No. 775,068. PATENTED NOV. 15, 1904.

A. RAYMOND, DEC'D.

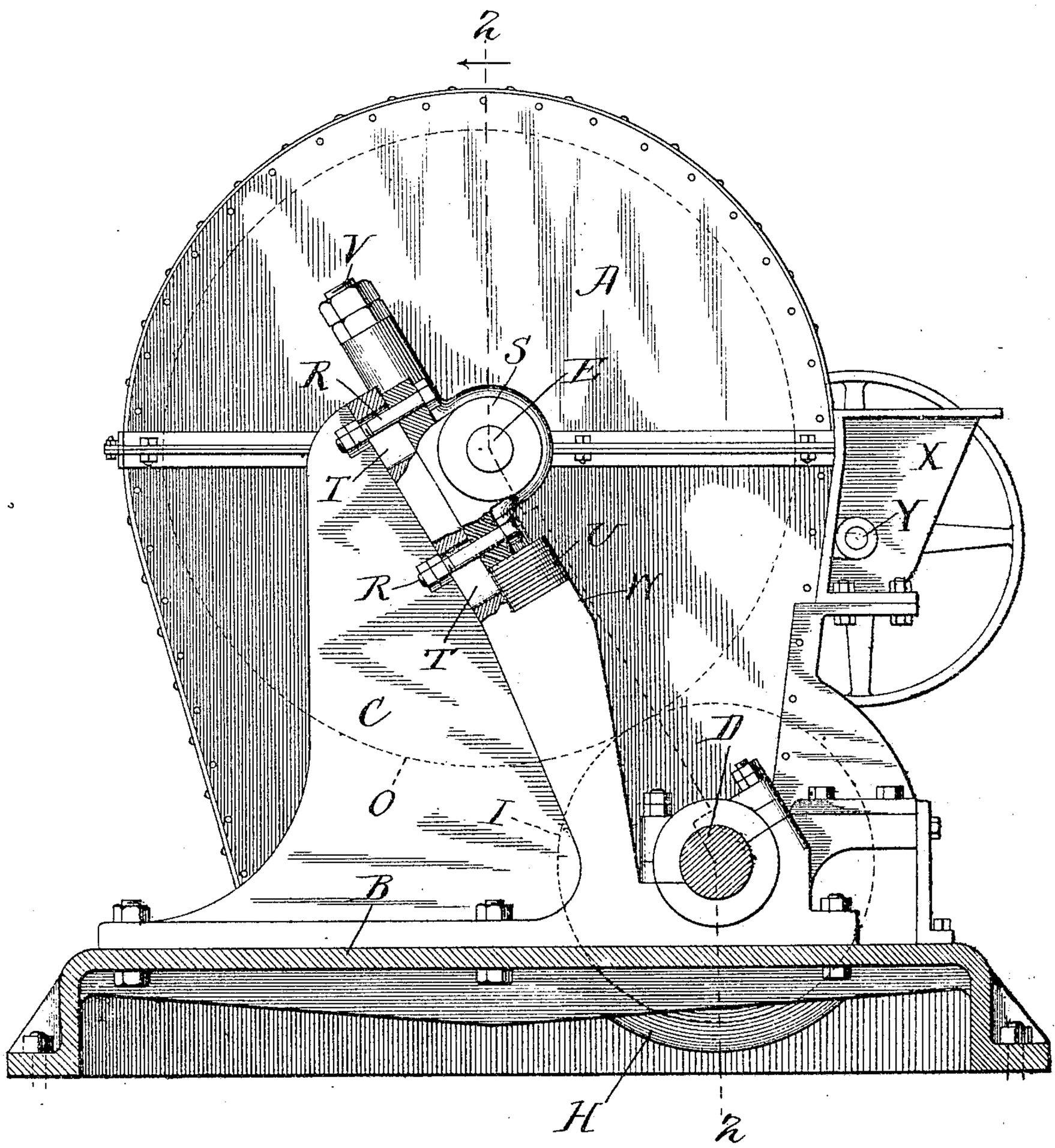
M. M. BARTELME. ADMINISTRATRIX.

PULVERIZER.

