

No. 631,239.

Patented Aug. 15, 1899.

H. M. WILLIAMSON.

ORE PULVERIZER.

(Application filed Mar. 18, 1898.)

(No Model.)

2 Sheets—Sheet 1.

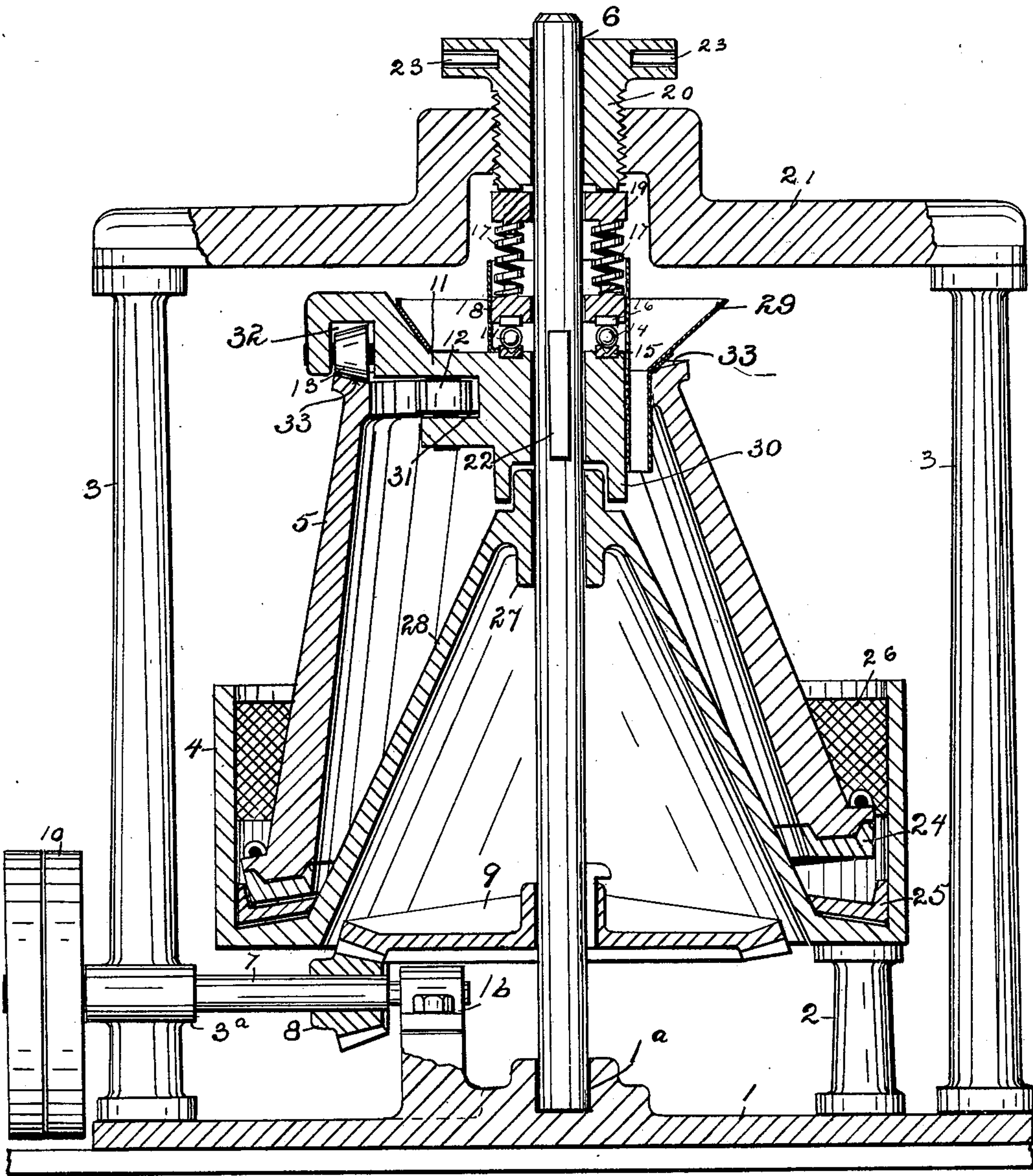


FIG. 1.

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By his Attorney  
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No. 631,239.

