(No Model.)

W. M. SMITH.

APPARATUS FOR PULVERIZING PHOSPHATE ROCK, &c.

No. 244,829. Patented July 26, 1881.

Fig. 1.

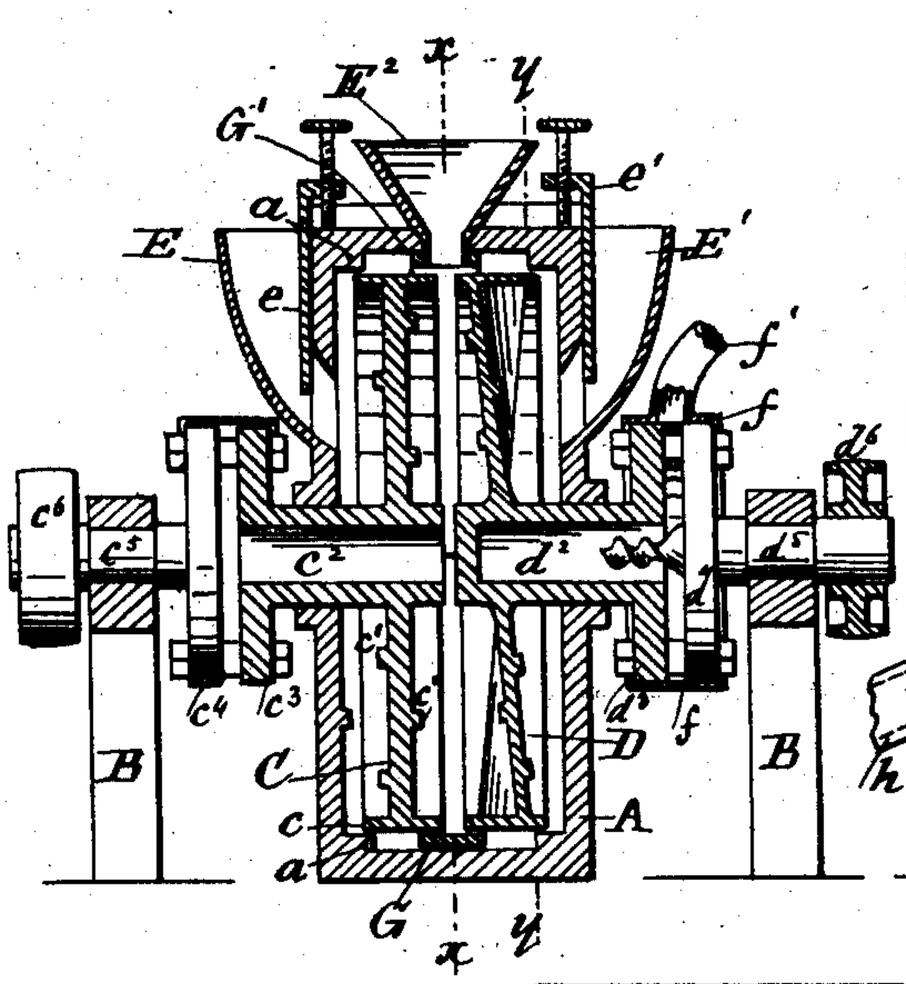


Fig. 3.