APPLICATION FILED JUNE 23, 1900.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1



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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2

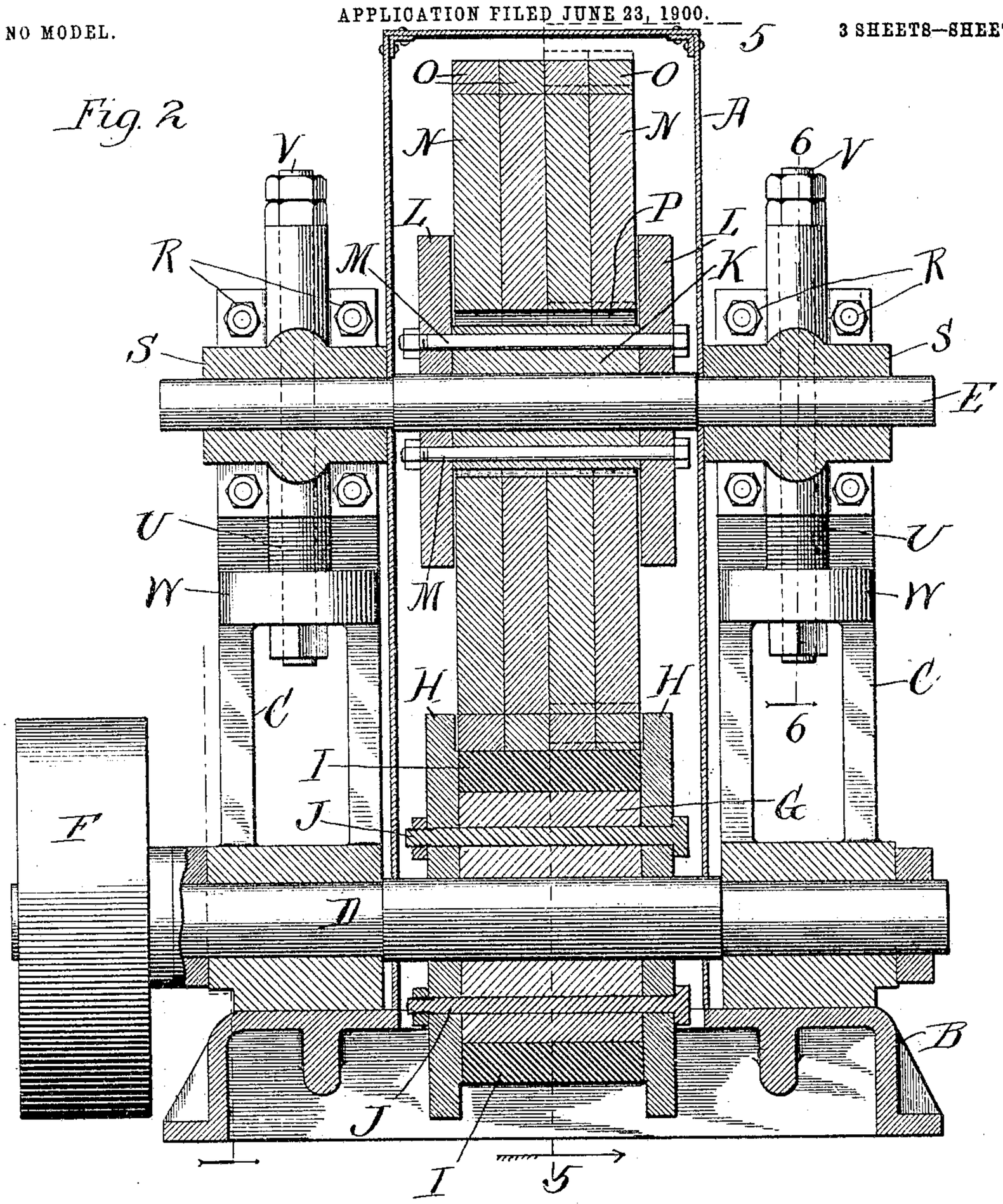


Fig. 3

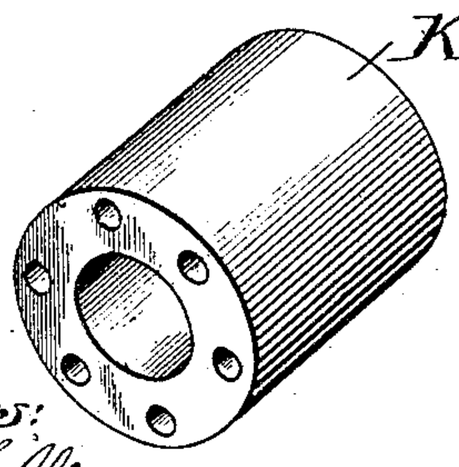
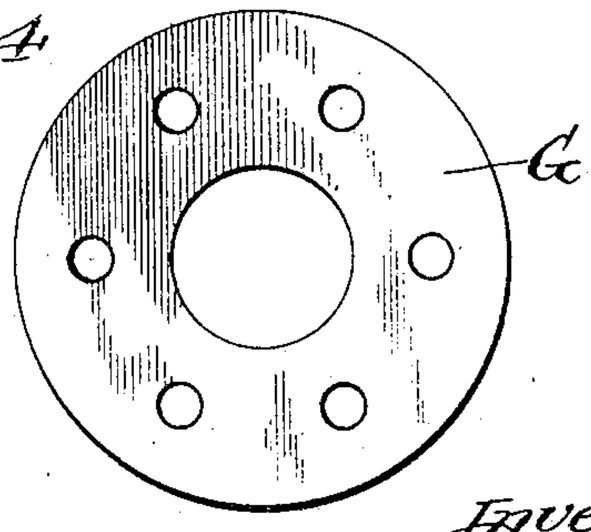


Fig. 4



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APPLICATION FILED JUNE 23, 1900.

NO MODEL. 3 SHEETS—SHEET 3.

