J. C. CLARK.

PULVERIZING MILL.

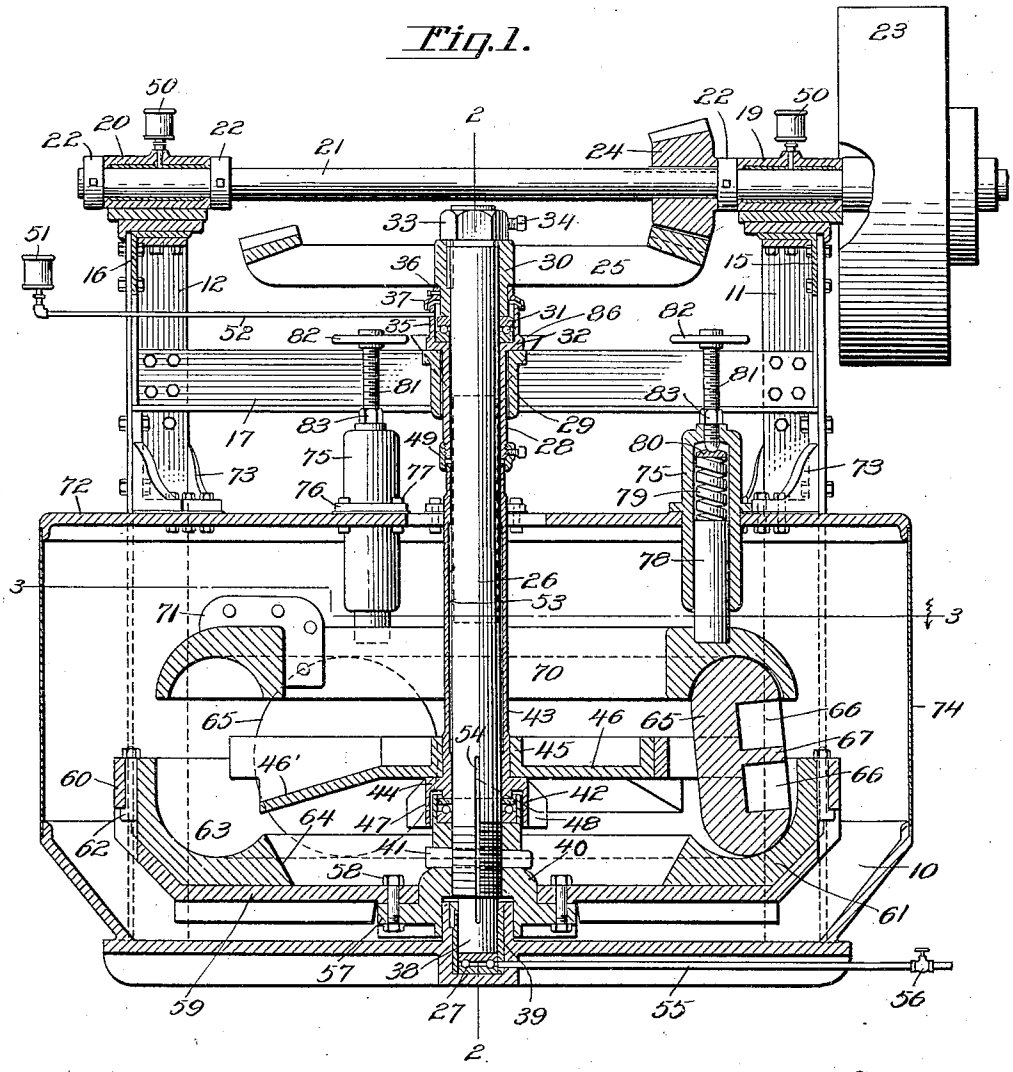
APPLICATION FILED APR. 18, 1912.

1,049,051.