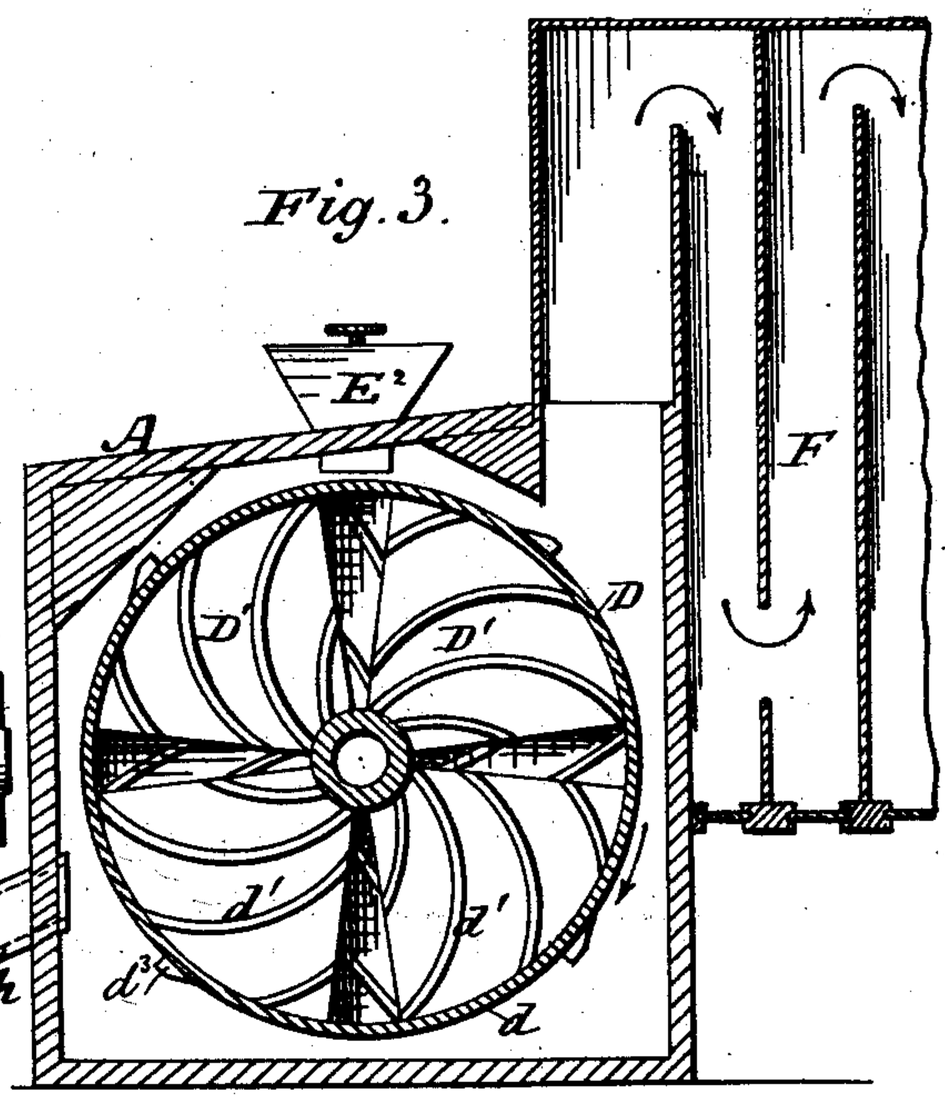


Fig. 2.

