I. M. PHELPS.
Pulverizing-Mill.

No. 196,039. **Patented Oct. 9, 1877.**

Fig. 1.

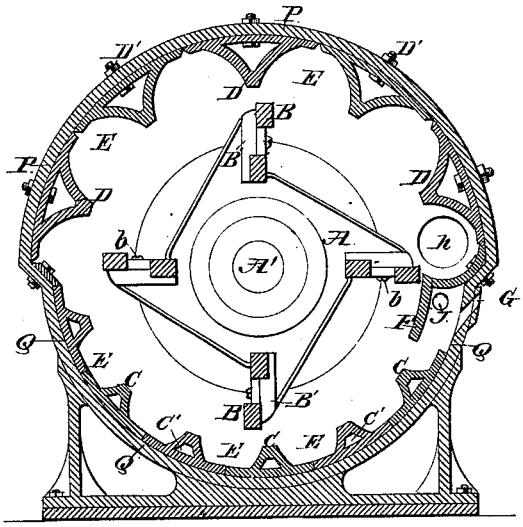


Fig. 2.

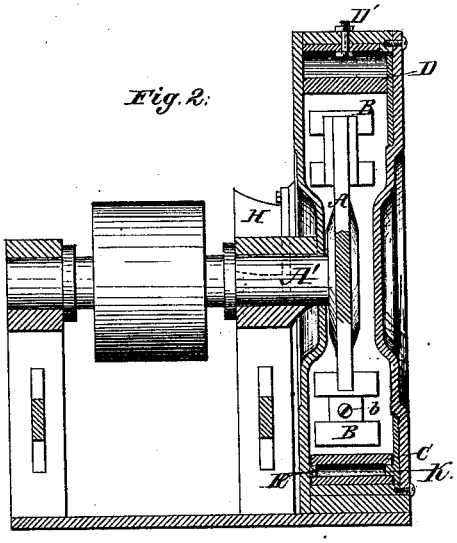


Fig. 3.

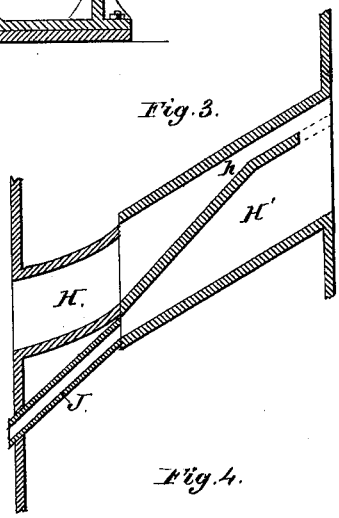
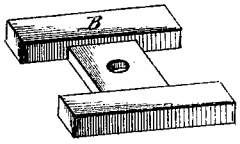


Fig. 4.



Attest.

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UNITED STATES PATENT OFFICE.

IRA M. PHELPS, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN PULVERIZING-MILLS.

Specification forming part of Letters Patent No. **196,039**, dated October 9, 1877; application filed March 7, 1877.

To all whom it may concern:

Be it known that I, IRA M. PHELPS, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pulverizing-Mills; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention belongs to that class of machines used in pulverizing rock, ore, and grain; and consists of two short half-cylinders of different diameters, the larger being placed above, and permanently united with, the lower, as shown in the accompanying diagrams; also, of a beater-wheel or pulverizer, with its shaft and pulley; of percussion bars and plates, attrition-chambers, a feed, a discharge, and a return pipe, &c.

Figure 1 is a vertical transverse section of my pulverizer; Fig. 2, a vertical longitudinal section. Fig. 3 is a longitudinal section of the discharge-pipe and return-trap; Fig. 4, a surface view of one of the beaters.

P Q are two short half-cylinders, joined at their section edges, as shown, the lateral or radial diameter of P being greater than that of Q Q.

A is the inclosed beater-wheel, consisting of a hub and quadrilateral disk securely fixed upon the end or arbor of shaft A′.

B B are the beaters, four in number. They are shaped somewhat like the letter **H**, consisting of two short parallel bars, united centrally by a strong flat girt or reach, and firmly secured to the corners of the quadrilateral disk, being held in position, first, by the shoulder of the inner cross-bar fitting into slot or gain B′, and, secondly, by the bolt *b*, as shown in the diagram. They are made reversible in order that the inner cross-bar may be made to take the place of the outer one when the latter becomes too much worn for further use.