Patented Aug. 15, 1899.

H. M. WILLIAMSON.  
ORE PULVERIZER.

(Application filed Mar. 16, 1898.)

(No Model.)

2 Sheets—Sheet 2.

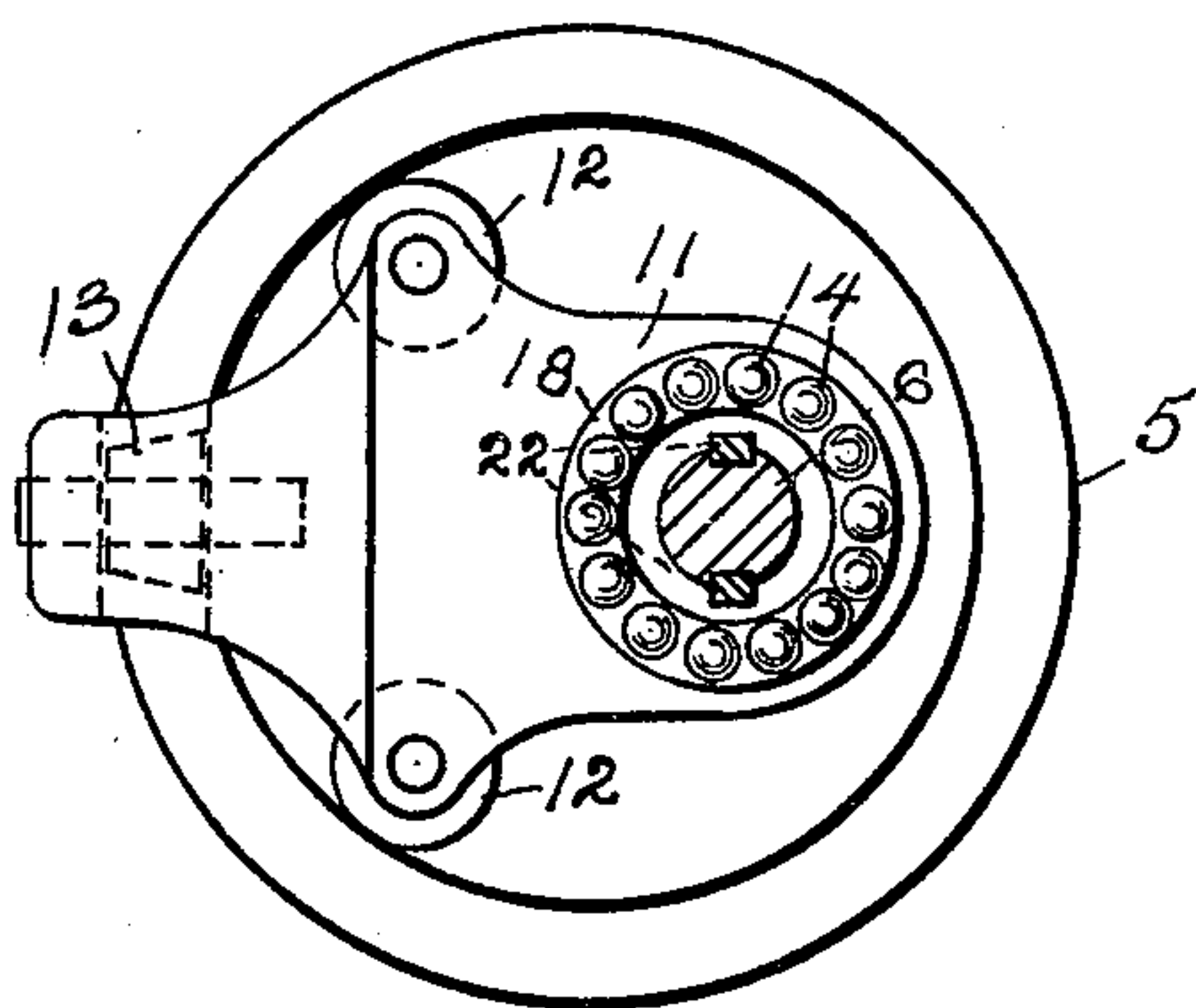


FIG. II.

