

No. 849,545.

PATENTED APR. 9, 1907.

B. HUNT.
GRINDING AND PULVERIZING APPARATUS.

APPLICATION FILED FEB. 27, 1906.

Fig. I.

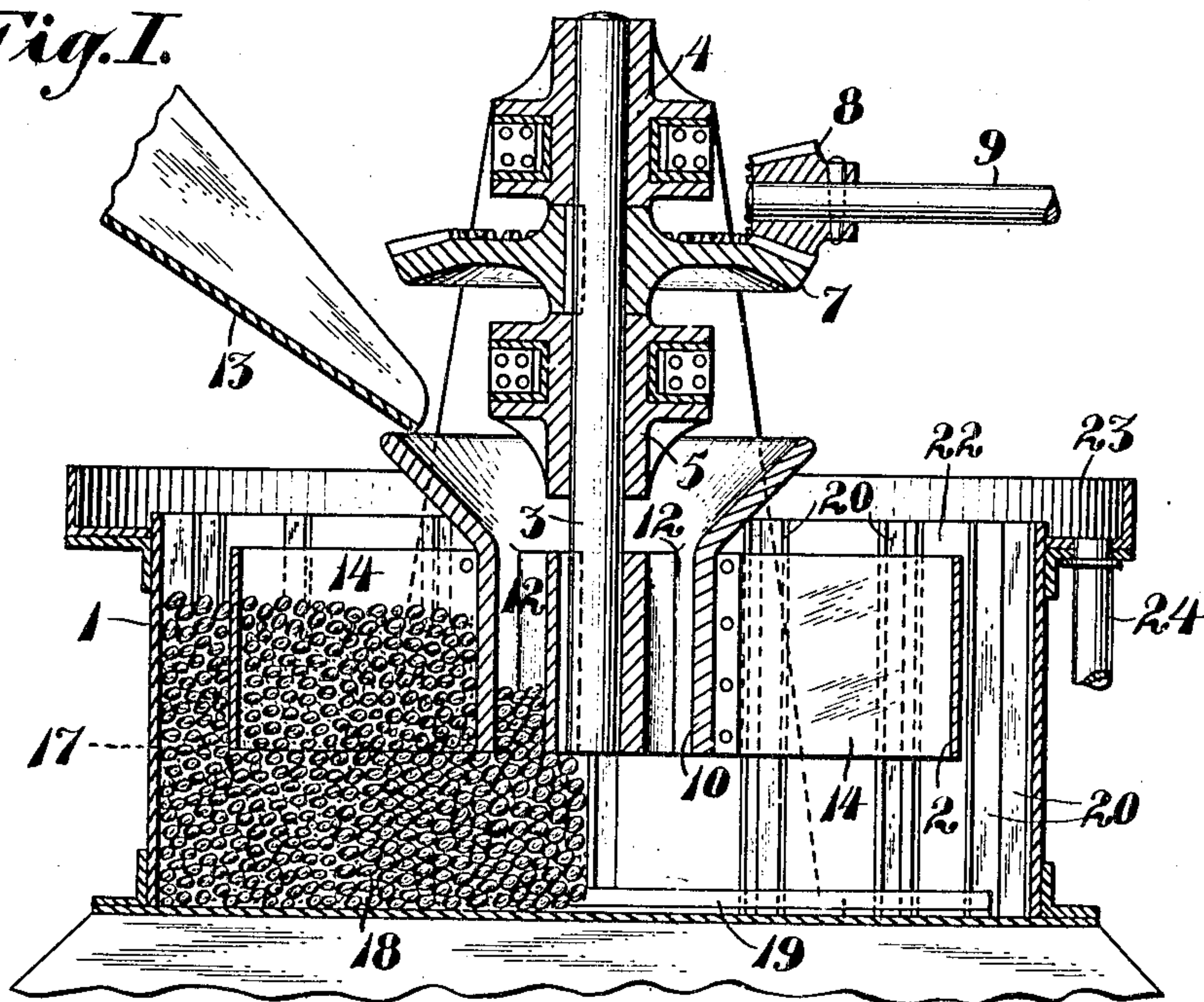
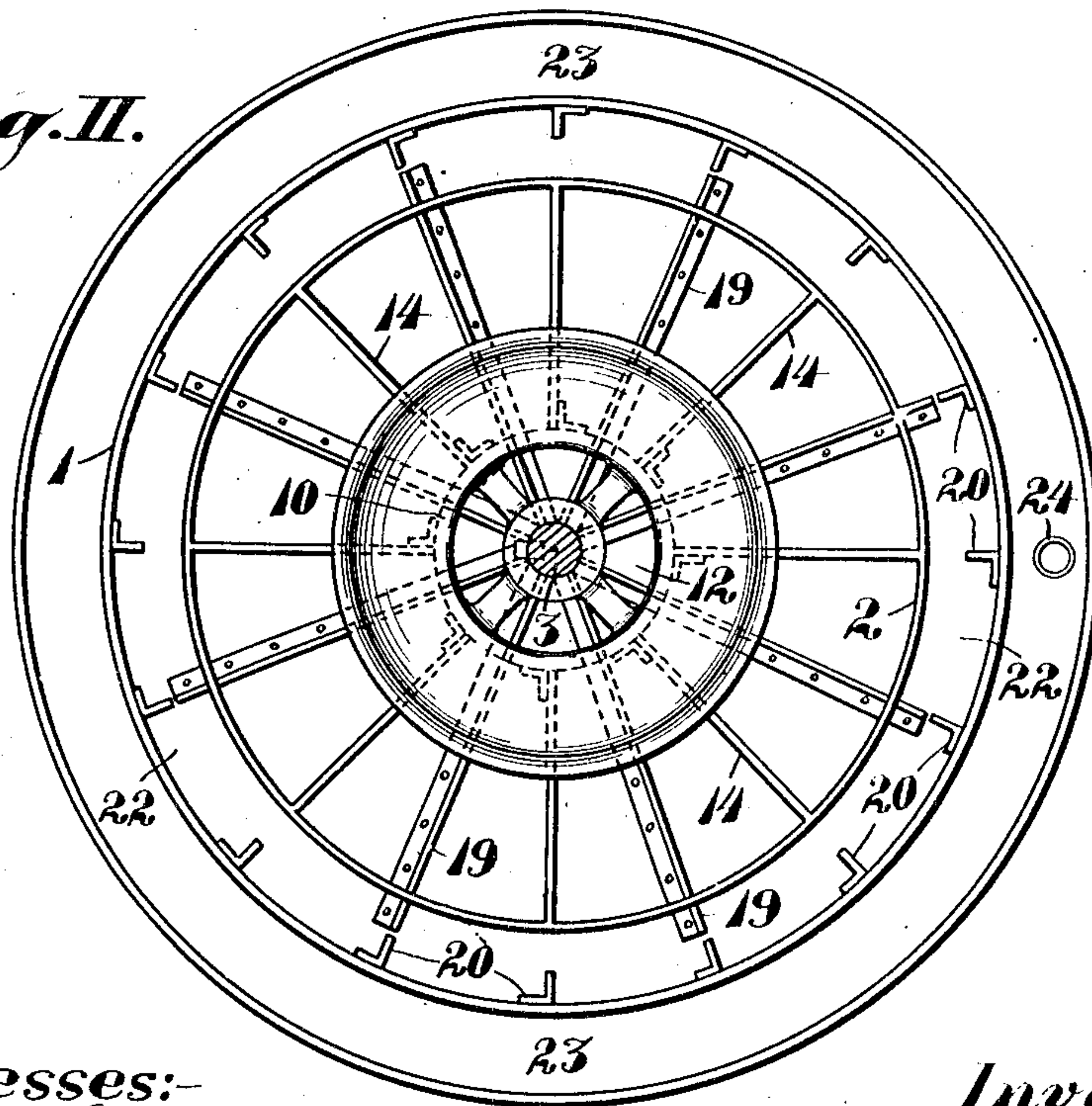