Patented Dec. 31, 1912.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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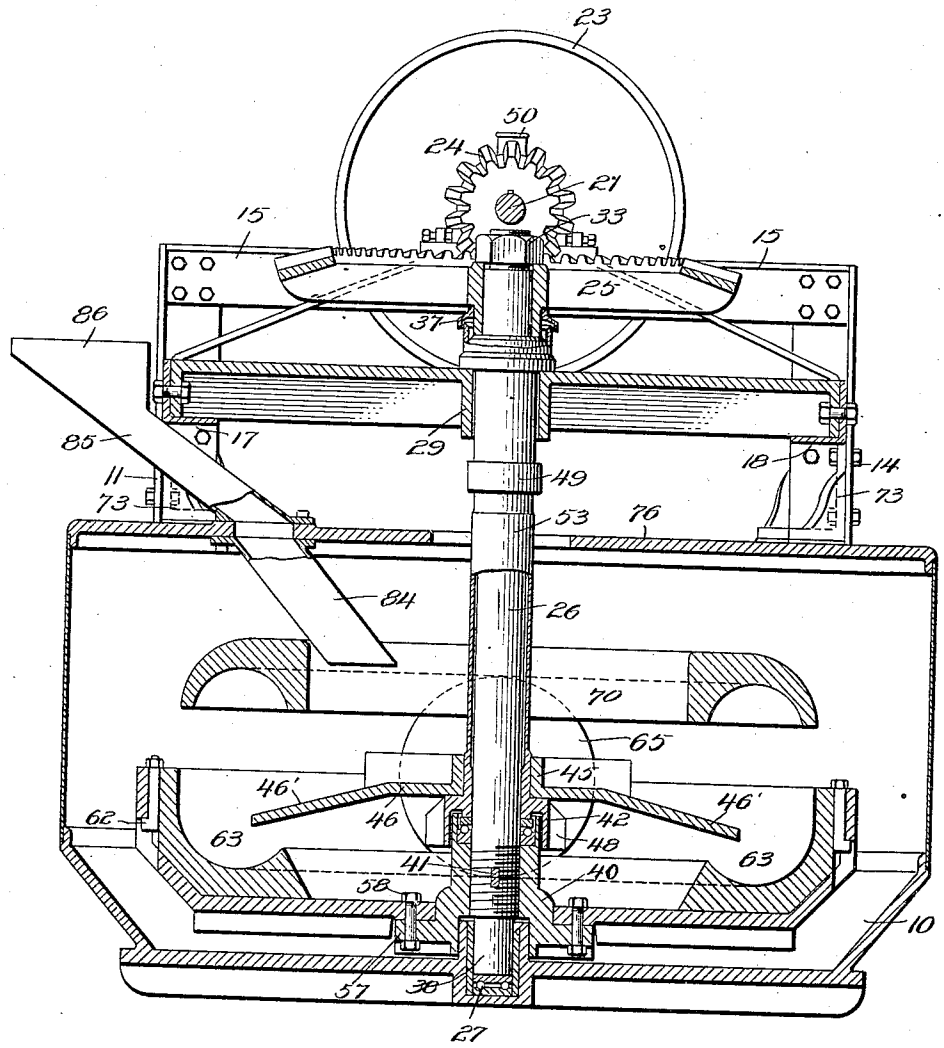
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

