(No Model.)

W. M. FULLER & J. J. HAYES.

PULVERIZING MACHINE.

No. 335,574. Patented Feb. 9, 1886.

Fig. 1.

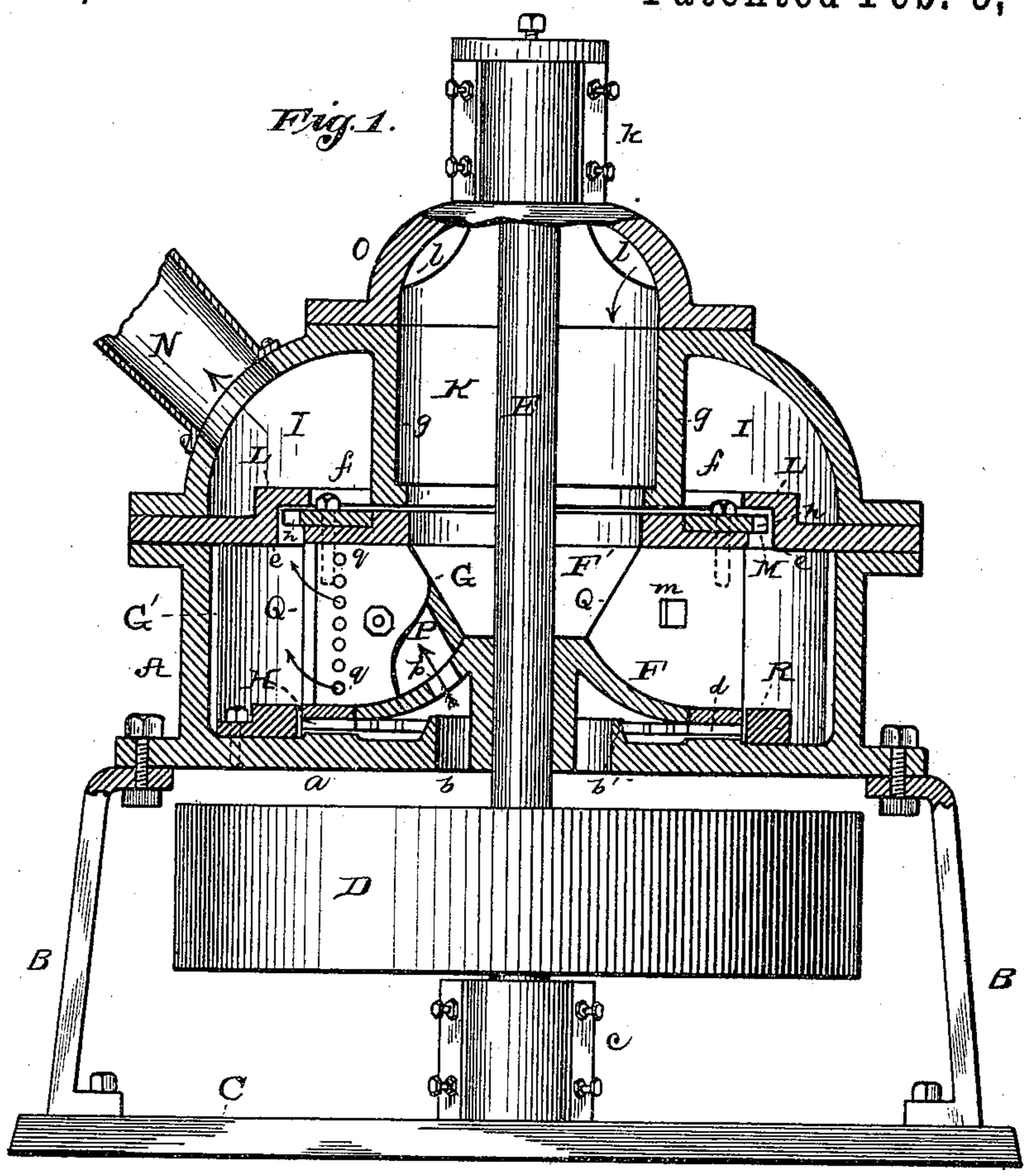
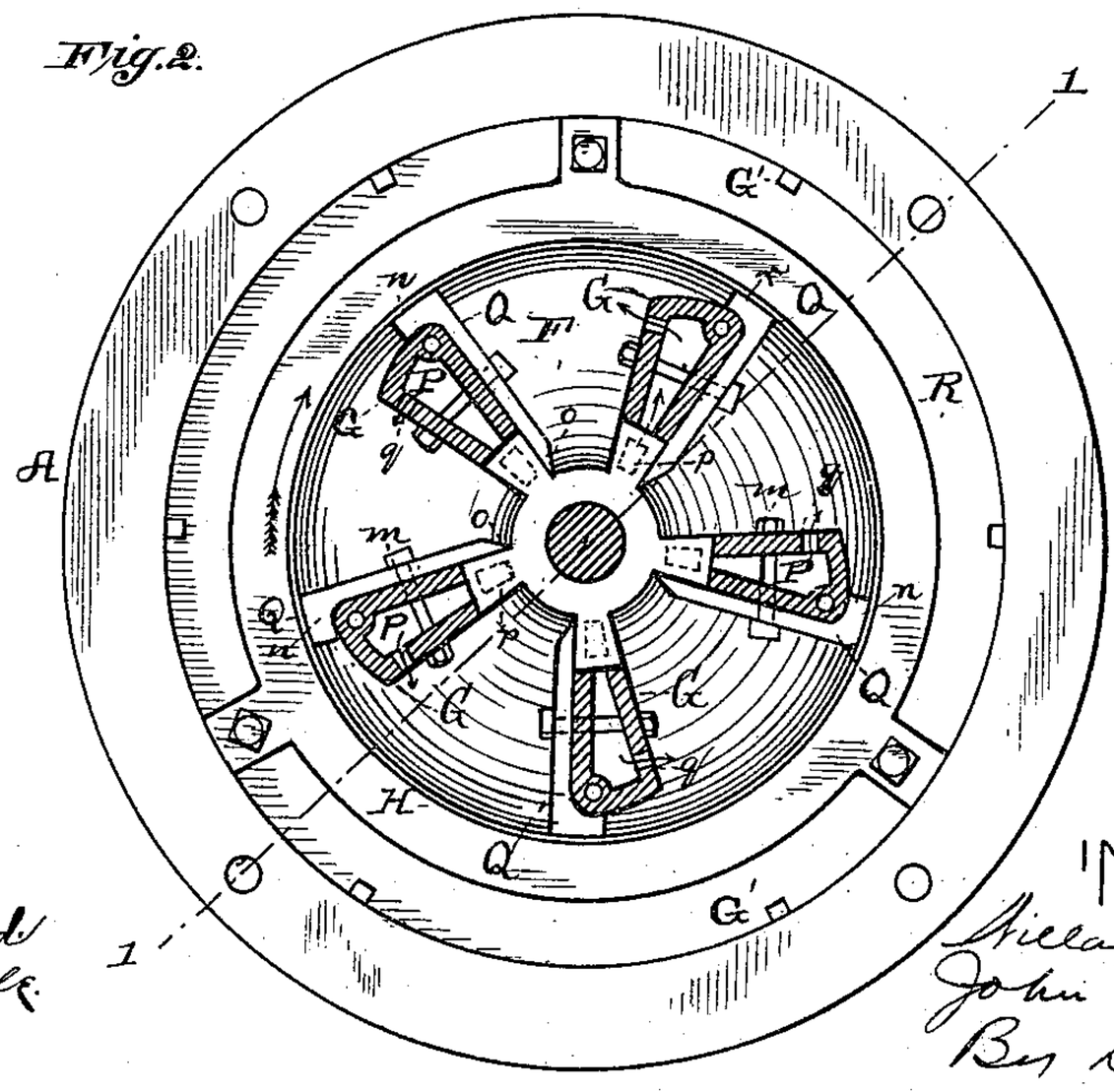