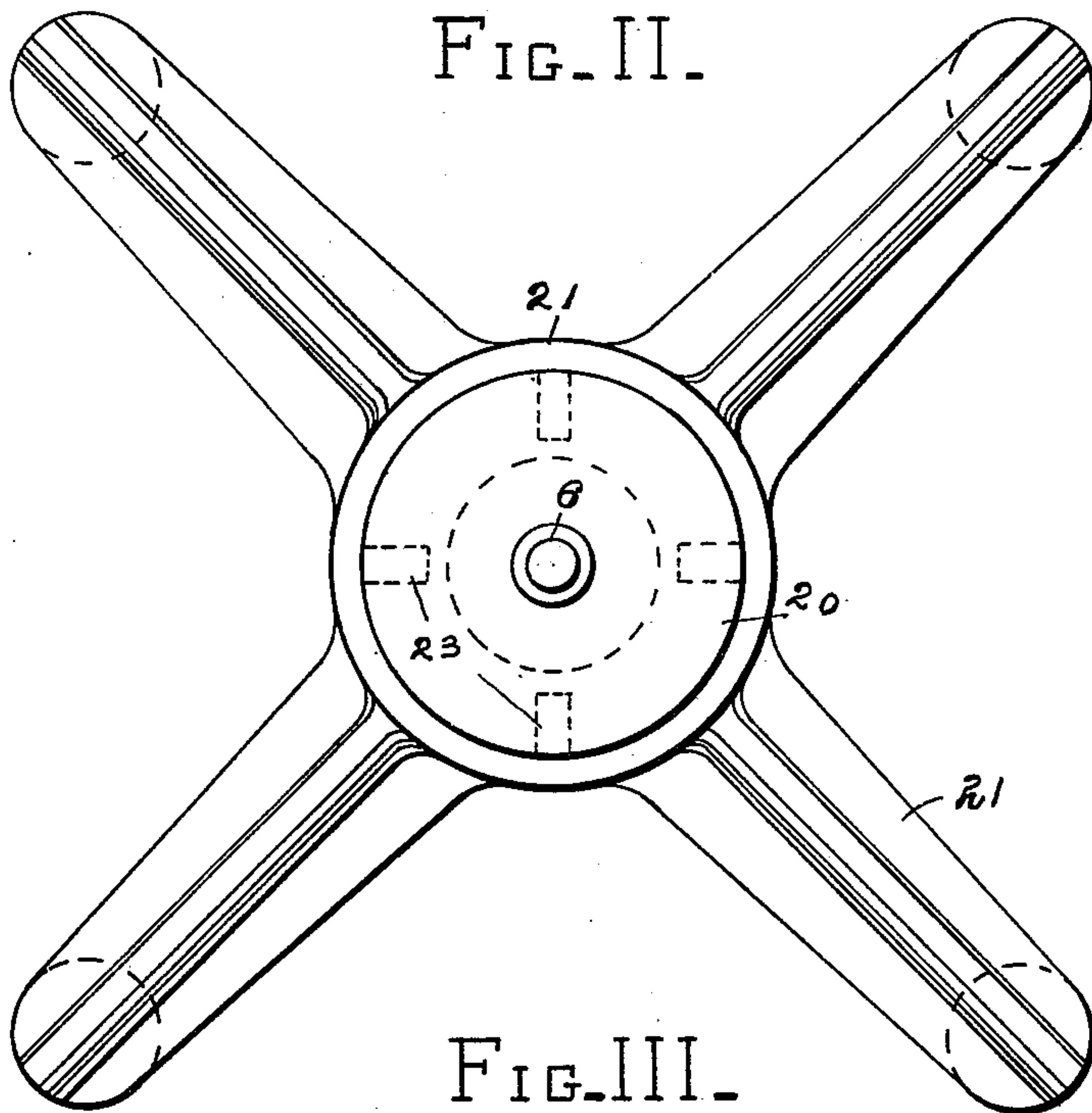


FIG. III.

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# UNITED STATES PATENT OFFICE.

HARRY MAXWELL WILLIAMSON, OF DENVER, COLORADO.

## ORE-PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 631,239, dated August 15, 1899.

Application filed March 16, 1898. Serial No. 674,134. (No model.)

*To all whom it may concern:*

Be it known that I, HARRY MAXWELL WILLIAMSON, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented new and useful Ore-Pulverizers, of which the following is a specification.