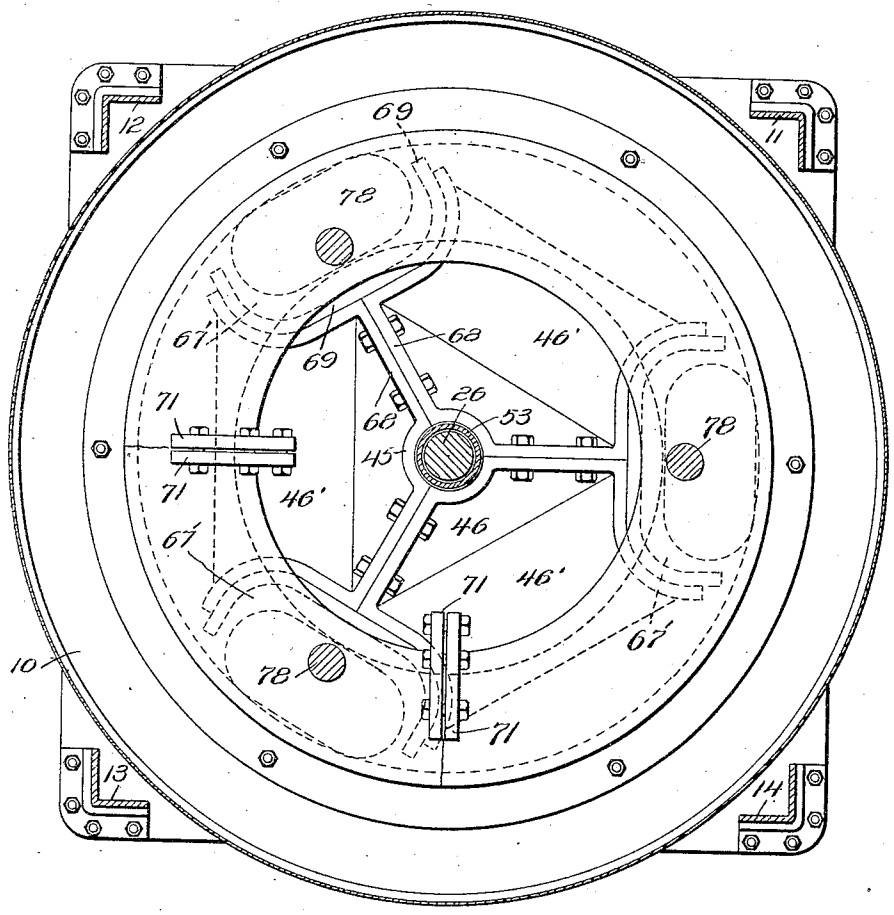
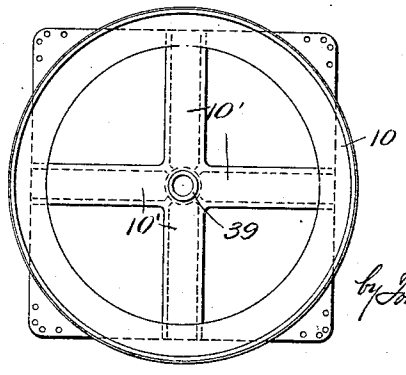


Fig. 5.



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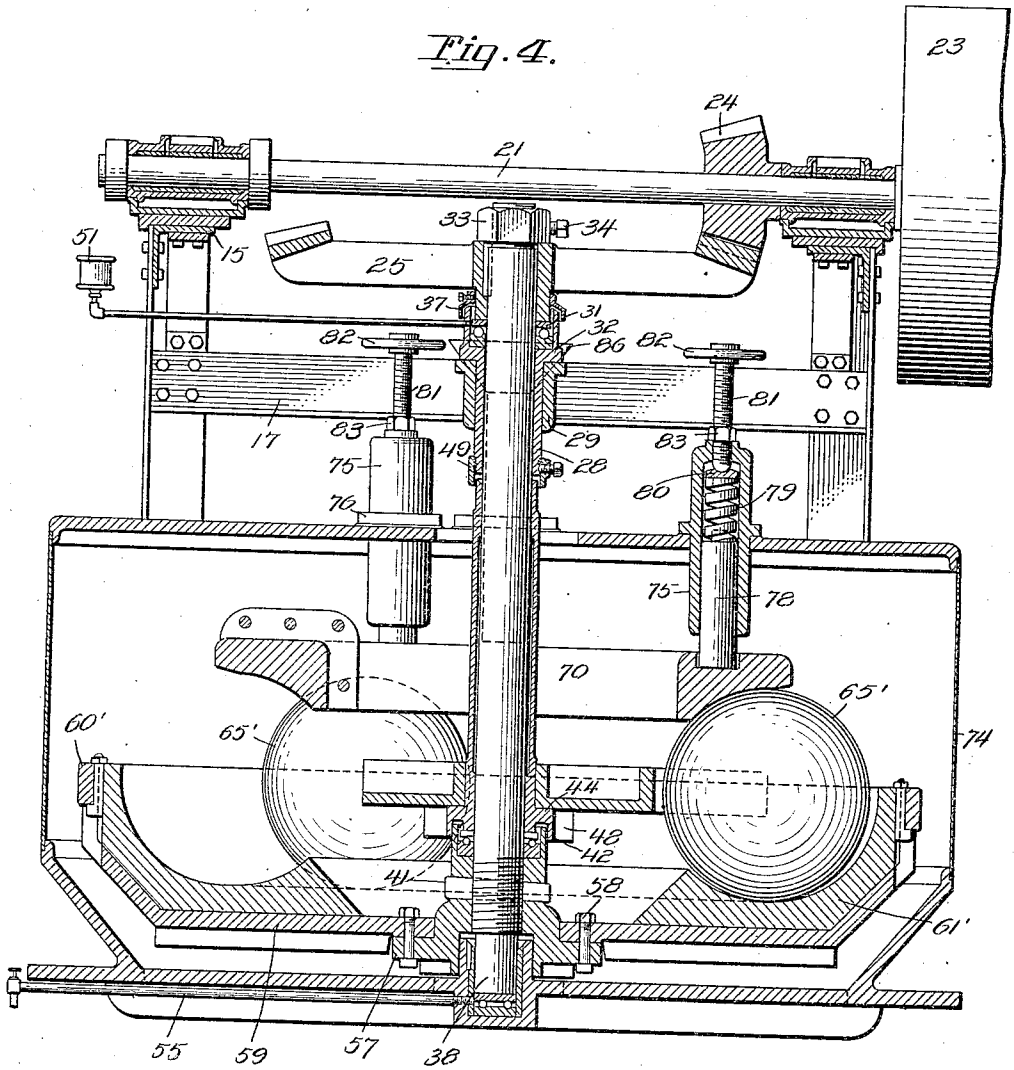
4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN C. CLARK, OF ATLANTA, GEORGIA.

