

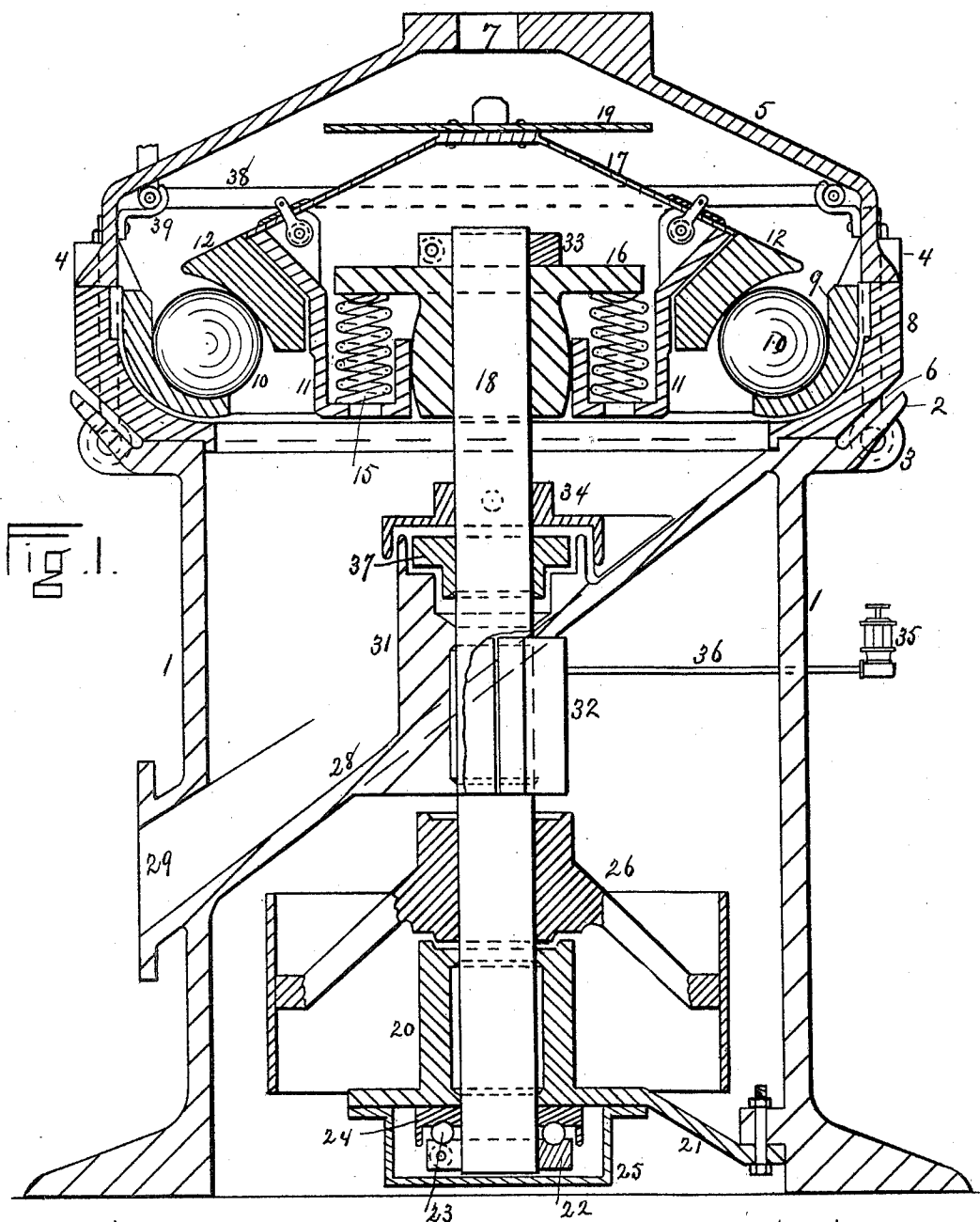
(No Model.)

2 Sheets—Sheet 1.

W. L. MORRIS.
BALL PULVERIZER.

No. 581,755.

Patented May 4, 1897.



WITNESS:
J. E. Harvey

INVENTOR.
Wm L Morris
By A. S. Hargue
Atty.

