(No Model.)

J. S. KINGSLAND.

ORE MILL.

No. 425,886. Patented Apr. 15, 1890.

FIG. 1.

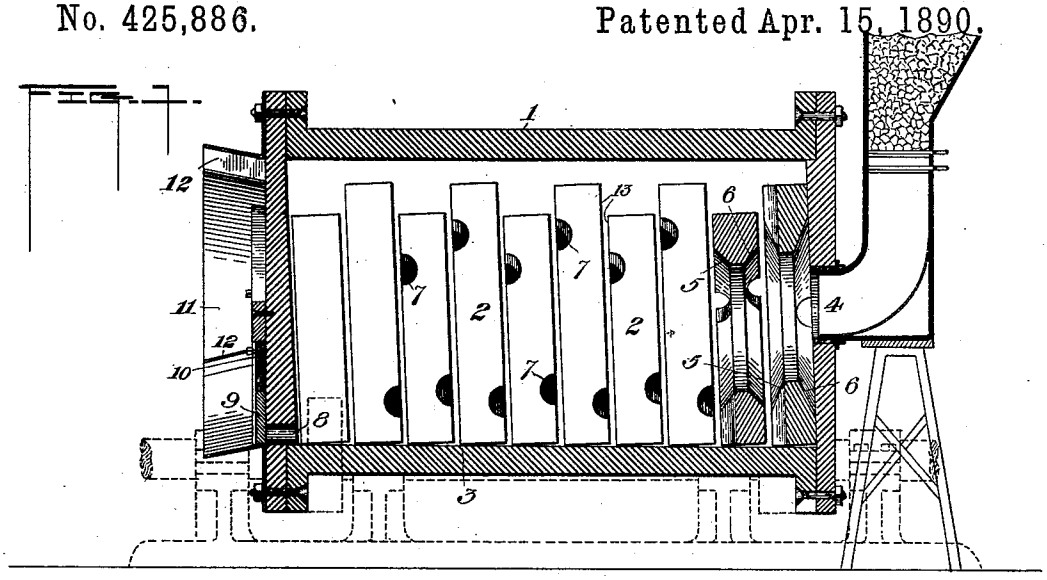


FIG. 2.

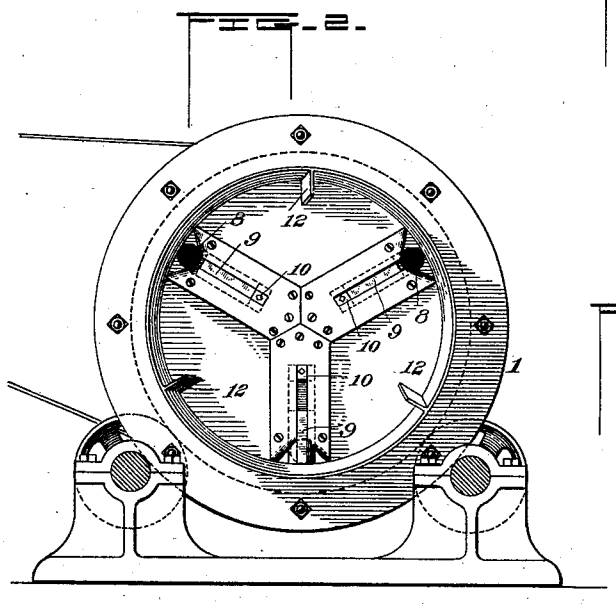


FIG. 3.

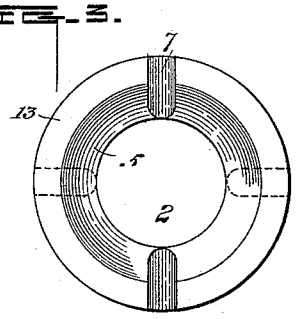


FIG. 4.

