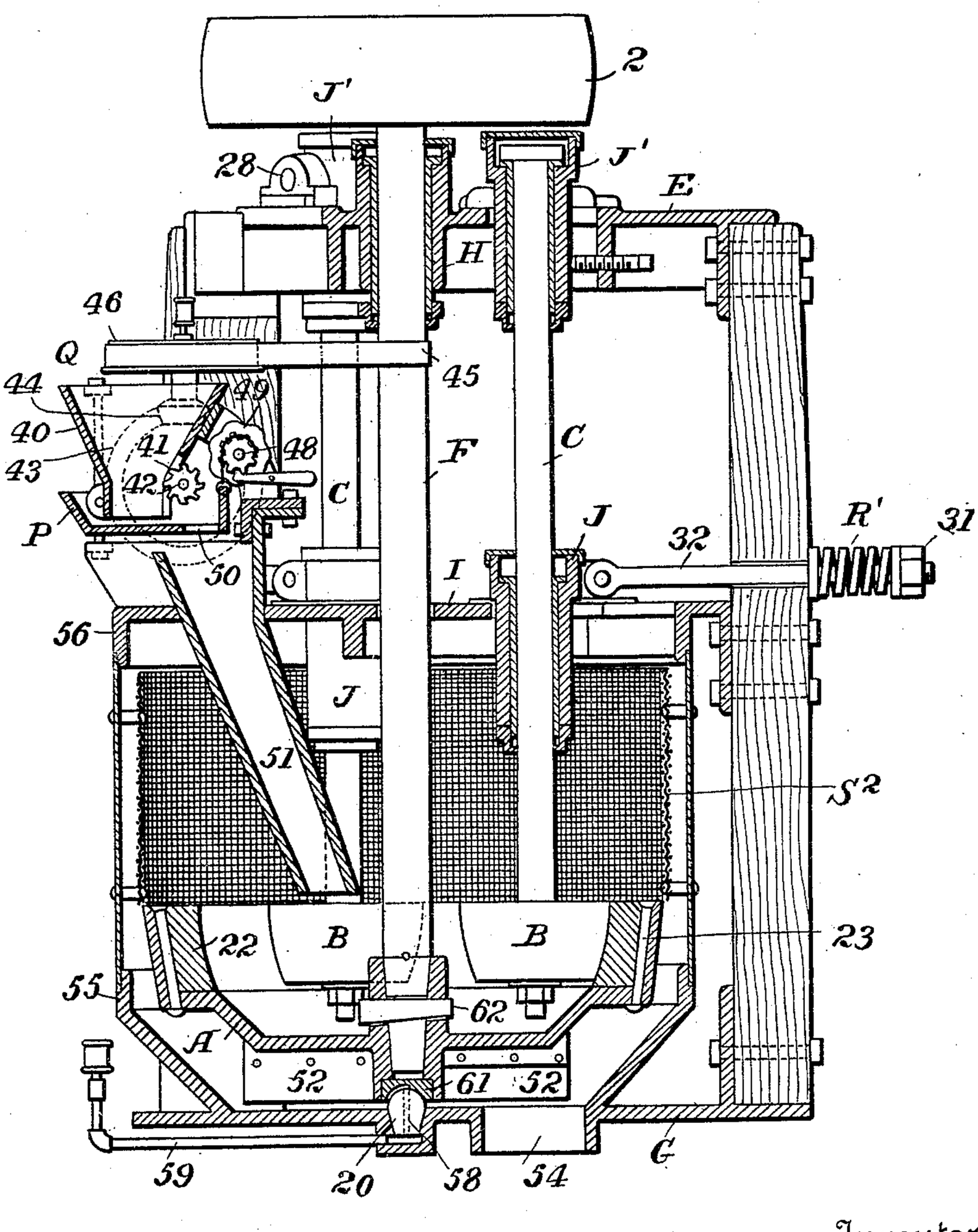
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

940,513. Specification of Letters Patent. **Patented Nov. 16, 1909.**

Application filed November 28, 1908. Serial No. 464,846.

To all whom it may concern:

Be it known that I, JOHN C. CLARK, a citizen of the United States, and resident of Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

My invention relates to grinding mills, and consists of a grinding mill having a rotatable basin or pan and grinding rollers preferably supported by shafts turning in substantially stationary bearings, with certain adjuncts fully set forth hereinafter and illustrated in the accompanying drawing, in which:

Figure 1 is a sectional elevation of a grinding mill embodying my improvement; and Fig. 2 a sectional elevation showing the parts somewhat modified.

