(No Model.) 2 Sheets—Sheet 1.

J. C. CLARK.

PULVERIZING MACHINE.

No. 561,491. Patented June 2, 1896.

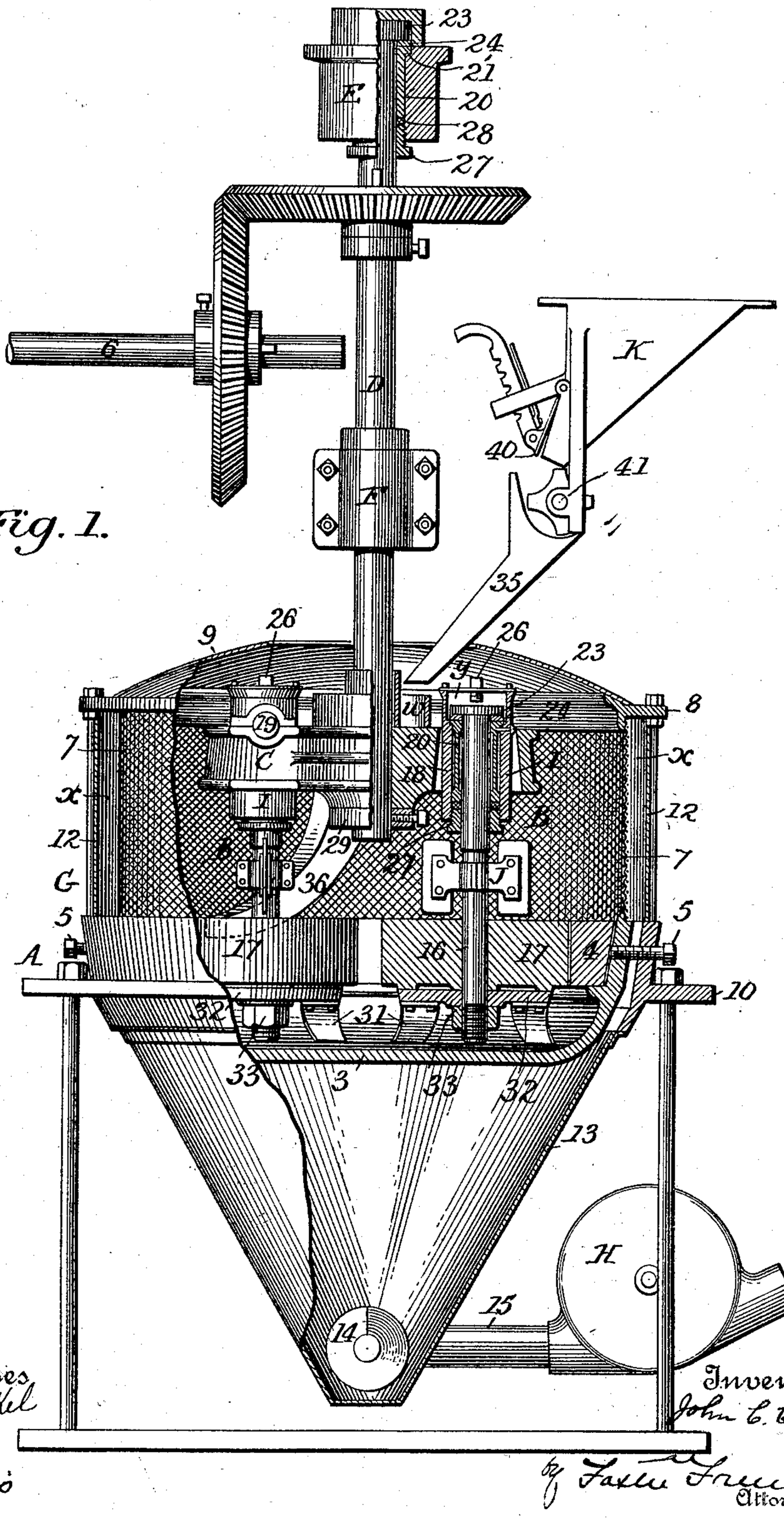