PULVERIZING-MILL.

1,049,051. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed April 18, 1912. Serial No. 691,534.

To all whom it may concern:

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

This invention relates to that class of pulverizing mills in which the grinding members are arranged to roll in a rotating basin and consists generally in improvements in the construction shown in my prior Patent No. 940,129 dated November 16, 1909.

The objects of the invention are to provide a pulverizing mill which has large capacity and requires a relatively small amount of power to operate.

Other objects and the features of novelty will be apparent from the following description taken in connection with accompanying drawings.

In the drawings: Figure 1 is a central vertical section of the mill. Fig. 2 is a central vertical section on the line 2—2 of Fig. 1 and taken at a right angle to Fig. 1. Fig. 3 is a horizontal section on the line 3—3 of Fig. 1. Fig. 4 is a view similar to Fig. 1 and showing a modified form of the invention. Fig. 5 is a top plan view of the base member of the frame.

Referring to the drawings it will be seen that the machine comprises a base member 10 which carries at its corners the uprights 11, 12, 13 and 14. The uprights 11 and 14 are connected together at their top by means of a cross member 15 and the uprights 12 and 13 are similarly connected together by means of a cross member 16. The uprights 11 and 12 are connected together by a cross member 17, and the uprights 13 and 14 are connected together by a cross member 18. The cross members 15 and 16 have mounted thereon, preferably at the middle, the bearings 19 and 20 respectively. A shaft 21 is arranged in the bearings 19 and 20 and provided with collars 22 to engage the ends of the bearings and prevent endwise movement of the shaft. The shaft 21 carries on one end a driving pulley 23 and adjacent the bearing 19 a bevel pinion 24, the latter meshing with a bevel gear 25 carried on the upper end of a vertical shaft 26. The shaft 26 has at its lower end an anti-friction step bearing 27 and is supported at its upper end by a bearing sleeve 28 which is carried by a cross member 29 secured to the members 17 and 18. The gear 25 is preferably keyed to the shaft 26 and has the lower end of its hub 30 resting on a thrust bearing 31, this thrust bearing being supported on the upper flange 32 of the bearing sleeve 28. The upper end of the shaft 26 is threaded to receive a nut 33, the latter being secured against turning movement by means of a set-screw 34. Since the hub 30 of the wheel 25 rests on the ball bearing 31 it will be seen that by adjusting the nut 33 the weight of the shaft 26 and the parts carried thereby may be distributed between the bearing 31 and the bearing 27.

