(No Model.)

J. J. BORDMAN.

PULVERIZING MACHINE.

No. 416,253. Patented Dec. 3, 1889.

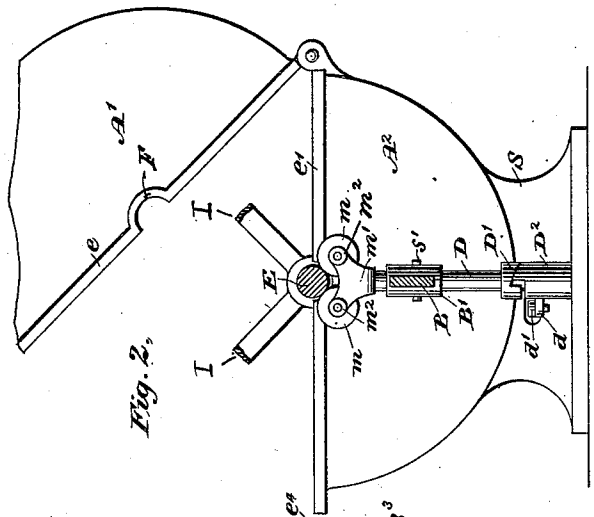


Fig. 2.

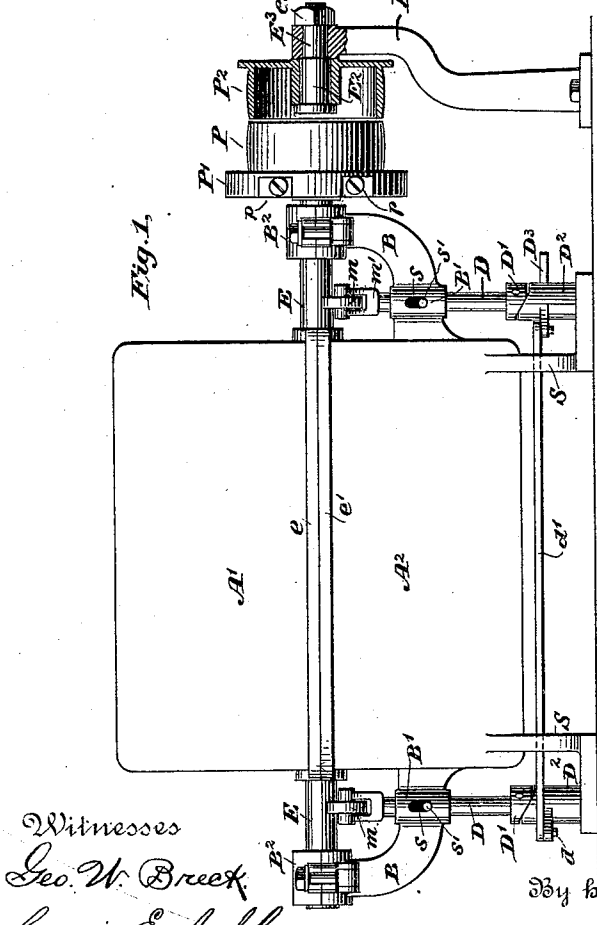


Fig. 1.



Fig. 3.

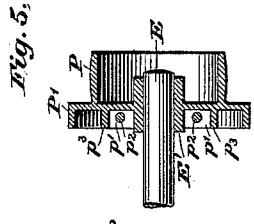


Fig. 5.

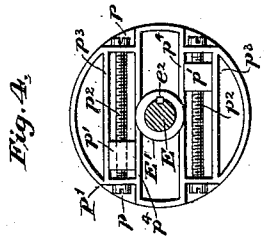


Fig. 4.

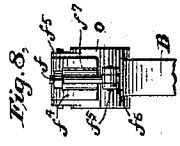


Fig. 8.

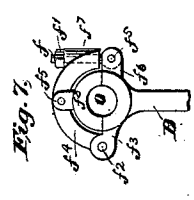


Fig. 7.

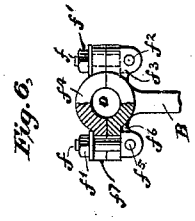


Fig. 6.

Witnesses
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UNITED STATES PATENT OFFICE.

JOHN J. BORDMAN, OF BROOKLYN, NEW YORK.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 416,253, dated December 3, 1889.

Application filed July 5, 1888. Serial No. 279,017½. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. BORDMAN, a citizen of the United States, and a resident of Brooklyn, Kings county, and State of New York, have invented certain new and useful Improvements in Pulverizing-Machines, of which the following is a specification.