The frame of the mill is provided with a base G having a central step 20 to support the bearing of a rotatable pan or basin A, the outer flange or side 21 of which may constitute a grinding face coacting with a roller B, but preferably the pan is provided with a grinding ring 22 which may be bolted in place by bolts 23 passing through coinciding channels in the pan and ring as shown in Fig. 2; or preferably the ring may fit nicely the inner face of the flange and may be provided with slots 24 for receiving keys 25 on the ring. This permits the ready application and removal of the ring, it being simply necessary to drive a wedge between the lower edge of the ring and the pan in order to loosen it and permit its withdrawal. There may be one or more rollers B with suitable means for securing any desired pressure toward the grinding surface, but as shown each roller is upon a substantially vertical shaft C, and there is a box rocking upon a suitable bearing which supports the shaft so that the latter while otherwise held in a fixed position may swing to permit the roller B to be carried to and from the ring.

As shown in Fig. 1 the rocking box J has side rocking bearing lugs 26, which rest upon a cap plate I extending above the pan and above a screen S hereinafter referred to, and with faces for the rocking bearings 26. In Fig. 2 the box J′ is provided with side trunnions 28 which constitute the rocking bearing. In either case a spring is provided which tends to carry the roller toward the grinding ring. In Fig. 1 the spring R is confined between a lug 29 on the upper spider E of the frame and has its bearing against a box D receiving and supporting the upper end of the shaft C, the said box sliding in a radial opening 30 of the spider. In Fig. 2 a spring R′ is confined between one of the posts of the frame and a nut 31 on a rod 32, which is pivoted to the box J, which slides in a slot in the cap plate I. In either case the spring serves as a means for carrying the roller toward the grinding ring, and the nut 31 in Fig. 2, or 33 in Fig. 1, may be adjusted to place any desired tension upon the spring. The boxes are constructed as may be required to provide anti-friction journal-like bearings for the shafts and to hold a suitable lubricant to reduce the friction.

The screen S consisting of wire gauze of a suitable mesh is provided so as to screen the material passing from the pan outward, and as shown in Fig. 1 the screen is bolted to and rotates with the pan and is provided externally with vertical strips 34 at suitable intervals, which by contact with a lug 35, carried by the cylindrical side 36 of the inclosing casing, receives such a vibration as to tend to dislodge any particles that may stick to the screen. In the construction shown in Fig. 2 the screen S^2 is supported directly by the casing and does not rotate.

The material is fed constantly by means of suitable feeding devices Q consisting, as shown, of a hopper 40 open at the bottom and with a slot at the side to receive the teeth of a feed wheel 41, upon a shaft 42, which carries a beveled gear 43, that in turn gears with a pinion 44 upon a shaft driven through the medium of a belt 45 and band wheel 46, from a central vertical shaft F, that is stepped in and keyed to the hub of the pan A, and turns in a bearing H carried by the upper spider E. The shaft F is provided with a band wheel 2 receiving a belt driven by any suitable motor.

In order to vary the extent of feed a pan P extends below the hopper Q and is supported by a band passing over the shaft 48, which may be turned by a hand-wheel 49, and is provided with a ratchet to engage a pawl to hold it in any desired position whereby the pan may be carried to the hopper or allowed to drop to regulate the discharge therefrom, an opening 50 in the pan permitting the material to pass therefrom

to a chute 51, the lower end of which is in a position to direct the material to the center of the pan or basin A.

In the operation of the machine the material in the basin A is carried outward by centrifugal action and tends to ride up the peripheral flange of the basin along the inclined face thereof and on to the inclined face of the grinding ring and is ground between the latter and the roller or rollers B, which act upon the material with a pressure regulated by the tension of the spring which carries the roller toward the grinding ring. The material which escapes from the basin and is thrown outward is brought forcibly against the screen and the finer portions pass through the screen and outward between the latter and the side 36 of the outer casing and then fall downward and pass through a discharge opening 54 in the base plate G, this movement being facilitated by means of blades 52 upon the bottom of the basin which carry the material outward in a position to fall through the discharge opening 54.

The coarser particles of material which cannot pass through the screen fall back into the basin and are again subjected to a grinding action. In some cases where it is not necessary to grind every portion to an extreme degree of fineness the screen may be dispensed with.