The bearing 31 is inclosed by a sleeve 35 which projects upwardly from the flange 32 of the bearing member 28. A collar 36 is arranged on the hub 30 of the wheel 25 and provided with a depending flange 37 which overlies the top of the sleeve 35 and thereby prevents the entrance of dust and other foreign materials into the interior of the sleeve. The lower end of the shaft 26 is provided with a journal 38 which is arranged in the bearing 39 carried by the base member 10. Above the journal 38 the shaft 26 is preferably screw-threaded to receive a hub 40, the latter being also secured to the shaft by means of a key 41. The lower end of the hub 40 is provided with a recess which fits over the bearing 39 and serves to prevent dust from entering said bearing. At the upper end of the hub 40 is a recess in which is arranged a ball thrust bearing 42 which carries the tubular member 43. At the lower end of the tubular member 43 is a flange 44 upon which is arranged the hub 45 of the plate 46. A sleeve 47 projects downwardly from the lower side of the flange 44 and serves to prevent dust from entering the bearing 42. Arranged on the exterior of the sleeve 47 are a plurality of radial wings 48 which act as a fan to drive the material outwardly. The tubular member 43 is preferably spaced from the shaft 26 throughout the greater portion of its length but at its ends fits the shaft. A collar 49 is preferably secured to the lower end of the bearing sleeve 28 and covers the space between the lower end of said sleeve and the upper end of the tubular member.

The bearings 19 and 20 are lubricated by

means of suitable lubricating devices 50 which may be of any preferred type. In order to lubricate the bearings for the shaft 26 I have provided a lubricating cup 51 which is connected with the interior of the sleeve 35 by means of a pipe 52. It will thus be seen that the bearing 31 receives a supply of lubricant directly from the cup 51. From the bearing 31 the lubricant works downwardly along the shaft 26 and thus lubricates the bearing sleeve 28 and the upper end of the tubular member 43 and thence the lubricant passes into the annular space 53 between the shaft 26 and the tubular member 43. The shaft 26 is provided with a longitudinal groove 54 which communicates with the annular space 53 and is adapted to convey the lubricant therefrom to the bearings 39 and 27. From the latter bearing the lubricant is discharged through a pipe 55 which is provided with a valve 56 and may lead to any suitable reservoir. If desired the lubricant may be withdrawn from the reservoir and, after being filtered, returned to the cup 51. From the above it will be seen that the entire mill is lubricated by means of three lubricating cups and that this arrangement produces a simple, convenient and thoroughly reliable system.

The hub 40 is provided near its lower end with a flange 57, to which is secured, by means of bolts 58, the basin 59 having the upturned sides 60. On the interior of the basin 59 is arranged the wearing ring or roll track 61, this ring being secured to the basin by means of suitable keys 62. The ring 61 is preferably provided on its upper side with an annular recess 63 and the inner edge of the ring is flared outward as at 64 for the purpose of causing any material which may find its way to the interior of the ring to be thrown up along the inclined portion 64 thereof and into the recess 63. Arranged in the recess 63 are three rolls indicated by the numeral 65. These rolls are preferably formed with their periphery circular in cross section and somewhat smaller than the recess 63, as clearly shown in Fig. 1. The rolls are also provided on their outer side with semi-cylindrical recesses 66, these recesses being separated by a web 67. The rolls 65 are preferably spaced equal distances apart and are held in spaced relation by means of the plate 46 which, as clearly shown in Fig. 3, is provided with suitable spaced pockets 67′ for the rolls. The plate 46 is preferably formed in three sections as shown in Fig. 3, these sections being secured together by any suitable fastening means in the flanges 68. The pockets 67 are preferably lined with wearing strips 69 which are adapted to be renewed from time to time as they become worn.

Resting on the rolls 65 is a pressure ring 70 which is provided with a recess in its under side, preferably semi-cylindrical in cross section to fit the periphery of the rolls 65. The pressure ring 70 may be formed of a single piece, but I prefer, in order to facilitate the removal and replacement thereof, to make the ring in two pieces as shown in Fig. 3. In order to secure a rigid construction I prefer to make one of the pieces constitute substantially three fourths of the ring and the other piece substantially one fourth, the pieces being secured together by means of bolts passing through the flanges 71. It will be seen that this construction of the ring facilitates the removal and replacement thereof for the reason that by disconnecting the parts of the ring these parts may be taken out of the mill without disturbing the shaft 26 and the parts associated therewith.