Fig. 2.



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WILLARD M. FULLER, OF NEW YORK, AND JOHN J. HAYES, OF BROOKLYN, N. Y.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 335,574, dated February 9, 1886.

Application filed July 9, 1885. Serial No. 171,035. (No model.)

To all whom it may concern:

Be it known that we, WILLARD M. FULLER, of New York city, in the county and State of New York, and JOHN J. HAYES, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Pulverizing-Machines, of which the following is a specification.

Our invention relates to improvements upon the pulverizing-machine described in a prior application for patent made by us May 20, 1885, Serial No. 166,090.

Its object is more particularly to furnish a better supply of air to the machine for drawing off the pulverulent material, and to do this in such a manner as to prevent clogging of the air-passages, and also to furnish a better protection to the wearing parts of the revolving center.

In the accompanying drawings, forming a part hereof, Figure 1 is a vertical section of the machine on line 1 1 in Fig. 2, the bearings and driving-pulley being in elevation, and the rear wall of one of the hollow radial wings being broken away to show air-inlet opening; and Fig. 2 a top view of the grinding-cylinder of the machine, with revolving center in horizontal section.

A is the grinding-cylinder, which is a cylindrical casting open at top, and having a bottom floor, *a*, provided with a central opening, *b*, around which opening the floor *a* may have a raised flange, *b'*. This casting forms a shallow cylindrical vessel which is supported by legs B at an elevation above a base-plate, C, to give room for the driving-pulley D, which is preferably made heavy enough to act as a balance-wheel. Centrally through the grinding-cylinder passes the vertical shaft E, stepped in a bearing, *c*, on base-plate C, and held at its upper end by a bearing above the grinding-cylinder, as will be presently explained. Keyed upon this shaft and located within the grinding-cylinder is the revolving distributing-center, which is composed of a conical disk, F, keyed to the shaft, and a top ring, F', supported from the disk by a number of radial wings, G. The ring F' provides for the central feeding of the material to be pulverized, while the wings G divide the revolving center into pockets, out through which the material is thrown by centrifugal action against the wall of material in the grinding-cylinder, which is kept from turning with the material in the revolving center by vertical ribs G' on the interior of such grinding-cylinder.

The revolving center fills the central portion of the grinding-cylinder and rises slightly above its upper edge. Its diameter, however, is less than the grinding-cylinder, leaving a clear annular space around it in which the grinding takes place by the attrition of the material carried around and thrown outwardly by the revolving center against the mass of material held stationary by the ribs of the grinding-cylinder.

The disk F of the revolving center is larger than the central opening, *b*, in the bottom *a* of the grinding-cylinder around the shaft, and at its periphery it approaches close to said bottom *a*, leaving, however, sufficient space for the admission of air through opening *b* into the grinding-cylinder. To guard this opening, and prevent the material being ground from forcing pieces out through this space, we provide a steel ring, H, which is secured to the ends of wings G, which are enlarged for this purpose, and which ring forms an extension of the periphery of the disk F. On its under side ring H is provided with oblique ribs *d*, which move in close proximity to a planed annular surface on floor *a* of the grinding-cylinder. These ribs are so set with relation to the direction of rotation that they form oblique blades, which act to force the material outwardly from the shaft and into the grinding-chamber. These blades also assist the exhaust-fan in producing a blast into the machine at this point.

Above the grinding-cylinder is an annular air-chamber, I, the inner walls of which form a central feed-passage, K, surrounded by the annular air-chamber and communicating with the open top of the revolving center. The annular air-chamber is divided from the grinding-cylinder by a horizontal annular partition, L, which is an annular plate resting on the walls of the grinding-cylinder and extending inwardly toward the top ring, F', of the revolving center. Near such ring the partition L has a shoulder, *e*, from which point it rises above ring F', and then extends horizontally partly over such ring, leaving, however, a clear space, *f*, between the inner edge of partition L and the vertical inner wall, *g*, of the

air-chamber I, which wall *g* approaches at its lower edge close to the top ring, F′, of the revolving center.

Upon ring F′, which is shouldered for that purpose, is secured, by bolts extending into enlarged ends of wings G, a steel ring, M, extending beyond the ring F′ and approaching close to the shoulder *e* of partition L. The ring M has its outer edge notched to permit the air and dust to pass freely up into chamber I. The projections *h* on the periphery of ring M are beveled on their under sides, as set forth in the application referred to, forming oblique blades, which guard this air-passage and force downwardly the material in the grinding-cylinder, preventing it from getting into the chamber I or from clogging the annular air-passage from the grinding cylinder into such chamber.

A pipe, N, connects the chamber I with an exhaust-fan, (not shown,) which is kept in rapid motion during the operation of the machine, and sight-holes covered by caps (not shown) may be provided in the sides of the chamber I. Upon chamber I is mounted a cap-piece, O, carrying the upper bearing, *k*, for the shaft. This cap is pierced by feed-openings *l*, through which the material to be pulverized is fed to the machine. A cylindrical hopper may be placed on top of the cap-piece including all the openings *l;* or a feed-spout may be connected with one of such openings.