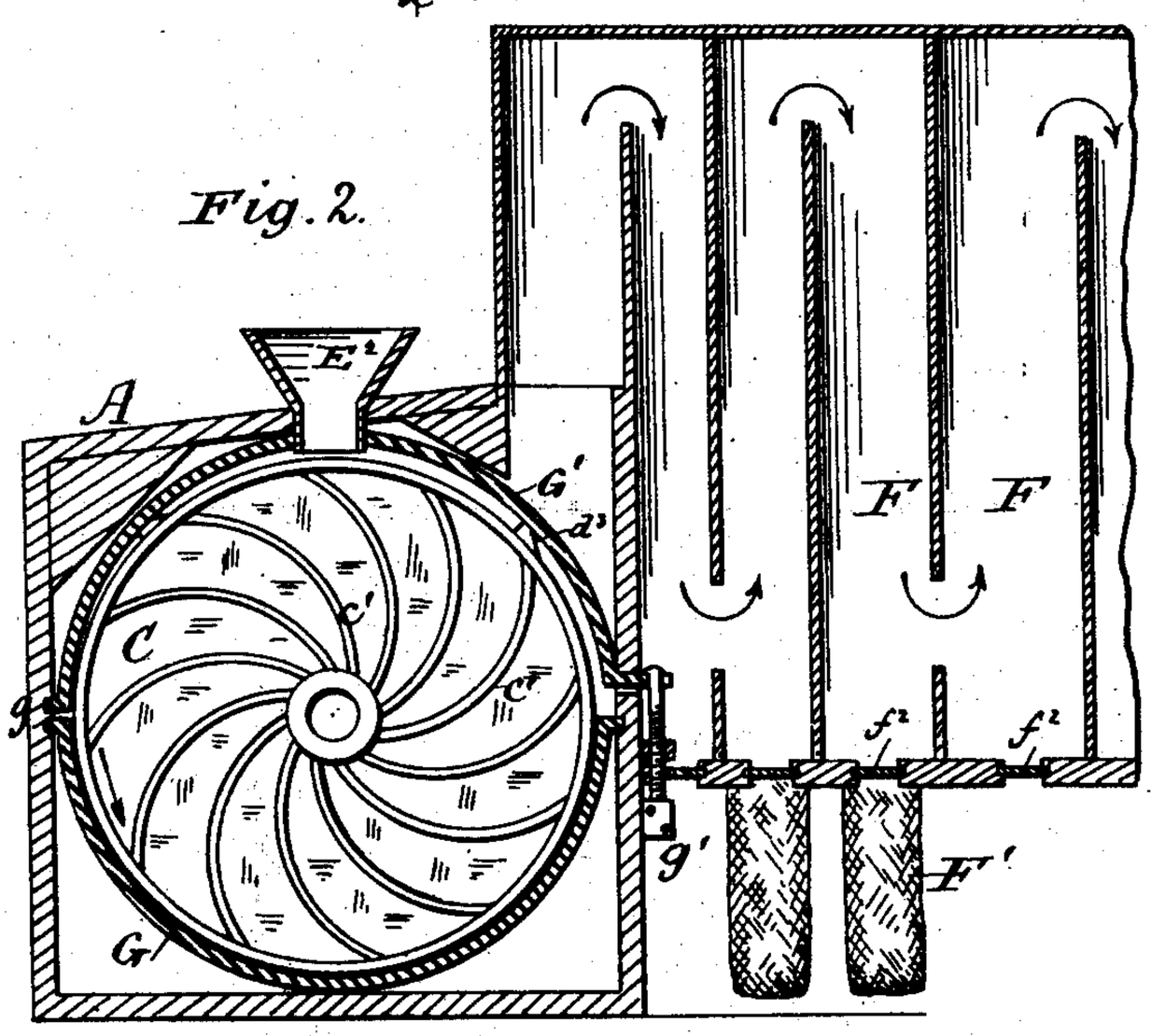


Fig. 4.

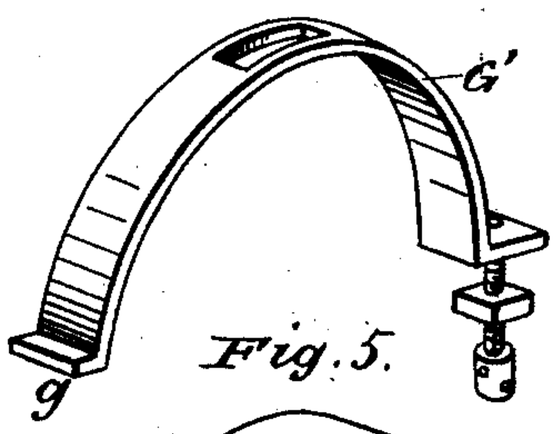
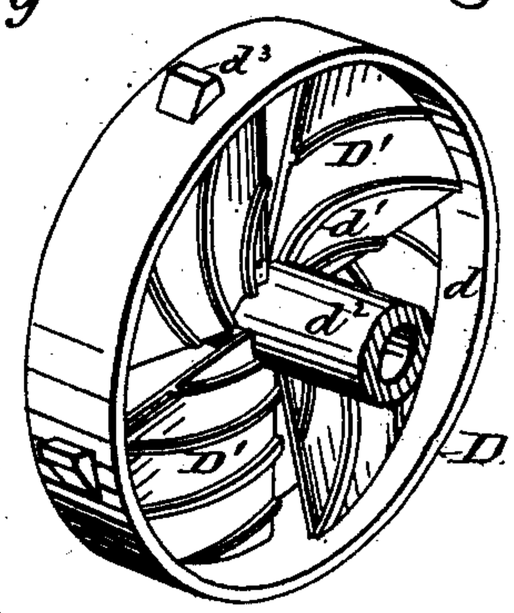


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM M. SMITH, OF AUGUSTA, GEORGIA.