Arranged above the pressure ring 70 is a plate 72 which is supported from the corner uprights 11, 12, 13 and 14 by means of the brackets 73. The plate 72 is preferably of substantially the same diameter as the base 10 and a casing 74 engages the periphery of the plate 72 and the base 10 and forms a closure for the side of the pulverizing chamber.

Extending through suitable openings in the plate 72 and spaced equal distances apart are the tubular members 75 which are provided with flanges 76, these flanges being secured to the plate 72 by means of suitable bolts 77. Within the tubular members 75 are the pins or plungers 78 which have their lower ends arranged in suitable recesses in the upper side of the ring 70. Springs 79 are arranged to bear against the upper ends of the pins 78 and have arranged at the top thereof the plates 80 which are engaged by the lower ends of the screws 81, these screws having threaded engagement with the top walls of the tubular members 75 and being provided at their upper ends with hand wheels 82. By turning the screws 81 it will be understood that the pressure of the pins 78 on the ring 70 may be varied to any desired extent. In order to hold the screws 71 in adjusted position I have provided suitable lock nuts 83.

The pins 78 prevent the ring 70 from rotating and also press the ring against the rolls 65 and, owing to the fact that the pins 78 are slidable in the tubular members 75, it will be seen that the ring is adapted to have an up and down movement to correspond with the variations in the quantity of material under the rolls 65. By having three of these pins 78 it will be seen that the ring 70 is held at three points and therefore all of the pins are active at all times in holding the ring against all of the rolls. The plate 46 is preferably formed with the inclined portions 46′ for the purpose of causing the material, which in the operation

of the machine is fed onto the plate 46, to freely slide outward into the recess 63 in the rim 61.

In order to feed the material, to be pulverized, into the machine any suitable feeding mechanism may be provided and for the purposes of illustration I have shown a chute 84, arranged to deliver the material onto the plate 46, and secured to the lower side of the plate 72. Communicating with the chute 84 is a chute 85 which may be provided at its upper end with a suitable receiving hopper 86 for the material to be pulverized.

The operation of the mill above described is as follows: The pulley 23 being driven from any suitable source of power rotates the shaft 26 by means of the gears 24 and 25. The basin 60 being rigidly connected with the shaft 26 is rotated therewith, and since the ring 70 which bears on the rolls 65 is stationary it will be seen as the basin rotates the rolls will also be rotated on their own axes and move around in the recess 63 at half the speed of the basin. Material being fed onto the plate 46 by means of the chutes 84 and 85 will be discharged into the recess 63 in the ring 61 where it will be crushed by the rolls 65. Since the crushing action of the rolls 65 will cause certain of the particles of material to be thrown into the interior of the ring it will be seen that it is necessary to provide some means to return these particles to the path of the rolls and this is accomplished by the centrifugal force due to the rotation of the basin and also by having the inner edge of the ring inclined upwardly. The material being delivered by the plate 46 to the inner side of the recess 63 will gradually work to the outer side of said recess as it is pulverized and be caught by the pockets 66 in the rolls 65. As the rolls rotate it will be seen that the material in the pockets will be thrown over the top of the ring 61 and the basin 60 and slide down the inner surface of the base member 10. The central portion of the base member 10 is provided with openings between the cross beams 10′ which support the bearings 27 and 39 and therefore the pulverized material will fall freely through the base of the machine into any suitable receiver arranged below the mill. The pressure of the rolls on the material may be varied by means of the adjusting screws 81. In the operation of the machine some of the material will adhere to the surface of the rolls and be carried up and crushed between the rolls and the ring 70 and therefore this construction provides an arrangement in which the rolls are double-acting.

In Fig. 4 I have shown a modified form of the invention in which spherical balls 65′ are employed in place of the rolls 65 above described. In the operation this form of the invention is exactly the same as that of the other form with the exception that the pulverized material is not lifted out of the track after being pulverized by the balls. In this form of the invention the material gradually works up over the top of the ring 61′ and the basin 60.

It will be obvious to those skilled in this art that varies changes may be made in the minor details of construction of the mill within the scope of the appended claims and therefore I do not wish to be limited to the precise details shown and described.

Having thus described the invention what is claimed as new is:

1. In a machine of the class described, the combination of a rotatable basin, crushing rolls arranged in said basin, a pressure ring bearing against said rolls, and spring means engaging said pressure plate at three points and adapted to press said ring against said rolls.