Fig 5

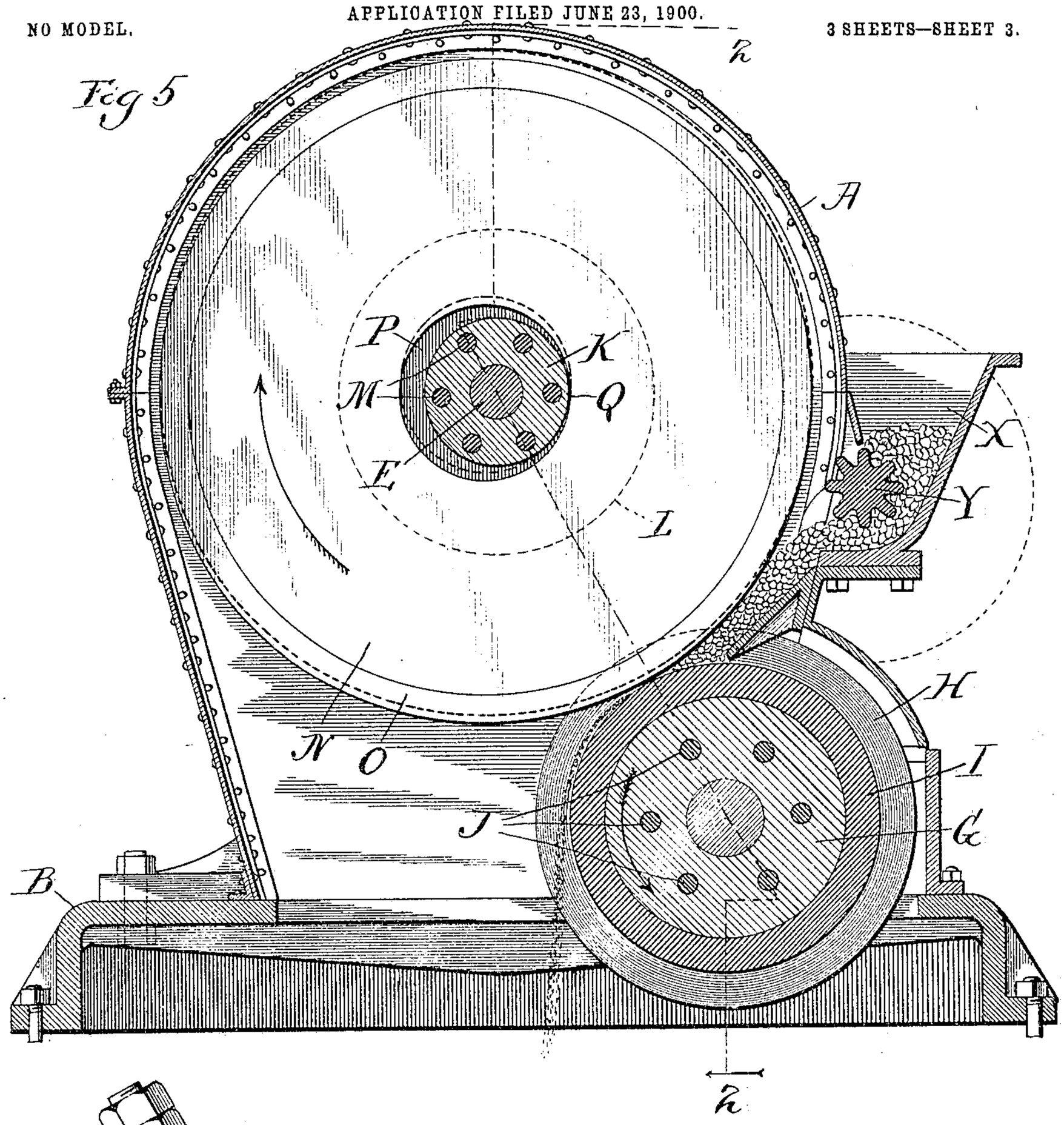

Fig 6

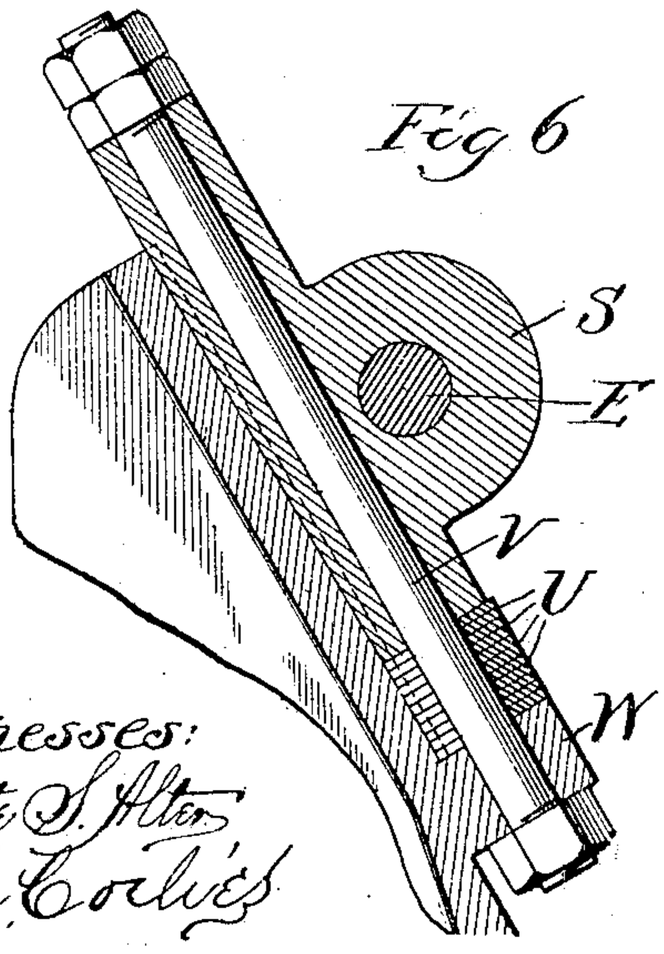

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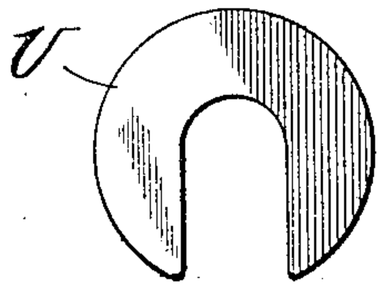
Fig 7



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No. 775,068. Patented November 15, 1904.

UNITED STATES PATENT OFFICE.

ALBERT RAYMOND, OF CHICAGO, ILLINOIS; MARY M. BARTELME ADMINISTRATRIX OF SAID RAYMOND, DECEASED.

PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 775,068, dated November 15, 1904.

Application filed June 23, 1900. Serial No. 21,280. (No model.)

To all whom it may concern:

Be it known that I, ALBERT RAYMOND, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pulverizers, of which the following is a specification.

This invention relates to improvements in pulverizers especially designed for reducing cement and light commodities, and has for its primary object to produce a simple, effective, and cheap machine of great capacity, yet which requires comparatively small power for its operation.

Another object is to have the grinding-rollers of such character that but one of them is power-driven, the other being driven from the first-mentioned roller by friction induced by the weight thereof, whereby the rollers will automatically accommodate themselves to variations in the character of the material, as well as pass through fractious material without injury to the rollers.