C C C are the sectional percussion-bars, extending across and resting upon the lower rim of the machine. Their sides are slightly concave, and have an angle or slope sufficient, together with the degree of curvature of their bases, to bring their percussion-surfaces at right angles with the tangent-lines of the circle made by the beaters in revolving. Each bar has a base-flange curved to fit the rim, upon which it rests and which it covers; also, a triangular hole, C′, penetrating each end longitudinally, to receive the pins or spurs K, projecting from the false side plates, and are thereby held in position.

D D D are the sectional percussion-plates, securely fastened to the upper rim by means of bolts D′, and also by spurs or lugs on the false side plates. As they are identical in shape, and in the angle or position and curvature of their faces, with the smaller percussion-bars in the lower segment of the circle, a further description is unnecessary.

E E E are attrition-chambers, being capacious recesses formed and bounded by the percussion-plates and periphery of the circle.

F is a thick guard-plate, the lower half of which is placed in front of and extends a little below the inlet or feed hole. The upper half, bent back and curved to suit, forms a floor just below and in front of the discharge-opening *h*. It is held in position by means of a bolt passing through the oblique portion of the rim, as shown, and by the ends of the plate projecting into slots in the false plates.

G is the feed pipe or opening, conveying the material to be pulverized through the rim or periphery, and discharging it into the mill behind the guard-plate F.

H is the discharge-pipe, communicating with a dust or flour chamber (not shown) through a larger box-pipe, H′, ascending at an angle sufficient to allow that portion of the material not fine enough to be blown through it to the dust-chamber to return, by its own gravity, to the mill. The lower end of the box-pipe is divided into two unequal horizontal chambers by means of the partition *h*, which may be shortened or lengthened according to effects desired, as will be hereinafter explained.

J is the return-pipe, and connects the lower chamber of the box-pipe with the inlet behind the guard-plate F.

The end plate of the machine, through which the shaft passes, may be cast solid with the rim. The one on the opposite end is detacha-

ble, and may be removed by withdrawing the bolts by which it is secured to the rim. A small crane or lever may be used to handle the same, a hook or knob being bolted to the upper part of the plate for the purpose.

The object of placing the feed-pipe at the periphery instead of near the center, as usual, is to compel all the material to be driven once, and only once, entirely around the circle to the outlet.

The object and purpose of guard-plate F is to shield the inlet from the dust and air projected centrifugally by the beaters, and to create by their action a partial vacuum between it and the said inlet.

The object and purpose of sectional percussion-bars C C and plates D D, with their curved and sloping faces, is to present surfaces of impingement at right angles to the lines of projection given to the fragments by the beaters, causing the numerous smaller pieces into which they are broken to rebound and collide with other pieces, with the combined force of the two moving in opposite directions. They are by this arrangement compelled to pulverize each other, thereby greatly facilitating the work, and diminishing the wear and tear of all the parts involved; and the object of enlarging the upper half of the cylinder is to proportionally increase the size of the attrition-chambers E E, and thereby furnish more room and opportunities for the material to pulverize itself in the manner just stated.

In operating my pulverizer it is necessary to crush or reduce the material to the consistency of common gravel, (finer would be better,) preparatory to pulverizing, by any suitable machine. It is better to place the crusher high enough to allow the material to pass in a constant and uniform stream from it to the pulverizer.

In pulverizing grain, or any material not requiring a previous crushing, a suitable hopper should be used to regulate the rate of supply. The beaters should have a speed of about two hundred and fifty feet per second.

The fineness of the material delivered into the dust or flour chamber may be regulated by the length of the partition h'. The longer the partition the more material or dust will be blown through to the chamber. The shorter it is the more of the coarser and heavier portion will fall upon the bottom board, and return by its own gravity to the mill through return-pipe J, to be repulverized.

Having thus described my invention, what I claim as new, and wish to secure by Letters Patent, is—

1. A pulverizing-mill in which the case or drum inclosing the beater-wheel is composed of two short half-cylinders, joined at their section edges, the lateral or describing diameter of the upper one being relatively greater than that of the lower, substantially as shown and described.

2. The combination, with a pulverizing-mill case the upper half of which is of a larger diameter than the lower, as described, of the removable section bars or plates, having percussion-surfaces which differ in degree of curvature according to the position of the plates and bars upon the case, said surfaces on contiguous sections forming attrition-chambers for more thoroughly disintegrating the material, substantially as herein shown and described.

3. The combination of a pulverizing-mill case in which the upper half is of larger diameter than the lower, as described, with the inclosed beater-wheel and the removable section bars and plates, having percussion-surfaces which are at right angles to the tangents of the circle described by the beaters, substantially as and for the purpose herein set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

IRA M. PHELPS.

Witnesses:
MORRIS SHAIN,
ANDR. L. LANIGAN.