My invention relates to improvements in machines for reducing and pulverizing all varieties of substances, and especially to that class of machines which are provided interiorly with rotary fans and beaters for accomplishing the pulverizing, and to the balancing or adjusting of the shafts which in said machines are employed for carrying the beaters and fans. In machines of this character the shaft which is employed for carrying the beaters and fans rotates at a very high rate of speed, it not being unusual at times to drive the shaft at a speed of two thousand or more revolutions per minute. Where the shoes or flat surfaces of the beaters or the fan-blades become unequally worn in the operation of pulverizing, the center of gravity of the whole system will be displaced, because it does not coincide with the center of rotation, and the effect will be to impede and retard the rotation of the shaft by causing lateral vibration, and thereby increasing the friction on the bearings and subjecting all parts of the machine to a very much greater strain than when the shaft is properly balanced.

The object of the present improvement is to provide means for obviating these difficulties by effecting an immediate balance of the shaft of the machine at any desired moment.

The invention will be best understood by reference to the accompanying sheet of drawings, in which Figures 1 to 8 show the devices for balancing. Fig. 1 is a side elevation of the machine partly in section; Fig. 2, an end view of the same; Fig. 3, a sectional view of the devices for raising the driving-shaft while being balanced; Figs. 4 and 5, views of the balancing devices, and Figs. 6, 7, and 8 views of details of the bearings.

Similar letters refer to similar parts throughout the several views.

In the drawings, A′ A^2 is the outer shell of the machine, the same being made in two horizontal sections—a lower section A^2, supported on the bent standards S S, and an upper section A′, fitting upon the lower section—hinged together and capable of being opened, the end walls of the machine being parallel. The sections A′ and A^2 are provided with the horizontal flanges, designated, respectively, in the drawings by *e e′*, for facilitating the opening and closing of the upper section, as shown in Fig. 2.

E is the central driving-shaft of the machine, which passes through the openings F F in the parallel end walls of the machine, which openings are just large enough to admit of the passage of the same, and is supported on the bearings B^2 B^2, Fig. 1, carried upon the brackets B B, which are cast on or otherwise attached to the end walls of the machine.

Fig. 2 shows two of the radial arms of the beaters I I, which are attached to the shaft E, and are shown with their extremities broken off.

The brackets B B are provided with a cylindrical sleeve B′, cast in one piece therewith, in which the vertical standards D are placed and which serve as bearings in which the same slide. These standards can be vertically raised or lowered by means of the beveled collar D′, which encircles the same, as shown, and is bolted to the lower portion of the standard D. The standards rest in sockets in the flat extremities of the legs S, as shown in Fig. 1, and have sufficient vertical play to enable them to be raised a short distance, and they are prevented from turning by the peg *s′*, passing through them and resting in the slots *s*. Beneath the sleeve is placed a second sleeve D^2, with a beveled upper head upon which the beveled edge of the sleeve D′ rests when the shaft E is lowered, and which is arranged to turn freely on a bearing in the flat portion of the standards S. This sleeve encircles the vertical standard D, and may be turned freely around it.

The sleeves D^2 are provided with the ears *d* at their sides, which are connected together by the link-bar *d′*, so that both sleeves may be rotated or moved simultaneously by turning the lever-arm D^3 its full distance, whereupon the flat surfaces of the sleeves come in contact with each other and afford opposing horizontal surfaces, and so hold the

rollers firmly until released by turning back the lever-arm D^3.

Any convenient form of device for rotating or moving the sleeves may be used; but in practice the lever-arm D^3, Figs. 1 and 3, will be found most convenient.

The upper extremities of the vertical standards D are provided each with two friction-wheels m m, mounted on the V-shaped arms m', and the arrangement of the vertical standards is such that they will come directly under the center of the driving-shaft E, as shown in Fig. 2.

The arrangement of the two inclined surfaces of the collars D′ and D^2 is such that they will meet in an inclined plane, as shown in Figs. 1 and 2. As the collar D′ is securely fastened to the vertical shaft D, when the collar D^2 is rotated from left to right the collar D′, and with it the standard D, will be raised in its socket and the wheels m m brought in contact with the shaft E, which, when the upper half of the shell A′ is opened, may be raised from the bearings B′ B′ and also from the opening in the end walls.

For the purpose of effecting the balance of the driving-shaft, a particular form of driving-pulley P′ P is used, containing within it any number or any arrangement of adjustable weights, but preferably two, arranged as shown.

P represents the portion of the pulley which comes in contact with the belt, and P′ represents the portion containing the weights, which latter portion is of greater diameter than the former.

The peculiar construction of the pulley is shown in Figs. 4 and 5. It is cast of metal in a single piece, and contains a central hub E′, which is keyed to the driving-shaft E by the key e^2. The enlarged portion contains parallel webs p^3 p^4, which serve to form grooves within which the weights p' p' can slide from one edge of the periphery to the other. The center line of both the weights is the same distance above the center line of the driving-shaft when the pulley is being adjusted and the webs forming the grooves placed in a horizontal position, as shown in Fig. 4.

Adjusting-screws p^2 are provided with screw-heads p p, passing through openings on the periphery of the enlarged portion of the pulley and through screw-threaded openings in the weights p' p', and by turning the screw-heads of these adjusting-screws the weights are caused to travel from side to side in their grooves without further manipulation, and are moved a greater or less distance.