My invention relates to ore-pulverizers in which a gyrating motion is given to a hollow cone or shell bearing an annular grinding-shoe at its base, the said shoe coöperating with a corresponding shoe which is fixed in the bottom of an annular grinding-pan having a raised annular outer wall and a raised conoidal central part, which affords a bearing for the driving-shaft.

The said invention consists in certain improvements in the mechanism for gyrating the grinding cone or shell and in the pulverizer generally, substantially as hereinafter set forth and claimed.

In the accompanying drawings, Figure I represents a vertical central section of my improved ore-pulverizer. Fig. II represents a plan view of the top of the grinding shell or muller and the devices by which it is oscillated, the upright shaft and feathers being shown in cross-section; and Fig. III represents a plan view of the frame, the shaft, and the pressure adjusting screw, which forms its upper bearing.

The numeral 1 designates the base of the frame of the machine, having a bearing-recess 1<sup>a</sup> formed in its upper face, in which is stepped the lower end of an upright shaft 6, extending through the entire machine to the spider-formed top 21 of the frame, where the said shaft has its upper bearing in the central bore of a tubular screw 20, turning in a screw-tapped central opening of the said top 21. The said screw is provided with recesses 23 in its periphery to receive a key or bar for turning it. Midway, or nearly so, between the said bearings the said shaft has a third bearing 27, formed in the upper end of a raised conoidal central part 28 of a stationary grinding-pan 4, supported on the short standards 2, rising from the said base. A bevel gear-wheel 9, keyed upon the shaft 6, meshes with a bevel-pinion 8, fast on a driving-shaft 7,

this latter shaft being provided with belt-wheels 10 and journaled in bearings 3<sup>a</sup> and 1<sup>b</sup>, the former on one of the columns 3 of the machine-frame and the latter raised on the base 1.

A hollow grinding-muller 5 is provided at its lower edge with an annular grinding-shoe 24, which coöperates with a similar shoe 25, fixed in the pan 4, at the bottom of the interior thereof. The ore is fed to the grinding-surfaces by a hopper 29, discharging into the space between the raised conoidal central part 28 of the pan and the inner face of the grinding shell or cone. After grinding, the comminuted ore passes upward through a screen 26, arranged in the pan, and is discharged in the form of a thickened partly-liquid mass. The said grinding-muller receives its oscillating motion from a pressure-head 11, which is preferably a casting and has an elongated form in plan view, as shown in Fig. II. One end of this pressure-head is centrally bored and extended downward to form a sleeve 30, this sleeve being vertically grooved to receive feathers or splines 22, formed on shaft 6, which permit the said pressure-head to move up or down on the said shaft, though continuing to turn with it. The sides of the said head are recessed at 31 to afford bearings for two horizontal rollers or wheels 12, which act against the inner face of the grinding cone or shell 5 and oscillate the latter. It is not necessary, though it is preferable, that more than one horizontal roller should be employed. The end of the said pressure-head which is the more remote from shaft 6 is recessed from below at 32, forming bearings for a vertical beveled roller 13, which runs on a correspondingly-beveled annular face or track 13 on the top of the grinding shell or cone 5. Springs 17, located between two rings 18 and 19, press the head 11 downward, holding the roller 13 to its track. Their pressure is adjusted by the screw 20, before mentioned, which bears against the upper ring 19. The lower ring 18 has an annular facing 16 set into its under side, which rests on a circular series of anti-friction-balls 14 in a channeled ring 15, which is set into a circular recess in the top of pres-



sure-head 11. The hopper 29, before described, is attached to the pressure-head and turns therewith. The lower end of sleeve 30 is recessed to receive the upper end of bearing 27 in order that it may be braced thereby in case of unusual strain.

The rotation of the shaft 6 and pressure-head 11 will cause the two horizontal rollers or wheels 12 and the beveled wheel 13 to travel around the upper end of the muller 5, so as to give it an oscillating and gyrating motion upon and against the bottom of the pan, whereby the ore will be ground between the two grinding-shoes. In case of any unusually hard and refractory substance the springs 17 allow upward yielding of the grinding-cone 5, so that no damage can be done, and the amount of resistance of the said springs may be regulated by the screws 20 to any required degree. The balls 14 and the smooth hard rings 15 and 16 between which they are located reduce to a minimum the friction of the pressure by the said springs on the pressure-head 11. The pressure of the said springs is at all times applied vertically to the said pressure-head—that is to say, in lines parallel to the shaft and concentrically on all sides thereof.