APPARATUS FOR PULVERIZING PHOSPHATE-ROCK, &c.

SPECIFICATION forming part of Letters Patent No. 244,829, dated July 26, 1881.

Application filed November 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. SMITH, of Augusta, in the county of Richmond and State of Georgia, have invented certain new and useful Improvements in Machines for Pulverizing Phosphate-Rock, &c , of which the following is a specification.

My invention relates to machines in which posphate-rock and other substances are reduced to a fine powder by means of beaters or serrated wheels revolving in opposite directions within a casing.

Heretofore the abrading-wheels of such machines have generally been placed in pairs, either with the circular rim or flange of one of the wheels overlapping, or they have been left unprovided with flange and the casing depended upon as an abrading-surface, and also to retain the crushed material until entirely pulverized. Abrading-wheels have also been made saucer-shaped and placed in pairs with their rims nearly touching.

The object of my invention is to provide a machine in which a great amount of the pulverizing will be accomplished by a portion of the material projected forcibly against the other by means of wheels provided with wings or blades placed at an angle to their axis, as found in ordinary propeller-wheels, these wheels or blades having also a series of ribs extending from the hub to the rim in consecutive curves nearly resembling volute curves.

The object of the invention is also to provide means for retaining and collecting the impalpable dust produced by said machine.

The invention will first be described in connection with the drawings, and then pointed out in the claims.

In the drawings, Figure 1 represents a vertical transverse section of the machine; Fig. 2, a vertical central section on line *x x* of Fig. 1; Fig. 3, a vertical section on line *y y* of Fig. 1; Fig. 4, a perspective view of one of the semicircular central rims detached from the machine; Fig. 5, a perspective view of one of the wheels used to project the material upon the other.

In said drawings, A represents the casing. It may be made of wood lined with ribbed plates, or of metal in sections. This casing is stationary, and is secured to a proper foundation, as well as the frame or posts B supporting the axles or shafts of the pulverizing-wheels. The number of these wheels may vary. I prefer to use two of them, as shown.

The wheel C is formed of a disk provided with a rim, *c*, extending over each of its sides, and a series of ribs, *c'*, on both of its faces, extending from the hub to the rim in curves nearly resembling volute curves, one of the objects of said curved ribs being to collect and direct the main portions of the material operated upon toward the hub and against its centrifugal tendency, and the rim is to retain the material within the space between the two wheels, or between one of the wheels and the casing. The hub c^2 of the wheel is hollow, to admit a current of air and bring it within the casing of the machine at the best place for its even distribution. The hub or shaft c^2 is provided with a coupling-flange, c^3, which is bolted to a similar coupling-flange, c^4, on the shaft c^5 of the pulley c^6. The bolts uniting the flanges c^3 c^4 have washers to keep these flanges apart and form a passage for a current of air to be admitted or forced through the hub c^2 and keep it cool.

The wheel D is made with two or more wings, D', set at an angle to its axis, and nearly similar in form to that of a propeller-wheel, but provided with a series of curved ribs, *d'*, extending from the hub d^2 to the rim *d*. The latter, overlapping the edges of the wings or blades D', has also upon its circumference four or more strippers, d^3, to keep any ore or phosphate-rock entering the casing from clogging the rotating wheel or wheels. The blades D' are of such size as to leave an opening between them, so that the material fed into the hopper E' will pass through said openings and be projected by the inclined blades against the wheel C, turning in the opposite direction, and bounced back and forth until reduced to an impalpable powder. The hub or shaft d^2 is hollow, but closed at its inner end. Its outer end has a coupling-flange, d^3, which is bolted to a similar coupling-flange, d^4, on the shaft d^5 of the pulley d^6. The coupling-flanges d^3 d^4 are inclosed by a loosely-fitting casing, *f*, into which water is admitted through the pipe *f'* and directed within the hollow hub by the screw projecting from the flange d^4. The wa-

ter keeps the hub d^2 cool, and escapes either between the casing and rims of the coupling-flanges or through a pipe attached to the bottom of said casing.