Q represents wearing-plates, one of which is removably secured by a bolt, *m*, to the front side of each wing G, (with relation to direction of rotation,) and covers the entire surface of the wing. The plate Q has its outer end, *n*, formed at right angles to the body of the plate, this flanged outer end extending oven the end of the wing, as shown, while the inner end, *o*, of the plate Q is beveled to an edge, so as not to interfere with the free feeding of the material to be ground. These removable wearing-plates completely protect the wings from being worn by the action of the machine, and can themselves be readily replaced when necessary.

The parts as so far particularly described are the same as in the application referred to.

In the operation of the machine the material to be ground passes down the central feed-passage, K, under the top ring of the revolving center, and out through the spaces between the radial wings G. It is ground by attrition against a body of the same material packed by the action of the machine in the grinding-cylinder. To carry off the pulverulent material air enters the bottom of grinding-cylinder through opening *b* and under ring H, and also down through material in feed-passage K. It takes up the pulverized material and carries it upwardly into chamber I and off through pipe N. We have found, however, that very little air can get down through the body of material in the feed-passage, and that if the exhaust-fan is accidentally stopped, as by the slipping off of its belt, the machine becomes clogged up, and the pulverulent material cannot be readily drawn off. To overcome this difficulty, we make the radial wings G of the revolving center hollow, so as to form air-pockets P, and we provide openings *p* in the disk F, near the shaft E, connecting pockets P with the opening *b* in the center of the floor *a* of the grinding-cylinder. The rear walls of the hollow radial wings have holes or slots *q*, out through which the air passes from the pockets P into the radial feed-passages of the revolving center, close enough to the ends of wings to prevent the pulverable material from stopping the circulation of air, and far enough from the point where the grinding takes place to prevent the clogging of the air-openings by the pulverulent material. The location of these openings on the rear sides of the hollow radial wings also assists to prevent clogging, and this location makes the revolving center an air-blower itself, the movement of the center forcing air from pockets P out through openings *q*.

We have also found that in the machine described in the application referred to the wearing of ring H, forming an extension of periphery of disk F, is considerable, it not being protected as is the extension to the top ring of the revolving center.

The material in the grinding-cylinder is crowded down on the floor of grinding-cylinder around the ring H, not only wearing the ring, but clogging the air-opening under it. To overcome this difficulty, we place in the grinding-cylinder a ring, R, which is removably secured to the floor *a* and surrounds the ring H, rising to the level of the upper surface of such ring H. The stationary ring R approaches quite close to ring H, and forms a shoulder rising upwardly from the floor of the grinding-cylinder, which shoulder protects such ring H, as well as the air-inlet beneath it. Ring R is removable, so that it can be renewed when worn.

What we claim is—

1. The combination, with the grinding-cylinder, of the revolving distributing-center having hollow wings forming air-pockets, and provided each with an inlet from the exterior of the machine and an outlet to the interior of the machine for delivering air to and from such pockets, substantially as and for the purpose set forth.

2. The combination, with the grinding-cylinder having a central opening in its bottom, of the revolving distributing-center having hollow wings forming air-pockets, such pockets having bottom openings communicating with the external air through said central opening, and with air-outlets to the interior of the machine, substantially as set forth.

3. The combination, with the grinding-cylinder, of the revolving center having hollow wings communicating with the external air

and provided with openings on the rear sides of the wings for delivering air to the machine, substantially as set forth.

4. The combination, with the grinding-cylinder having a central opening in its bottom, of the revolving center having hollow wings provided with openings on their rear sides delivering air to the machine and bottom openings communicating with the external air through the central opening in the bottom of the grinding-cylinder, substantially as set forth.

5. The combination, with the grinding-cylinder, of the revolving distributing-center turning therein, composed of bottom disk, top ring, and radial wings, said bottom disk traveling over the floor of the grinding-cylinder, so that a horizontal air-passage is formed between them, and an upwardly-projecting shoulder on the bottom of the grinding-cylinder surrounding the bottom disk of the revolving center for protecting its edge and the air-opening thereunder, substantially as set forth.

6. The combination, with the grinding-cylinder, of the revolving distributing-center turning therein, composed of bottom disk, top ring, and radial wings, and a removable ring on the bottom of the grinding-cylinder surrounding the edge of the bottom disk of the revolving center, substantially as set forth.

This specification signed and witnessed this 1st day of July, 1885.

WILLARD M. FULLER.
JOHN J. HAYES.

Witnesses:
A. W. KIDDLE,
H. W. SEELY.