A further object is to have the grinding-rollers so that they may be quickly and cheaply repaired and the grinding-surface renewed without the loss of the entire roller.

A still further object is to have the driven roller composed of independent sections freely mounted, so that any one or more sections thereof may move radially toward and away from the driving-roller, whereby lumps or fractious material may lift and pass by one section of the driven roller without affecting the operation of the other sections thereof and also without undue strain upon the shaft supporting the driving or the driven roller.

These and such other objects as may hereinafter appear are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a sectional elevation of a pulverizer embodying my invention. Fig. 2 is a vertical section on the line 2 2 of Fig. 1. Fig. 3 is a detail perspective view of a hub of one of the grinding-rollers. Fig. 4 is a face view of one of the hub-flanges. Fig. 5 is a vertical section on the line 5 5 of Fig. 2. Fig. 6 is a vertical section on the line 6 6 of Fig. 2, and Fig. 7 is a detail view of one of the adjusting-shims.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates a sheet-metal casing of any suitable shape mounted upon a base B, upon which is also mounted at each side of the casing pillow-blocks C, which afford at their lower ends a bearing for the driving-shaft D and at their upper ends a bearing for the driven shaft E, the lower bearing being a fixed bearing and the upper bearing being adjustable, as explained farther on.

Mounted rigidly upon the driving-shaft D, to which power may be applied by the pulley F or in any other convenient manner, is the driving-roller, made up of the hub G, the disks H at each end thereof, the grinding-ring I, fitting snugly upon the hub between the disks, and the bolts J, passing through the hub and through each of the disks, so that the roller may be readily separated and a new grinding-ring substituted for an old worn one without loss of time or any other material than that of the old ring. The disks H extend beyond the periphery of the grinding-ring I, and the grinding-disks N fit therebetween. Thus, as will be readily understood, the material being crushed will be prevented from escaping from the lower roll.

Mounted upon the driven shaft E, which instead of being immediately above the driving-shaft is located out of vertical alinement therewith, is the driven roller, made up of the hub K, the disks L at each end thereof, the bolts M, passing through the hub and both of the disks L, binding them tightly together, and the roller proper, composed of a series of disks N, arranged side by side and each having applied to the periphery thereof a grinding-ring O of the same thickness as the disks N. It will be noted that the combined thickness of the disks N is slightly less than the distance between the inner opposing faces of the disks L, so that the disks N are not clamped between the disks L, but, on the contrary, are free to move with relation to each other; but such movement is intended to be practically

all radial, as the axial or lateral movement thereof should be no more than sufficient to allow a free radial movement. It will also be noted that each of the disks N has a central circular hole P of somewhat greater diameter than the hub K, and by reason of the relative diameters of the driving and driven rollers and the distance between the axes thereof the driven rollers at all times rest upon the driving-roller and have only one point of contact with the hub K, as at Q in Fig. 5. This point of contact between the driven roller and the hub K will of course change slightly as the shaft E, carrying the hub K, is adjusted toward and away from the driving-shaft D, provision for such adjustment being illustrated in Fig. 1, in which the fastening-bolts R of the bearing-block S of the shaft E pass through elongated slots T in the pillow-blocks C. Between the lower end of the bearing-block and a shoulder on the pillow-block is inserted a series of shims U, which are cut away at one side, as clearly illustrated in Fig. 7, to embrace the steadying-bolt V, which passes through the bearing-block S at right angles to the bolts R and through the shoulder W on the pillow-block, so as to aid the bolts R in holding the bearing firmly in any adjusted position. Obviously by the insertion or removal of any number of shims the position of the bearing-blocks S, and consequently of the shaft E, may be readily adjusted so as to allow a greater or less rise of the driven roller away from the driving-roller, according to the character of the material being operated upon. As above pointed out, the rollers are out of vertical alinement, but with their axes parallel. In actual fact, as shown in the drawings, Fig. 5, the center of gravity of the upper roller falls without the periphery of the lower roller; but this relative arrangement may be varied as desired. There is a distinct advantage arising from the fact that the rollers are out of vertical alinement. This advantage consists in providing a force exerted in opposition to the rotating movement of the upper roller due to the frictional contact. This force is the weight of the roller itself, which weight normally tends to move the roller in a direction contrary to that indicated by the arrow in Fig. 5; but as it also tends to bring the periphery of the roller into closer contact with the periphery of the lower roller a closer frictional contact is obtained, thus making it possible to obtain a greater crushing effect without placing additional strain on the driving-shaft.