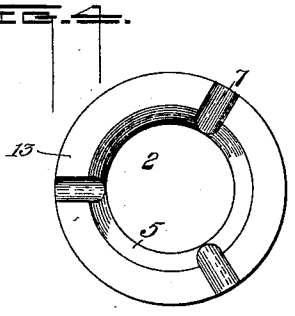
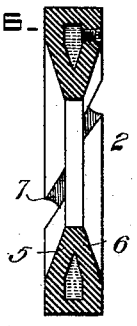


FIG. 5.



FIG. 6.



WITNESSES

L. A. Commander

Edward Lockwood

INVENTOR

James S. Kingsland

by Benj. R. Catlin

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES S. KINGSLAND, OF FLATBUSH, NEW YORK.

ORE-MILL.

SPECIFICATION forming part of Letters Patent No. 425,886, dated April 15, 1890.

Application filed January 24, 1890. Serial No. 338,004. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. KINGSLAND, a citizen of the United States, residing at Flatbush, in the county of Kings and State of New York, have invented certain new and useful Improvements in Ore-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the invention is to provide means for grinding ores and other substances, which shall be simple in construction and efficient and durable in operation; and it consists in the matters hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal section of the improved mill, and Fig. 2 is an elevation of the discharging end. Figs. 3 and 4 are side elevations of rings, and Figs. 5 and 6 are views of modified forms.

The improvement may be applied to revolving cylinders of a well-known type—such as indicated at Fig. 1 in the drawings. These may be mounted on friction-rollers and revolved by gearing of any approved kind. Within the cylinder is placed a series of heavy rings 2 in such manner that they each rest upon an edge or on one side of the curvilinear face of the ring, as at 3. Preferably the rings are held in an inclined position and so as to stand upon an edge, as above stated, by the inclined inner faces of the cylinder-heads. In the position illustrated these heads hold the rings so that they stand upon the edges opposite the end in which is the charging-inlet 4, while the edges nearest said end are elevated slightly above the bottom of the cylinder; but it is obvious that when the cylinder with its contained rings is caused to revolve the inclination of the inner faces of the cylinder-heads will be reversed with each half-revolution and that continued rotation will impart to the rings a movement in the direction of the axis of the cylinder of an oscillatory character, whereby particles of ore or other material falling under the rings will be crushed against the cylinder-wall.

The rings are preferably made of different diameters, whereby they move with unequal velocity when revolved by the rotating cylinder, whereby they grind the material between their faces. To increase this effect, as well as to facilitate the centrifugal movement of the material, the inner circumferential edges of the rings are chamfered or beveled, as indicated at 5 and 6, and preferably at different angles. For example, one bevel may have an inclination to the main face of the ring of twenty-two and one-half degrees and another one of forty-five degrees, but these angles may be varied. Their effect is to increase the movement of the contents of the space inclosed by the rings and to increase the grinding effect produced by their faces. Thus the face 13 of a small ring will, by the revolution of the cylinder, be brought against the bevel 5 of a larger ring, and the face 13 of a larger ring will be brought in contact with the edge of a smaller ring, whereby a variety of grinding contacts are produced.

At 7 are indicated passages radially disposed in the ring-faces, which passages receive material and facilitate its centrifugal movement, and as the rings move with different angular velocities, because of the inequality of their diameters, said passages in the different rings will be carried by each other in such manner that their edges will have a shearing action.

In some cases the rings are cored out to provide an interior chamber adapted to receive water, mercury, or other fluid, whereby the temperature or the movement of the rings, or both temperature and motion, may be modified. Thus, for example, water or other fluid colder than the contents of the cylinder would tend to prevent rise of temperature, and it could also be used to cause a variable center of gravity in a ring, and thus retard or modify its rotary movement.

At the delivery end of the cylinder one or more exit-openings 8 are provided, and by preference two or more are employed and arranged with gravitating covers or slides 9, automatically moving in dovetailed ways in such manner that they will drop by gravity and close each opening when it is brought by the revolution of the cylinder to its lower position, and will in like manner uncover said opening when it approaches its highest position. The effect of this construction is to

prevent the ground material from leaving the cylinder except through an opening in its upper part. The size of this opening or of such openings may be regulated by an adjustable block 10, fastened at will by a set-screw, and this device can also be used when desired to temporarily close the exits.