A loose pulley P^2 is provided, mounted on a separate shaft E^2 E^3, as shown in Fig. 1, for the purpose of holding the belt and allowing the driving-shaft to operate when the belt is released from the driving-pulley P.

The operation of the present invention will be apparent from the foregoing description. When it is desired to readjust the balance of the machine for any reason, the belt of the machine is thrown onto the loose pulley P^2, the upper section A′ of the pulverizing-cylinder is raised, as shown in Fig. 2, the nuts of the bearings B^2 are unscrewed, slackened, and the shaft E raised from its bearings by moving the lever D^3, as shown in Fig. 2, and supported so that it can turn freely on the friction-rollers m m. The weights p' p' are moved in their grooves to such a position that there shall be just as much weight on one side of the driving-shaft, at every point, as there is on the other; or, in other words, the center of gravity is again brought to correspond with the center of rotation. The shaft is then lowered into its bearings by turning the lever D^3 back to its original position and the cylinder closed.

Figs. 6, 7, and 8 show methods of arranging the bearings in which the shaft E rotates, so as to facilitate the operation of balancing.

Fig. 6 shows a form of bearing in which two pivoted screw-bolts are used, which hold a curved strap which covers the bearing. In this view B represents the bracket and the bearing proper, f^3 f^3 two lugs on either side of the bearing, to which the screw-bolts f f are pivoted by the pivots f^2 f^5, and f' f' are the nuts that screw down on the bolts. The strap f^4 terminates at one end in an open lug f^7 and at the other in a perforated ear, through which the bolts f f pass, and which serve to hold the strap in place when the nuts f' f' are screwed down. Fig. 6 shows the strap f^4 held down by the nuts, and o represents the space through which the shaft E′ passes. When it is desired to release the shaft from its bearings, it is only necessary to slacken the nuts f' f' on the bolts f f. The left-hand bolt will then drop out of the open lug and fall on its pivot f^5 in the lug f^6, and the strap f^4 may then be lifted upon the hinge formed by the right-hand pivoted bolt.

Figs. 6 and 7 are respectively side and front views of a slightly-modified form of bearing. Here the strap f^4 is hinged or pivoted at f^2 to the lugs f^3 in the bearing B at one side—the left-hand side—as shown in the views, and an open lug f^7, with a pivoted bolt f, secured by the nut f', and hinged by the pivot f^5 in the lug f^6, used at the other end as before. The interior collar f^8, pivoted at the point f^5, is provided for holding the shaft in position. The method of opening and closing this form of bearing is substantially the same as before.

I claim as my invention—

1. In a pulverizing-machine, the combination, with the driving-shaft provided with radial arms carrying rotary beaters, of a driving-pulley on said shaft outside of the pulverizing-chamber, containing in its interior movable counterpoises arranged to be adjusted at any desired position for balancing the driving-shaft and the pulverizing mechanism.

2. In a pulverizing-machine, the combination, with the driving-shaft provided with ra-

dial arms carrying rotary beaters, of a driving-pulley containing in its interior sliding weights, and means, substantially as described, for sliding said weights from the outside of the pulley for balancing the driving-shaft and the pulverizing mechanism.

3. In a pulverizing-machine, the combination, with the driving-shaft E, of the driving-pulley P on said shaft, the flange P′, cast in one piece with said pulley, the weights p' p', sliding in the webs p^3 p^4 in said flange, and the screws p, passing through screw-threaded openings in the weights and through openings in the flange P′, and the screw-heads p for turning said screw.

4. In a pulverizing-machine, the combination, with the main driving-shaft of the machine and its bearings at each end of and outside of the pulverizing-chamber, of movable friction-bearings for supporting the driving-shaft when released from its bearings during the operation of balancing.

5. In a pulverizing-machine, the combination, with the main driving-shaft of the machine and its bearings at each end of and outside of the pulverizing-chamber, of the vertically-movable friction-wheels mounted on a vertical standard, and an arrangement of connected levers, substantially as described, for raising said standards simultaneously and equally and for supporting the driving-shaft on the friction-wheels during the operation of balancing.

6. In a pulverizing-machine, the combination, with the main driving-shaft at either end of and outside of the pulverizing-chamber, of the standards D D, with the friction-rollers for supporting the shaft during the operation of balancing, the stationary beveled collars D′ and the loose collars D^2, surrounding the base of the standards, the link d', connecting the collars D^2 D^2, and the lever D^3, whereby the collars D^2 D^2 are rotated and the standards raised so that the shaft is supported on the friction-rollers.

7. In a pulverizing-machine, the combination, with the driving-pulley, of a loose pulley mounted on and rotating upon a separate shaft for receiving the driving-belt during the operation of balancing the driving-shaft of the machine.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 29th day of June, 1888.

JOHN J. BORDMAN.

Witnesses:
WILLARD PARKER BUTLER,
EDWIN T. RICE, Jr.