Fig. II.



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UNITED STATES PATENT OFFICE.

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GRINDING AND PULVERIZING APPARATUS.

No. 849,545.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, BERTRAM HUNT, a subject of Great Britain, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Grinding and Pulverizing Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to means for grinding and pulverizing substances, especially minerals, such as auriferous or other ores, by agitation and attrition, and to certain useful improvements in machines and apparatus for that purpose, as hereinafter described, explained, and illustrated by drawings that form a part of this specification.

My improvements consist in confining and moving the abrading agent, commonly pebbles, metallic balls, or the like, between revolving and fixed or relatively moving surfaces disposed in a horizontal plane, so that both the pressure thereon and the rate of movement will be under control.

The objects of my invention are to increase the action of the abrading agent, as hitherto employed in tube-mills, tumbling-barrels, and like machines, by an improved construction permitting pressure of the superincumbent mass on the abrading agent and the substance to be ground or pulverized, also to attain rapid motion of the abrading agents and consequent increase of effect and of the amount of work that can be performed in a given time and in proportion to the cost, weight, and dimensions of the machinery employed.

To these ends I construct grinding and pulverizing machines substantially as shown in the drawings, such construction being especially adapted for finely-comminuted mineral ores, Figure I being a vertical section through a simple machine to operate according to my invention, and Fig. II a plan view of the device shown in Fig. I with the superposed parts omitted.

In grinding and pulverizing by means of free-moving agents—such as gravel, pebbles, metallic balls, or the like, among which the material to be treated is diffused—there are in the horizontal machinery now in use two defects that limit the amount of work performed and increase the cost and extent of the machinery employed. These defects are

a want of means to produce pressure between the rubbing or abrading surfaces and the limitation of speed, which cannot exceed what will permit the abrading material to fall by gravity against centrifugal force. I do not in this remark respecting pressure include crushing-machines operating with balls or rollers having superposed weight thereon, but refer to that class that operate by attrition, as in the type of machines already named.

