

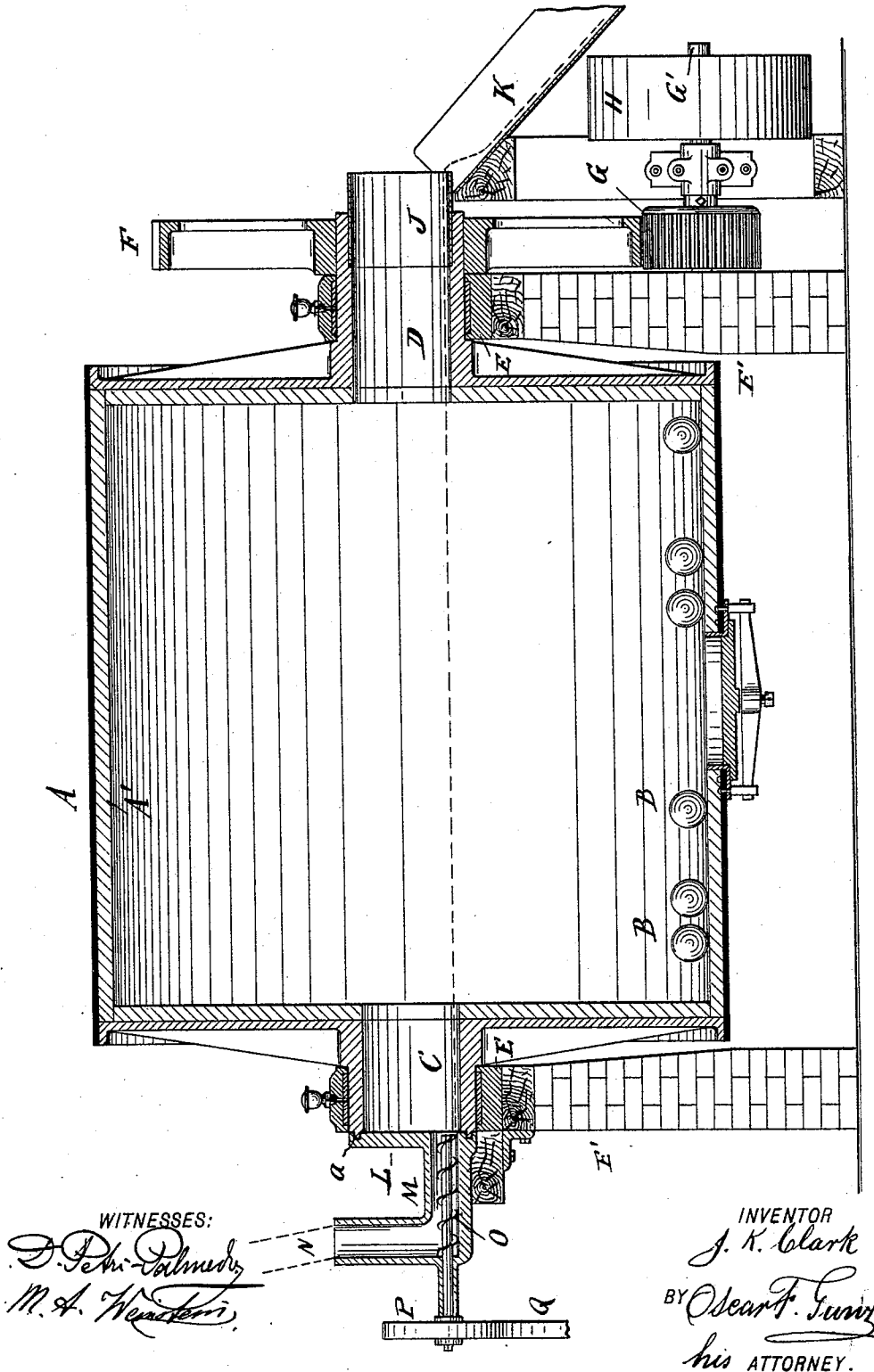
(No Model.)