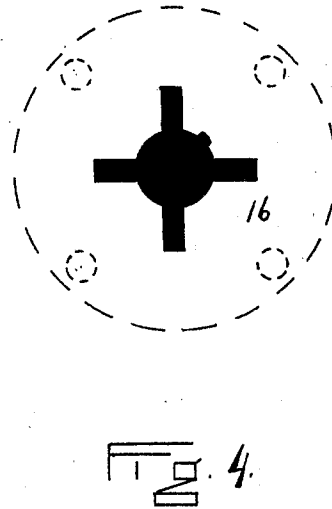
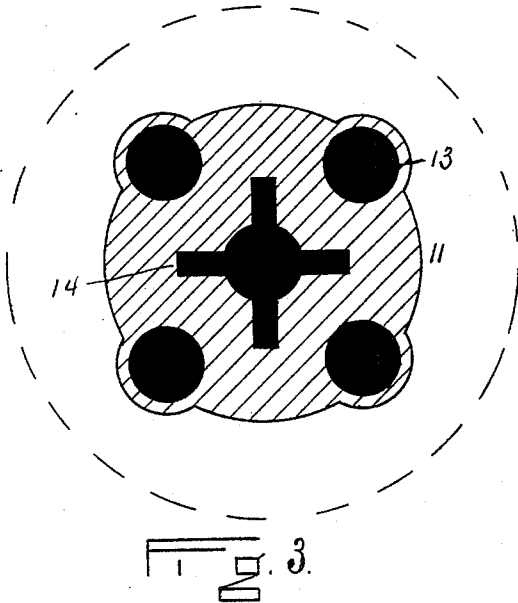
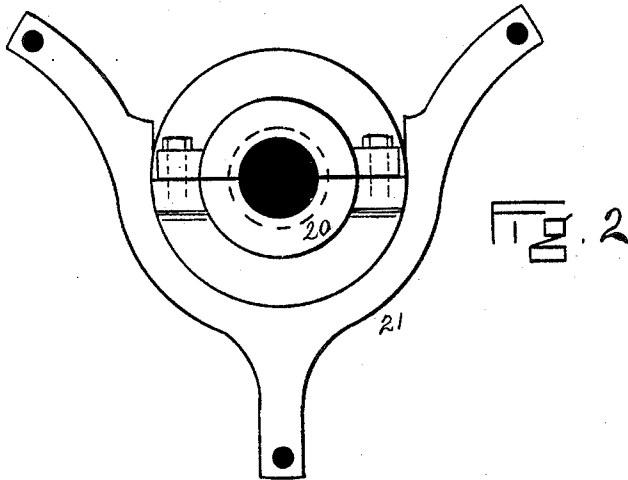
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WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM L. MORRIS, OF CLEVELAND, OHIO, ASSIGNOR TO THE MORRIS
BALL PULVERIZER COMPANY, OF SAME PLACE.

BALL PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 581,755, dated May 4, 1897.

Application filed May 29, 1896. Serial No. 593,599. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. MORRIS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Ball Pulverizers, of which the following, with the accompanying drawings, is a specification.

This invention has relation to that class of devices especially designed for pulverizing rock and ores which carry deposits of precious metals, and in which the pulverizing agent consists of a series of independently-acting balls or rolls adapted to revolve in a track concentric to the axis of an actuating super-imposed driver, the latter being so arranged as to allow the pulverizing-balls to pass over material varying in size.

In the accompanying drawings, which form a part of this specification, Figure 1, Sheet 1, is a central vertical section of my improved device. Fig. 2, Sheet 2, is a plan of the tripod-frame. Fig. 3, Sheet 2, is a horizontal section through the rotatable driver, showing disposition of the spring-wells and aperture for the reception of the wabblers. Fig. 4, Sheet 2, is a similar view through the wabblers.

1 represents a suitable cylindrical case or shell, the upper end of which terminates in a concentric channel having the flaring flange 2, said flange being provided with a series of ears 3, coincident with a series of lugs 4 upon the periphery of the cap 5, by means of which and suitable bolts 6 said cap is secured and retained in place. The cap is provided with a proper opening 7, through which the material to be operated upon is fed by any suitable means. This flanged channel receives a circular track 8, which is provided with a removable wearing face or ring 9, and in which the series of pulverizing-balls 10 revolve. The space between this track 8 and the wearing-ring 9 is partially filled with asbestos, while I drive in wooden wedges at the upper edge to obtain the desired rigidity.

11 is a rotatable driver which is provided with a removable wearing-ring 12, which rests upon the pulverizing-balls 10. This driver 11 is hollow, and in its depending portion there is formed a series of wells 13, Fig. 3,

preferably four in number, which are designed to receive the springs 15. The central portion of this driver 11 has formed in it an axial opening 14, substantially in the form of a Greek cross, as shown, and this is designed to receive the head or wabblers 16, which is slidingly keyed upon the upper end of the shaft 18. 17 is a cap which covers the weight and is retained in place thereon by any suitable bolts. This cap carries a disk-plate 19, upon which the materials to be operated upon falls and which, through centrifugal action, tends to distribute the material evenly to the action of the pulverizing-balls.