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

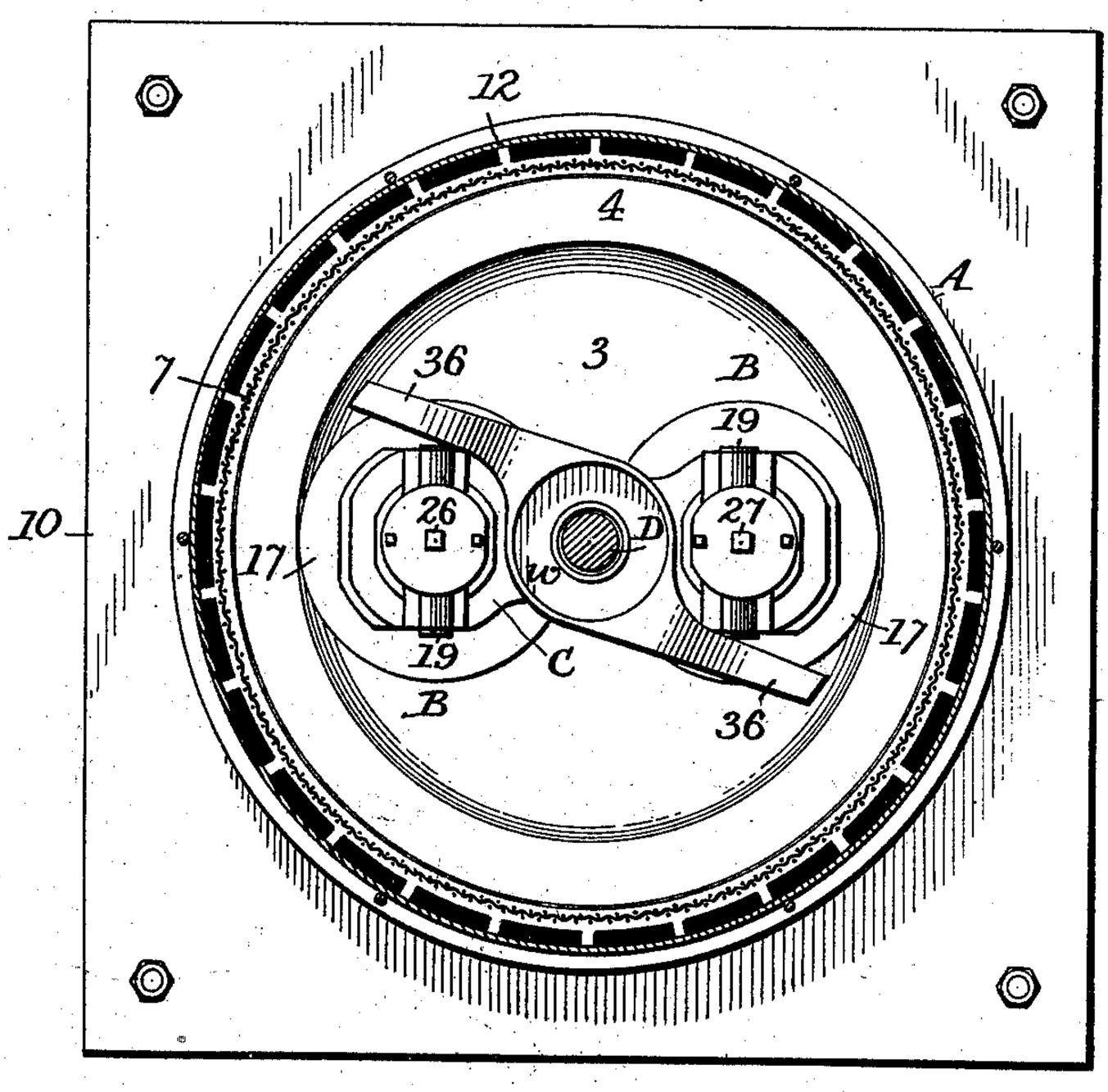
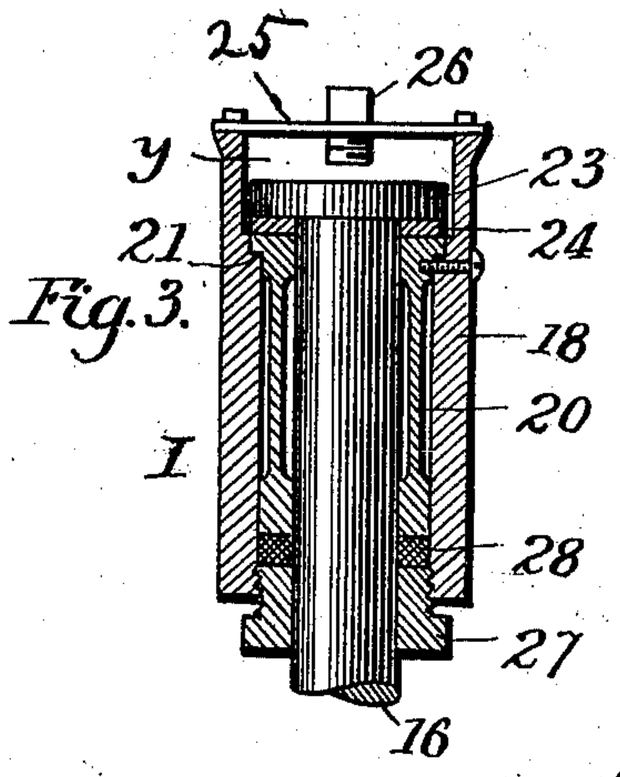


Fig. 3.