J. K. CLARK.

APPARATUS FOR GRINDING ORES OR OTHER SUBSTANCES.

No. 583,008.

Patented May 18, 1897.



UNITED STATES PATENT OFFICE.

JOSEPH K. CLARK, OF BUTTE, MONTANA.

APPARATUS FOR GRINDING ORES OR OTHER SUBSTANCES.

SPECIFICATION forming part of Letters Patent No. 583,008, dated May 18, 1897.

Application filed May 1, 1895. Serial No. 547,765. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH K. CLARK, a citizen of the United States, residing in Butte city, in the county of Silver Bow and State of Montana, have invented certain new and useful Improvements in Apparatus for Grinding or Pulverizing Ores or other Substances, of which the following is a specification.

This invention relates to new and useful improvements in apparatus for grinding or pulverizing ores and other substances.

Heretofore many attempts have been made to produce a pulverizing-machine capable especially of use in grinding ores which would work rapidly and economically, which would finely pulverize the ore, and which would also deliver the product at a uniform degree of fineness; but, so far as I am aware, while many pulverizing-machines have been invented none of them have been capable of doing sufficiently rapid and fine work to make their use economically successful, especially for working the poorer grades of ores.

To produce a machine which will deliver a much greater product with a given horsepower than prior machines and which will also be capable of delivering an exceedingly fine and uniform product is the object of my invention, and this object I accomplish by providing a grinding or pulverizing machine of the ball-and-drum type having axial inlet and outlet openings, with a positive feed for the material to be reduced, the usual air-blast being discarded, the arrangement being such that when the material in the drum reaches a certain level further feeding of the material will cause the overflow from the other end of the receptacle of the material reduced, the discharge of the finished material being thus effected by displacement instead of by an air-blast, as in prior constructions.

In the accompanying drawing, forming a part of this specification, a vertical longitudinal sectional view of my improved apparatus is shown.

A drum A, preferably made of sheet metal, is provided with lining A', of porcelain or other suitable material, and contains a greater or less number of porcelain balls B or flint pebbles or similar grinding devices. The drum is provided on one head with the inlet-neck C and on the other head with the outlet-

neck D, which necks are mounted to turn on suitable bearings E of any approved construction, and which bearings are fastened on the supports E', which form the supports for the rotating drum. As shown in the drawing, the inlet and outlet openings are arranged opposite each other in the heads of the drum, and the outlet-opening is unobstructed by a sieve or other straining device, so that the pulverized material has a free and uninterrupted passage from the drum and can therefore flow therefrom in a regular stream. As shown, a cog-wheel F is fixed on the outlet-neck D outside of the bearing E, and said cog-wheel is engaged with a driving-pinion G, fixed on the same shaft G' with the belt-pulley H. This arrangement may, however, be varied, if desired. An inclined chute K is arranged below the outer end of the tube J, as shown, the upper end of said chute being directly below the tube J.

In the construction shown in the drawing, L indicates a fixed piece which is located adjacent to the outer end of the inlet-neck C, which neck has an annular tongue *a* at its end, which is adapted to fit into an annular groove in the said fixed piece L. The fixed piece L has an L-shaped neck M, the bottom of which leads to the bottom part of the inlet-neck and the upwardly-projecting part of which neck is connected with the supply-pipe N for the ore to be ground. A conveyer-screw O, which in the construction illustrated is in the bottom horizontal part of the neck M, serves to convey the material to be ground into the drum, and said screw is rotated at the required speed by means of a pulley P and belt Q independent of the means for rotating the drum.