The lower end of the driving-shaft 18 passes through a suitable split box 20, which is supported by a tripod-frame 21, the arms of which latter are rigidly secured to the inner walls of the case 1. The said box 20 may be formed integrally with the said tripod, as shown in Fig. 2.

A split clamp-nut 22 is secured upon the shaft, near its lower end, the upper face of said nut having an annular groove formed therein for the reception of antifriction-balls 23, upon which latter rests a loose collar 24.

25 is a removable case for inclosing the parts last described to prevent dust from getting upon the bearing.

26 represents the driving-pulley, which may be keyed upon the shaft, though I prefer to employ a split pulley, as shown, as it is easily removed and adjusted.

28 is an inclined partition-shelf which directs the pulverized material to the discharge 29. The center of this shelf carries a half-box 31, provided with a cap 32, and between which the shaft passes. Its upper end passes through the hub of the head or wabblers 16 and receives an adjusting clamp-nut 33.

34 is a cap-collar to exclude dust from the box 31 and stuffing-box 37.

35 represents an oil-cup from which a conducting-pipe 36 runs, preferably, to the cap 32, so that oil may be delivered to the shaft practically at the highest point where lubrication is needed, and from whence, by gravity, the lubricant passes to the extreme lower end of the shaft.

In practice motion is imparted to the shaft

through the medium of the drive-pulley and through the shaft to the driving-weight. The revolutions of the weight or "driver" cause the balls upon which it rests to travel around the track at a speed proportionate to that at which the shaft is driven, and the material fed to the machine passes to the ball-track, where it is pulverized, not through the vertical pressure upon the grinding balls or spheres alone, but also through the pressure produced from their centrifugal and tangential action when in operation.

In machines of this class the centrifugal action tends to cause the grinding spheres or balls to climb or creep up the wall of the grinding-track to the highest attainable point, especially when driven at a high rate of speed. Such movement of the balls carries them above the point at which the best results are obtained in pulverizing, as it lifts them above the bottom of the track. To obviate this objection and to retain the balls at their lowest points where they will travel in the bottom of the track, I employ the two adjustable nuts 22 and 33 at the lower and upper ends of the drive-shaft, respectively, so that the parts may be readily adjusted in order to limit the centrifugal "climbing of the balls," while it in no wise interferes with the oscillation of the driver incidental to the unevenness of the material being operated upon.

By securing the shaft against end displacement, as described, it will readily be seen that upon turning down the nut 33 the wabblor is forced down upon the shaft, thereby necessarily increasing the pressure of the springs upon the revoluble weight or driver. Hence such increased tension must exert a greater pressure upon the grinding-balls than would be exerted by the gravity of the parts. This increased tension of the springs could not be obtained were it not for the fact that the shaft, being secured against end play, practically forms one of the points of resistance to prevent the expansion of the springs, while it also prevents the centrifugal force, the spring expansion, or both combined, from lifting or forcing the revoluble parts out of their relative positions.

The machine as above described is for dry crushing, but I provide a perforated pipe 38,

supported by brackets 39, through which water may be introduced, so as to adapt the machine for "wet work."

What I claim as my invention is—

1. In a pulverizing-mill, the combination of a driving-shaft, a revoluble hollow driver inclosing springs interposed between said driver and a wabblor longitudinally adjustable upon said driving-shaft, the lower end of said shaft being journaled in antifriction-bearings and secured against end displacement, and a driving-ring revoluble with said hollow driver and exerting a vertical, tangential and centrifugal pressure upon grinding-balls traveling in a rigid concentric grinding-track, substantially as and for the purpose set forth.

2. In an ore-pulverizer, in combination, an inclosing frame, a concave ring-track, crushing-balls within said ring-track, a concave driving-ring in peripheral contact with said crushing-balls, a hollow driver engaging said driving-ring, a wabblor movable longitudinally upon an actuating-shaft, springs interposed between said wabblor and said hollow driver, an adjusting-nut upon the upper end of said shaft, and a cap removably secured to the said driver and carrying a distributing-disk, substantially as and for the purpose set forth.

3. In a pulverizing-mill of the character described, in combination, a driving-shaft, a wabblor longitudinally adjustable upon said shaft, a hollow driver engaging said wabblor, springs interposed between said hollow driver and said wabblor an adjusting-nut upon the upper end of said shaft, rigid bearings for the lower end of said shaft, a loose collar upon said shaft below said rigid bearings, an adjustable nut upon the lower end of said shaft, and antifriction-balls between said loose collar and said nut, substantially as and for the purpose set forth.

In testimony whereof I affix my signature, in presence of three witnesses, this 21st day of May, 1896.

WM. L. MORRIS.

Witnesses:

JOHN W. MORRIS,
E. HARVEY,
H. S. SPRAGUE.