To attain an increased efficiency and reduce the dimensions of machines operating by attrition, I provide a construction substantially as shown in the drawings, now to be referred to.

1 is a main casing of cylindrical form, shown with vertical walls, but which can be made divergent or flaring.

2 is a revoluble agitating device, hereinafter called the "driver," supported on a shaft 3, held in bearings 4 and 5, having suitable supports and driven by the wheels 7 and 8, power being applied to the shaft 9. This constitutes what is called a "top-driving" arrangement; but it will be understood that the driver 2 can be operated from beneath the machine by extending the shaft 3 down through the bottom of the casing 1, both these forms of construction being common in practice.

The driver 2 consists of hollow hub 10, with an annular passage 12 for ore or other material to be ground, that is supplied from a spout 13 or in other suitable manner. To the hub of the driver 2 is attached a series of arms or vanes 14, that stir and agitate the filling or abrading material 18, which is, by preference, coarse gravel or pebbles of hard stone.

On the bottom of the main casing 1 are fastened radial bars or ribs 19, also vertical ribs 20 around its interior, to baffle and prevent rotation and consequent scouring of these surfaces by the abrading material 18, but still permitting to some extent mobility of the whole.

The ribs or bars 19 and 20 are substitutes, in effect, for the usual renewable lining, of metal or other hard material, required in grinding and pulverizing machines of the present type and not only replace such linings but avoid a smooth line of cleavage when the abrading material meets the linings and where little or no effect results from motion.

The pressure on the abrading material 18 is in proportion to its depth, being most intense at the bottom, and in all parts, except at the surface, far in excess of what can be attained in tumbling-machines, which for pressure on the grinding medium is no more than the gravity of a thin layer and with water is only the weight of the grinding material in excess of its specific gravity.

10 The combined water and material to be ground on reaching the bottom of the passage 12 is radially diffused in the horizontal plane 17 at the bottom of driver 2 between two strata of the abrading material, both 15 mobile, that have an intense grinding action by reason of the body of the latter between the arms 14 being in revolution and that below the plane 17 being stirred or agitated mainly on the top or as the distance between 20 the vanes 14 and the baffling-vanes 19.

The annular zone 22 between the driver 2 and the walls of the vessel or pan 1 I make of varying width according to the fineness of the grinding or abrading material used, but 25 in all cases to permit a slow revolution of the general mass contained in this annulus. The coarser the pebbles or grinding material the wider this space is made, approximately one-fifth of the radius of the driver 2.

30 The abrading material between the radial arms or vanes 14 being carried around with the driver 2 prevents scour or wear upon these parts of the machine and, as in the case of vessel or pan 1, renders linings unnecessary.

35 In the present machine the material to be ground or pulverized, with the required amount of water, passes down at 12, coming first in contact with the grinding material 40 near the center, where motion is slow, then is diffused outward and upward until in liquid form it flows into the annular launder 23 and escapes through the pipe 24 for further treatment by chemicals or otherwise for finally 45 extracting the metalliferous part.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

50 1. In a grinding and pulverizing machine, in combination, a cylindrical vessel, a revolvable driver having radial vanes, centrally mounted within said vessel, leaving an annular space between said driver and the vertical wall of the vessel and a circular space

55 between the driver and the bottom of the vessel, and granular abrasive material in said annular space and said circular space, and between said vanes, for effecting the grinding function as said abrasive material moves at differential speeds by the operation 60 of the driver, substantially as specified.

2. In a grinding and pulverizing machine, in combination, a cylindrical vessel, a revolvable driver having radial vanes, centrally 65 mounted within said vessel, leaving an annular space between said driver and the vertical wall of the vessel and a circular space between the driver and the bottom of the vessel, baffling-ribs on the inner face of the vertical wall of the vessel, radial baffling-bars on 70 the bottom of said vessel, and granular abrasive material in said annular space and said circular space, substantially as specified.

3. In a grinding and pulverizing machine, in combination, a cylindrical vessel, a revolvable driver having radial vanes, centrally 75 mounted therein, leaving an annular space between the two at the sides and a circular space at the bottom, a driving-shaft at the center of the driver, a hopper-shaped hub 80 surrounding said shaft, baffling-bars arranged within the vertical wall of the vessel and on the floor thereof, and granular abrasive material in said annular and circular spaces, substantially as specified. 85

4. In a grinding and pulverizing machine, in combination, a cylindrical vessel, a revolvable driver having radial vanes centrally 90 mounted therein, leaving an annular space between the two at the sides and a circular space at the bottom, a driving-shaft at the center of the driver, a hopper-shaped hub surrounding said shaft, a feeding-chute adjacent to said hopper-shaped hub, baffling-bars arranged on the inner wall and floor of 95 said vessel, an annular trough surrounding said vessel at the top, with spout, and granular abrasive material in said annular space and said circular space, substantially as specified. 100

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

BERTRAM HUNT.

Witnesses:

JAMES MASON,
ELMER WICKES.