In Fig. 2 the lower discharge-opening is shown as closed by the sliding cover 9, after it has been moved down to its lowest position by gravity. As the cylinder revolves, this cover will be moved in its ways or guides by gravity, so as to open the discharge, as indicated at the upper part of said figure. The blocks 10 are made adjustable toward and from the openings, and are secured in any desired position by set-screws. As represented, they are set to permit the openings 8 to be entirely uncovered by the falling of the covers 9; but the blocks may be moved toward said openings and fastened by screws or otherwise, so that the sliding covers are prevented from moving to uncover the discharge-openings entirely, or, if desired, so as to close the openings during the entire revolution. It is obvious that the set-screws could be otherwise applied, or that well-known equivalents could be substituted.

The exit end of the cylinder is preferably provided with an annular ring or skirt 11, having interior blades or wings 12, which may have an oblique arrangement, as indicated. These wings will cause a slight air-current, tending to withdraw the fine material from the cylinder and direct it away therefrom.

The operation of the invention can be understood from the above description. Ore or any suitable substance to be ground is fed into the charging-inlet 4 by any usual means while the cylinder and its contained rings are being revolved, and finds its way into and through the interior passage formed by the central holes in the several rings and into the spaces produced by the chamfered inner edges of the rings, and into the passages 7, and to a small extent between the plane faces of said rings and underneath their circumferential faces, in which situations it is crushed or ground and speedily reduced to a sufficient degree of fineness. The escape from the cylinder is regulated by the gravitating covers of the exits, as before stated. The otherwise empty spaces of the cylinder and grinding-rings will be filled with the ore or other material in constant motion and subjected at different points to a variety of pulverizing actions. The rings, for example, will break and crush under their lowest faces, while they will rub or triturate between their parallel faces, and the edges of the passages 7 will have a shearing effect, as will also the outer edges of the smaller rings. The passage of material through the revolving cylinder can be regulated or altogether suspended for a time, if found desirable.

The mill is ordinarily full of the material being ground, which will be forced along toward the delivery end by the rotation of the cylinder and the consequent movement of the rings and material. The return of the latter toward the inlet is hindered by the fresh charge and also by a suitable inclination of the cylinder, if necessary. The blades 12 also produce sufficient draft to remove the finely-ground material from an open exit, and said material can be received and conveyed away in any usual or convenient manner.

It will be obvious that the invention is independent of the material used in the construction of the machine. Cast-iron is suitable for the purpose, and preferably the rings and cylinder are made of the same degree of hardness. The number of the rings is not of the gist of the invention, nor the number of the passages 7, and these might be omitted without sacrificing all the advantages of the improvement, as also might be the chamfering of the inner edges of the rings.

More than two sizes of rings could be employed, and a part only could be provided with diametric passages or with beveled edges.

A crushing action of the rings might be produced by providing their peripheries with oblique faces, as indicated in Fig. 5.

Various other particulars may be modified by mechanical skill without essentially altering the principles of operation.

Having thus described my invention, what I desire to secure by Letters Patent, is—

1. In a grinding apparatus, a cylinder provided with suitable inlet and outlets, and means for rotating it, in combination with rings loosely placed side by side in its interior, said rings being of unequal diameters and provided with faces 13, and having their inner edges chamfered, substantially as set forth.

2. In a grinding apparatus, a cylinder provided with suitable inlet and outlets, and having the inner faces of its head inclined to its axis, in combination with rings loosely placed in its interior, substantially as set forth.

3. In a grinding apparatus, a cylinder provided with two or more exits having gravitating covers placed at different points around the axis of the cylinder and adapted to be automatically opened and closed by the revolution of the cylinder, substantially as set forth.

4. In a grinding apparatus, a cylinder provided with two or more exits having gravitating covers placed at different points around the axis of the cylinder and adapted to be automatically opened and closed by the revolution of the cylinder, and set-screws for regulating the extent of the movement of the covers, substantially as set forth.

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

JAMES S. KINGSLAND.

Witnesses:

THOS. S. HOPKINS,

BENJ. R. CATLIN.