The operation is as follows: The drum, being supplied with a suitable quantity of balls or pebbles, is caused to rotate, and the ore or other material to be treated is fed into it through the inlet-opening. As the ore is fed into the drum the material in the drum gradually rises until it reaches the level of the discharge-opening, the ore being meanwhile finely ground by the action of the balls or pebbles in the drum. As the material is fed into the drum the larger and heavier particles gravitate to the bottom of the cylinder, the finely-ground material, which is often an

impalpable powder, on account of its lightness rising to the top, and consequently when the material in the drum rises to the level of the outlet the lighter material, being displaced
5 by the heavier incoming material, is slowly crowded through the outlet and is discharged from the machine, falling (in the construction illustrated) upon the chute K.

The delivery of the pulverized product from
10 my improved machine is thus effected not by the use of a blast or by suction, as have heretofore been common practices in machines of this description, but merely by gravitation and displacement under the influence of the positive feed. In this respect
15 my machine constitutes a radical departure from prior constructions, the result being that, whereas in prior machines employing a blast or exhaust for delivering the product
20 only from two to four tons per day of product ground to one hundred and twenty-five mesh could be produced, with my machine, in which the discharge of the finished product is effected by displacement under the influence of
25 the positive feed and without the use of a blast or exhaust, but causing the discharge by the action of the feed alone, I am able to and do produce from twenty-four tons of dry product to thirty-five tons of wet product per
30 day, having a fineness of one hundred and twenty-five mesh.

A further advantage of my improved machine is that the fineness of the product may be accurately and quickly regulated by regulating the feed, as, the degree of fineness being controlled by the time to which the material is subjected to the action of the pebbles,
35 by increasing the feed, and consequently permitting the material to remain in the drum a shorter time, the finished product will be of coarser mesh, whereas by reducing the feed and permitting the material to be subjected to the action of the pebbles a greater time it may be reduced to a much finer condition.

45 Instead of a chute any other suitable device may be used for carrying off the ground product. When a chute is used, the top thereof should be directly below the end of the tube J, so that when the machine is operating
50 on dry material the powder will not drop any appreciable distance upon the chute, as otherwise a draft might carry away a great part of the same.

Only the finest particles of ore pass out of
55 the drum, as, for the reasons already stated, they alone rise to the surface and are discharged through the outlet-opening. The apparatus requires practically no attention,

as all that is necessary is to regulate the feed so that the discharged material will have the
60 requisite fineness.

Although my improved apparatus is intended, primarily, for the treatment of ores, it may also be used for pulverizing other minerals and similar substances.
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I wish expressly to disclaim any form of pulverizing apparatus of the ball-and-drum type which uses a blast to effect the delivery of the pulverized material, my invention, as stated, consisting in substituting for the blast
70 a positive feed for the material to be reduced and effecting the discharge by displacement under the action of the feed.

That which I claim as my invention, and desire to secure by Letters Patent, is—
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1. In a pulverizing apparatus of the class described, the combination with a rotary receptacle, of grinding balls or pebbles arranged in a mass therein, inlet and outlet openings in said receptacle, means for gradually feeding
80 the product to be pulverized into said receptacle through said inlet-opening, the apparatus as a whole being constructed to preserve the contained mineral from the influence of a blast or current of air, whereby the
85 pulverized product will be discharged through said outlet-opening in a flowing stream substantially under the action of the feed alone, substantially as described.

2. In a pulverizing apparatus of the class
90 described, the combination with a rotary cylinder having axial inlet and outlet passages opposite each other, and grinding balls or pebbles arranged in a mass in said cylinder, of forced feeding mechanism in said inlet-passage,
95 said outlet-passage being unobstructed and being of a diameter considerably less than that of the cylinder, the apparatus as a whole being constructed to preserve the contained mineral from the influence of a blast or current of air, whereby the pulverized mineral
100 will be caused to rise by gravitation to the surface of the materials in the cylinder and will be discharged through said outlet-passage in a flowing stream, substantially under
105 the action of the forced feed alone, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 20th day of April,
110 1895.

JOSEPH K. CLARK.

Witnesses:

OSCAR F. GUNZ,
N. M. FLANNERY.