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UNITED STATES PATENT OFFICE.

JOHN C. CLARK, OF ATLANTA, GEORGIA.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,491, dated June 2, 1896.

Application filed December 10, 1895. Serial No. 571,711. (No model.) Patented in Canada December 26, 1895, No. 50,908.

To all whom it may concern:

Be it known that I, JOHN C. CLARK, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Pulverizing-Machines, (for which Letters Patent of Canada were granted to me on the 26th day of December, 1895, No. 50,908,) of which the following is a specification.

My invention relates to that class of pulverizing-mills in which suspended pestles having crushing-rollers at their lower ends are revolved within the rim of a mortar-basin; and my invention consists in constructing and arranging the parts of such a mill so as to reduce wear and friction and prevent heating, so as to permit a ready renewal of the wearing parts, and so as to carry the incoming material directly between the faces of the mortar and pestles, all as fully set forth hereinafter, and as illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional elevation of a pulverizing-mill provided with my improvements. Fig. 2 is a plan in section through the supporting-shaft. Fig. 3 is a detached sectional view of the bearings.

The mortar A of the mill is constructed in any suitable manner; but as shown it consists of a basin 3, having a ledge upon which is supported a cast-steel grinding-ring 4, centered and secured in place by means of set-screws 5, and within the mill operate two pestles B B, each of which is suspended from a cross-head C upon a vertical pendent shaft D, suspended from an upper bearing E and passing through a guide-bearing F, and to which rotation is imparted through the medium of double gears from a driving-shaft 6.

Above and around the basin 3 extends a screen 7, having a mesh of any suitable fineness, supported at its upper end by a ring 8, from which projects inward an annular plate 9, partially covering the basin, and the ring 8, a lower ring 10, and an intermediate cylinder 12, of thin metal, constitute an outer casing G, forming an intermediate chamber *x* around the screen and basin, and which communicates with a hopper or chute 13, leading to a passage containing a screw conveyer 14. With the passage containing the conveyer communicates a pipe 15, leading to an air-exhauster H of any suitable construction.

As will be readily understood, the fine material which results from the grinding action of the pestles in the mortar passes through the screen 7 into the chamber *x* and thence to the screw conveyer, by means of which it is carried forward to any suitable receptacle, depending upon the character of the material operated upon.

In mills of this character as usually constructed there is always a great amount of friction, resulting in a corresponding consumption and waste of power and in the heating of the bearings and other parts, which prevents the machine from being operated in such manner as to secure the maximum grinding effect and efficiency. I overcome these objections by the means which I adopt for supporting and guiding the shafts and for feeding the material to the grinding devices, as I will now describe.

The shaft 16 of each pestle carries the grinding-roller 17, the top of which is substantially upon the same plane as the ring 4, and the said shaft is supported in a swinging box I, consisting of a cylinder 18, of metal, provided with trunnions 19, which have their bearings in the arms of the cross-head C, so arranged as to permit the pestles to swing radially outward from the axis of the shaft D. Each box 18 is bored out to receive a hollow brass 20, with a flange 21 at the upper end resting upon a shoulder within the cylinder, and upon the upper end of the brass is an annular bearing-surface for the head of the shaft 16. As shown, the said head consists of an enlargement 23 at the end of the shaft, having an under facing in the form of a cast-iron ring 24, which rests upon the top of the brass, the internal diameter of the cylinder being enlarged to receive the head of the shaft and constituting an oil-chamber *y* above and surrounding the same. Through the cap 25 of the oil-chamber passes a cock-head bearing in the form of a screw 26, central but slightly out of contact with the head of the shaft.

Within the lower threaded end of the cyl-

inder 18 screws a follower 27, surrounding the shaft and packing a rubber packing-ring 26 against the shaft and against the lower end of the brass 20.