By means of the construction above described I gain many substantial advantages over grinding mills of ordinary construction. I have found that where the basin is rotated and the rolls are supported by shafts which rotate in substantially stationary bearings there is a great reduction in friction and of the amount of power required to operate the machine and a much less tendency for the bearings of the roller shafts to heat than in constructions where the shafts themselves are carried by bearings revolving around a central axis. Further in ordinary constructions the requisite amount of material is fed to the basin and is ground until properly reduced and then discharged, but this is attended with a great amount of friction resulting from the traveling of the rolls through the material, causing their rapid wear and requiring a large amount of power to drive them. By the above construction I can feed the material to the basin only just as fast as it can be reduced so that there is never sufficient in the basin to act as a material resistant to the rollers, and further the latter will act more effectively upon the small body of material thus progressively fed than upon a large body filling the basin. Further in the above construction I am enabled to regulate with nicety the amount of pressure exerted by the rollers upon the material passing between them and the grinding ring.

It will be seen that the casing which surrounds the pan and the screen is formed by the base G which has a flange 55 to which the lower edge of the cylindrical portion 36 of the casing is bolted and by the cap frame or base I, which has a flange 56 to which the upper edge of the said cylinder 36 is bolted. The casing is thus formed of three pieces which may be readily removed and separated.

In order to properly oil the step 20, I provide it with a central channel 58 to which oil is fed by pressure through a pipe 59, and this channel coincides with the curved channel 60 in the step bearing 61, which curved channel extends downward nearly to the bottom of the step bearing, but is closed at the lower end so as to retain the lubricant which is thus always abundantly supplied to the bearings themselves without being discharged to any material extent.

The lower end of the shaft F is connected to a hub of the basin by a cross-key 62, the removal of which permits the ready withdrawal of the shaft.

For wet grinding water is introduced at a point near the bottom of the chute 51, as for instance through a pipe 70, provided with a regulating cock 71.

I do not here claim the combination of the rotating basin and the screen carried thereby as this forms the subject of a claim in a separate application for Lettters Patent.

Without limiting myself to the construction and arrangement shown, I claim:

1. The combination in a grinding mill of a rotatable pan, a shaft and horizontal grinding roller at the lower end of the shaft, and a bearing box for the shaft intermediate its ends, a normally fixed bearing on which said box rocks, a second box receiving the upper end of the shaft, and a spring bearing on said box and arranged to be compressed on the inward movement of the lower end of the shaft and roller.

2. The combination in a grinding mill of a rotatable horizontal pan, a shaft carrying a crushing roller at its lower end, a box supporting the shaft at the upper end, a second box receiving the shaft at a point between its ends, a support having a flat bearing face on which the lower box rocks, and means for shifting the lower box radially to different positions.

3. The combination in a grinding mill of a rotatable horizontal pan, a shaft carrying a crushing roller at its lower end, a box supporting the shaft at the upper end, a second box receiving the shaft at a point between its ends, a bearing on which the lower box rocks, a rod pivoted to said box and extending through part of the frame, and a spring and nut for shifting and holding the rod longitudinally.

4. The combination in a grinding mill of

a rotatable horizontal pan, a shaft carrying a crushing roller at its lower end, a box receiving the shaft at a point between its ends, a bearing on which the box rocks, a box receiving the upper end of the shaft, a spring bearing on said upper box to resist the inward motion of the shaft and roller, and a cap plate provided with a slot in which the upper box may slide radially.

5. The combination of the rotatable basin, surrounding casing, and a screen supported fixedly and by the casing adjacent to and extending above the basin as set forth.

6. The combination with the rotatable basin, rollers, shafts supporting the rollers, a box for each shaft and support therefor, the box and support provided with rocking bearings having curved lower faces, and a support having a flat face for each bearing.

7. The combination of the rotatable basin, shaft, roller, and two boxes, one intermediate the ends of the shaft and provided with a rocking bearing, and a support having a flat bearing face therefor, and the other at the upper end of the shaft, and a spring acting on the upper box to carry it inward.

8. The combination of the rotatable basin, shaft, roller, and two boxes, one intermediate the ends of the shaft and provided with a rocking bearing and means for adjusting the box radially, and the other at the upper end of the shaft, and a spring acting on the upper box to carry it inward.

9. The combination in a grinding mill, of a rotatable basin, a vertical rotatable shaft, a roller at the lower end thereof coöperating with the basin, a journal box adapted to support the shaft axially at its upper end, a second journal box receiving the shaft above the roller, and means for shifting the second journal bearing radially.

10. The combination in a grinding mill, of a rotatable basin, a vertical rotatable shaft having a roller at its lower end cooperating with the basin, a journal box adapted to support the shaft axially at its upper end, a second journal box receiving the shaft above the roller and provided with bearing lugs, a support having a flat bearing face with which the bearing lugs engage, and means for shifting the second bearing radially to different positions along the flat bearing face.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN C. CLARK.

Witnesses:
E. W. Collins,
Edward Johnson.