The extension of the shaft 6 up through the entire machine, with bearings both in the top and bottom of the frame and also an intervening bearing in a fixed part, necessarily makes the machine much stronger than if the said shaft were made to end at the pressure-head or some other point short of the top of the frame. The compactness of the pressure-head and the horizontal and vertical rollers carried thereby and constituting the means of gyral oscillation will of course permit this very strong construction of the machine without exceeding a very moderate height. The said head and rollers, with the hopper and other attachments, hardly amount to more in vertical height than a rather thick horizontal disk, especially so far as the parts above the top of the cone are concerned. They consequently add very little to the necessary height of the machine, which therefore stands low and is very strong. Its devices for oscillating the grinding-cone are particularly durable, simple, reliable, and easily replaced.

Of course this machine may be used for coal or other suitable material, as well as for ore.

We are aware that individual elements of the machine are old in grinding devices—such, for instance, as the horizontal wheels or rollers for oscillating the cone, the general structure of the pan and gyrating cone, and other details. We do not claim these broadly, nor do we claim the general principle of grinding ore, coal, or other material by means of a fixed shoe in a pan and another shoe operating against the same and carried by a gyrating shell or cone; but

What we do claim, and desire to secure by Letters Patent, is—

1. A pressure-head carrying an antifric-tion device which bears on the top of the grinding muller or shell and also carrying means, horizontally in contact with the said muller adapted to give the latter a gyral motion as the said head rotates, in combination with the said muller, the pan in which it works to grind the ore, the shaft on which the said head is slidably feathered, and means for forcing the said pressure-head downward by yielding pressure applied thereto vertically, substantially as set forth.

2. In combination with a pan and a grinding-muller operating therein, a shaft extended from the bottom to the top of the machine, a pressure-head attached to the said shaft and rotating therewith, horizontal and vertical rollers journaled in and carried around by the said pressure-head and arranged to give the said muller a gyral motion, and springs arranged about the said shaft and bearing vertically on the said pressure-head at points on opposite sides of the said shaft, substantially as set forth.

3. A pressure-head 11 provided with recesses 31 and recess 32 in the under side of one end, and bored and grooved vertically as described, in combination with a shaft having splines or feathers fitting in the grooves of the bore, springs which bear on the said pressure-head to force it downward, vertical and horizontal rollers turning in the recesses aforesaid, a grinding-shell having its upper end arranged for contact with the said vertical and horizontal rollers, and a pan in which the said grinding-shell operates on the ore or other material as it is gyrated by the said rollers, substantially as set forth.

4. In combination with a fixed pan, a gyrating muller which operates therein and is provided at the top with an annular beveled face, a beveled roller in contact with the said face, horizontal rollers acting against the inner face of the upper end of the said grinding-shell, a vertical shaft, a sliding pressure-head which turns with said shaft and carries all of the said rollers and spring-pressed devices which surround the said shaft and apply yielding pressure to said head in lines parallel to the said shaft, substantially as set forth.

5. A shaft extending up through the entire grinding-machine, in combination with the frame which provides bearings for the ends of the said shaft, a fixed pan formed with a bearing for the middle of the said shaft, a gyrating grinding shell or muller which operates in the said pan, a pressure-head adapted to slide on the said shaft but turning therewith and carrying vertical and horizontal rollers to act on the top and inner face of the upper end of the said grinding-shell, substantially as set forth.

6. In combination with a fixed pan and a grinding shell or muller operating therein and provided with a beveled face on its top, a pressure-head, a vertical beveled roller car-



ried thereby and running on the said beveled  
face, a horizontal roller or rollers also carried  
by the said head and acting against the inner  
face of the upper end of the said shell, a shaft  
5 on which the said pressure-head is feathered,  
means for driving the said shaft, rings and  
antifriction-balls arranged between the said  
springs and the said pressure-head and a  
screw bearing on the said springs to adjust  
their pressure, substantially as set forth.

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