When the shaft D revolves, the two pestles are carried with it, and they are permitted to swing outward at the lower ends by centrifugal action and with little friction by mounting the pestle-shafts in the swinging boxes I, and it will be seen that the angles taken by the shafts result in no frictional difference, inasmuch as the entire shaft bearing and support swings with the shaft, the outer or swinging bearing of the box being wholly independent of the inner direct bearing for the rotating shaft. It will be seen that the shaft has two inner bearings, one upon the inner bore and the other upon the top of the brass, and it will be evident that when the latter becomes worn it may be readily renewed and that the wearing away of the head of the shaft results only in affecting the removable bearing-ring 24. As both the brass and the bearing-ring may be readily replaced at small cost, and as these are the only portions connected with the pestles that are subjected to any great degree of wear, the general efficiency of the apparatus may be constantly and indefinitely preserved.

As the oil-chamber *y* is above the head of the shaft, there will be maintained a constant supply of lubricant to the bearing-face below the head and the bearing-face within the brass, the oil being retained within these parts by the packing-ring 28. By this construction friction is so reduced and the parts so well lubricated that there is practically no heating of the bearings or their supports.

While the suspended shaft D may be supported in any suitable manner, I prefer to provide it with a head, brass, and oil-chamber, constituting the bearing E, constructed in the same manner as the bearings of the pestle-shafts.

By providing cock-head bearings 26 I effectually prevent the pestles from riding over the material and being lifted up out of position.

In order to adjust the parts vertically, the cross-head C is adjustably connected to the shaft D by means of a collar 29 upon the shaft adjustable vertically and secured by one or more screws or otherwise.

With each roller 17 are combined stirring-blades 31, connected to a disk 32, turning freely upon the shaft 16, supporting the roller 17 and resting upon a nut 33 upon the lower threaded end of the shaft.

Above each roller 17 is a fan J, consisting of radial blades, which aid in discharging the material toward the screen 7.

Heretofore it has been common in pulverizers of this character to feed the material onto the tops of the rollers or into the basin at or near the center. I have found that great advantage results from acting upon the incoming material while it is separated from the mass, the particles being thus isolated, and a better crushing effect secured. I therefore so feed the material that it will fall between the faces of the rollers and of the ring 4 in such manner as to be crushed between the same before it reaches the mass of material in the basin. One means of so conducting the material to the crushing-surfaces consists in providing a receptacle *w* above the cross-head C, into which the material is fed from a chute 35, and from the said receptacle extend two chutes 36 36, each leading downward and outward to a point beyond the periphery of one of the rollers 17 and adjacent to the point where the said periphery touches the surface of the ring 4. Therefore as the material drops from the chute 36 it will be met by the face of the revolving roller 17 and will be carried by the latter against the face of the ring 4, and as the roller rotates will be crushed and ground between the two faces, the particles falling into the basin. It will be evident that the rotation of the shaft D will serve to throw the material outward centrifugally and secure the proper feeding action.

The coarse material may be fed in any suitable way to the chute 35. As shown, it passes from a hopper K, provided with an adjustable gate 40, onto a revolving bladed shaft 41, which feeds it uniformly to the chute 35.

Without limiting myself to the precise construction and arrangement of parts shown, I claim as my invention—

1. The combination in a pulverizing-mill, of a revolving shaft provided with a cross-head, boxes swinging upon said cross-head, a revolving shaft turning in each box with its axis passing through the swinging axis of the box, and carrying a crushing-roller, a brass removably secured within each box as a lateral bearing for the roller-shaft, a head upon each roller-shaft having a bearing upon the upper edge of the brass, and cock-head bearings arranged centrally above the heads of said roller-shafts, and out of contact therewith, substantially as described.

2. The combination in a pulverizing-mill, of a revolving shaft provided with a cross-head, boxes swinging upon said cross-head, a revolving shaft turning in each box with its axis passing through the swinging axis of the box, and carrying a crushing-roller, a brass removably secured within each box and against which the roller-shaft has a lateral bearing, a head upon each roller-shaft bearing upon the upper edge of its brass, oil-chambers above the heads and brasses, packing-rings below the brasses within the boxes, and a follower for each of said rings, substantially as shown and for the purpose described.

3. The combination in the bearing of a pulverizing-mill, of a box, a brass removably secured within but shorter than the box, the latter constructed to form an oil-chamber above the brass, a shaft provided with a head within said oil-chamber and bearing laterally

upon the brass, a packing-ring below the brass, and a follower for confining the ring in place, substantially as described.

4. The combination of the revolving shaft D, cross-head, suspended boxes, shafts 16 provided with rollers and turning in said boxes, and cock-head bearings arranged centrally of and above the shafts, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN C. CLARK.

Witnesses:
E. EVERETT ELLIS,
W. CLARENCE DUVALL.