2. In a machine of the class described, the combination of a rotatable basin, crushing rolls arranged in said basin, a non-rotatable pressure ring bearing against said rolls, and spring means engaging said pressure ring at three equally spaced points and adapted to press said ring against said rolls.

3. In a machine of the class described, the combination of a rotatable basin, crushing rolls arranged in said basin, a non-rotatable pressure ring bearing against said rolls, and three equally spaced independently adjustable spring means engaging said ring and adapted to press the same against said rolls.

4. In a machine of the class described, the combination of a rotatable basin, three equally spaced crushing rolls arranged in said basin, means for maintaining said rolls in said spaced relation, a non-rotatable pressure ring bearing against said rolls, and spring means engaging said pressure ring at three equally spaced points and adapted to press said ring against said rolls.

5. In a machine of the class described, the combination of a substantially vertical shaft, a basin carried by said shaft having a roll track in its upper side, three rolls arranged to run in said track, means adapted to maintain said rolls in substantially equidistant relation, a pressure ring having a groove in its under side and engaging said rolls, and spring means engaging said pressure plate at three equidistant points and adapted to press said plate against said rolls.

6. In a machine of the class described, the combination of a vertically arranged shaft, a basin carried by said shaft and provided with a roll track, crushing rolls arranged in said track, a step bearing at the lower end of said shaft, a thrust bearing

near the upper end of said shaft, supports for said bearings, and means for vertically adjusting said shaft whereby the load thereon may be distributed between said bearings.

7. In a machine of the class described, the combination of a frame, a vertically arranged shaft, a step bearing for the lower end of said shaft and supported by said frame, a basin carried by said shaft and provided with a roll track, crushing rolls arranged to run in said track, a thrust bearing near the upper end of said shaft and carried by said frame, a driving wheel on the upper end of said shaft and engaging said thrust bearing, and means for moving said shaft vertically relative to said wheel whereby the weight of said shaft and the parts carried thereby may be distributed between said bearings.

8. In a machine of the class described, the combination of a frame, a vertically arranged shaft, a step bearing for the lower end of said shaft carried by said frame, a basin carried by said shaft and provided with a roll track, crushing rolls adapted to run in said track, a pressure ring bearing against the top of said rolls, a plate supported by said frame above said pressure ring, spring means carried by said plate and adapted to press said ring against said rolls, a bearing sleeve for the upper end of said shaft supported by said frame, a thrust bearing above said sleeve, a driving wheel on the upper end of said shaft, and having a hub engaging said thrust bearing, and means on the upper end of said shaft above said wheel adapted to adjust said shaft vertically relative to said wheel whereby the weight of said shaft and the parts carried thereby may be distributed between said thrust bearing and said step bearing.

9. In a machine of the class described, the combination of a frame, a vertically arranged shaft having a step bearing at the lower end thereof supported by said frame, a basin carried by said shaft and provided with a roll track, crushing rolls arranged in said track, a non-rotatable pressure ring bearing on the top of said rolls, a fixed plate supported by said frame above said pressure ring, three independently adjustable equally spaced spring devices carried by said plate and engaging said ring and adapted to press the latter against said rolls, a bearing carried by said frame and supporting the upper end of said shaft, a wheel mounted on the upper end of said shaft, and means carried by said frame for driving said wheel.

10. In a machine of the class described, the combination of a rotatable shaft, a basin carried by said shaft and provided with a roll track, rolls arranged to run in said track, said rolls being in the form of disks having rounded peripheries and provided with pockets in their outer sides, said pockets being adapted to receive the crushed material and carry it upwardly and discharge the same over the top of said basin.

11. In a machine of the class described, the combination of a rotatable shaft, a roll basin carried by said shaft and provided with a roll track of curved cross section, crushing rolls arranged to run in said track, said rolls being disk-shaped and having rounded peripheries, a pressure ring provided with a groove in its under side engaging the tops of said rolls and closely fitting the same, and said roll track being of substantially larger curvature than the periphery of said rolls whereby said rolls are adapted to be arranged in an inclined position when running.

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

JOHN C. CLARK.

Witnesses:
G. W. SEVIER,
HARRISON JONES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."