If desired, the material to be fed to the machine can be introduced on each side through the hoppers E and E′, the gates e and e' being mainly to regulate its admission. It can also be introduced from the top through the hopper E^2, and this is desirable when more than two wheels are inclosed. The rims of the wheels are preferably placed some distance apart; and to retain the material within the interior of said wheels there is close to their rims a lower semicircular plate or stationary rim, G, secured to the casing, and an upper semicircular plate, G′, retained connected to the casing at one end, at g, and rendered adjustable by means of a screw, g', passing through a nut attached to the frame, so that the escape of the fine dust can be regulated, the air admitted through the hollow hub c^2 facilitating its escape. Air can also be forced into the interior through the same axial passage, or through an opening, h, in the side of the casing. The material, if already reduced to small fragments, may be admitted with the air through the same openings, c^2 or h. As the outer edges of the wheels are nearly fitted by the annular flanges a within the casing, the escape of the pulverized material is regulated by the upper semicircular plate, G′. The upper half of the flanges a may also be made adjustable, so that an impalpable powder will be obtained. Some difficulty has been experienced to collect this fine powder without employing very large receiving-chambers. This I accomplish by conducting the escaping current of air and dust or powder through a series of ascending and descending flues, F, gradually increasing in size, to have a gradually dying-out current, and to the bottom of said flues I secure open bags F′ under openings controlled by slides f^2.

In the drawings the wheel D is represented as placed in the casing with the disk-wheel C; but the latter may be dispensed with and the material be thrown and reduced to powder by said wheel D against the casing, and if the material is fed in from above, the wings or blades D′ may be united to form steps or flat surfaces to strike said material if it should escape on the outside of the wheel. The casing A is left polygonal to afford a good clearance for the pulverizing-wheels, the lower space soon becoming partly filled with fragments of rock, against which the strippers d^3 will act and clear the track for the wheels.

Having now fully described my invention, I claim—

1. In a pulverizing-mill, the combination of a stationary casing with a disk-wheel, C, having a flanged rim overlapping said disk on both sides, and a propeller-shaped wheel, D, having a rim overlapping the wings D′ of said wheel, substantially as and for the purpose described.

2. In a pulverizing-mill, the combination of the wheel D, its hollow shaft closed at one end, pulley-shaft d^5, coupling-flanges upon the adjoining ends of said shafts, casing f, and pipe f', substantially as and for the purpose described.

3. In a pulverizing-mill, the combination of wheel C, provided with an overlapping rim, its hollow shaft open at the inner end, pulley-shaft, and coupling-flanges upon the adjoining ends of said shafts, with washers between them to retain a free passage of air to the hollow shaft, substantially as and for the purpose described.

4. The combination of the stationary casing A, two revolving wheels provided with means for disintegrating, and having a common diameter and similarly-flanged rims, with the stationary semicircular rim G overlapping the inner edge of both wheels, substantially as and for the purpose described.

5. The combination of the stationary casing A, and two revolving wheels provided with means for disintegrating, and having a common diameter and flanged rims, with the stationary semicircular rim G and adjustable semicircular rim G′, substantially as and for the purpose described.

6. The combination of the stationary casing, two revolving wheels provided with means for disintegrating, and having a common diameter, flanged rims thereof having their outer peripheries smooth adjoining their edges, and strippers d^3, located centrally upon said periphery, with semicircular stationary rim G and adjustable rim G′, substantially as and for the purpose described.

7. The combination of a stationary casing, two hollow shafts and wheels having similarly-flanged rims, with ribs upon said wheels arranged from the hub to the rim in successive curves, as shown, to direct the material to be pulverized toward said hub, substantially as set forth.

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