The purpose of having the driven roller made up in disk-like sections is to give greater freedom at different points along the grinding-surface, according to the exigencies arising at any particular point along the surface—such, for instance, as the feeding in of a lump or lumps of fractious material which the rollers cannot crush or pulverize. In such case only that section of the driven roller which comes in contact with the fractious material will back off away from the driving-roller, so as to allow the fractious material to pass through, the remaining sections of the roller continuing at work as before. This arrangement makes each and every section of the driven roller independent of all the other sections, yet working in harmony and in unison therewith, except when occasion demands that it shall give way for the passage of obstructing material. In dotted lines in Fig. 2 I have shown the two right-hand sections raised or backed off from the driving-roller, the same effect being shown by dotted lines in Fig. 5.

In operation the driving-roller is continuously rotated, while the driven roller depends for its rotation upon the friction resulting from the grinding of the material between the meeting surfaces of said rollers, Fig. 5 clearly illustrating the operation of the machine and showing a feed-hopper X at one side of the casing delivering the cement or other material through the periphery thereof into the jaw between the rollers, an agitator Y being also shown in the hopper to assist in the feeding and prevent clogging thereof. The action of the grinding-rollers is such as to reduce the lumps of cement to an impalpable powder, in which form it flows off of the opposite side of the grinding-rolls, which turn in the direction indicated by arrows in Fig. 5, and no unground product can pass between the rollers, except such substances as are sufficiently fractious to resist the crushing effect of the driven roller, and in such event such material will pass through without injury to the machine or straining the shafts or bearings thereof.

A pulverizer constructed in accordance with my invention has great capacity, because the operation thereof is exceedingly rapid, the rollers are continuously at work upon the material, while the grinding action tends to constantly draw in fresh material, though only as rapidly as the rollers can take care of it.

Obviously various modifications in the construction and arrangement of the parts of my machine may be made without departing from the spirit of my invention—such, for instance, as varying the number of sections of the driven roller or the manner in which the sections are secured together and adjusted, and, indeed, it would be no departure from the broad idea of my invention to have the driven roller solid or formed in one piece so long as the roller is capable of bodily radial movement toward and away from the driving-roller without moving the shaft of the driven roller with it, and all such changes are contemplated by my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a pulverizer, the combination with a

driving-roller, of a driven roller normally resting upon and rotated by frictional contact with the driving-roller, said rollers being out of vertical alinement, said driven rollers comprising a plurality of disks each having a central bore, a hub of less diameter than the bore of the disks on which the disks are mounted and have independent radial movement, said hub having longitudinally-arranged bolt-openings, disks of smaller diameter than the disks forming the said roller arranged at opposite sides of the latter, and bolts passed through said smaller-diameter disks and the bolt-openings in the hub, substantially as described.

2. In a pulverizer, the combination with the driving-roller, of a driven roller composed of a plurality of disks, a grinding-ring mounted on each of said disks, a hub on which the disks are loosely mounted and have radial movement independently of each other, a shaft on which the hub is mounted, disks mounted on the said shaft and engaging the ends of the hub, and tie-bolts passing through the said disks and hub, substantially as described.

3. In a pulverizer, the combination with the driving-roller, of the driven roller formed with a central bore, a shaft extending through the said central bore of the said driven roller, a hub mounted on the said shaft and being arranged within the bore of the said driven roller, said hub being of smaller diameter than the bore of the said driven roller, and being formed with a series of longitudinal openings, bolts arranged in the openings of the said hub, and disks mounted on the opposite ends of the said bolts, substantially as and for the purpose specified.

4. In a pulverizer, the combination with a driving-roller, of a driven roller normally resting upon and rotated by frictional contact with the driving-roller, said driven roller being composed of a plurality of disks, each formed with a central bore, of a shaft extending through the central bores of the said disks, a hub mounted on the shaft, the bores of said disks being greater in diameter than the diameter of the said hub, and disks removably secured to the outer ends of the said hub.

5. In a pulverizer, the combination with the driving-roller, and disks, of greater diameter than the roller, secured to its opposite sides, of a driven roller composed of a plurality of disks each having a central bore, said disks normally resting on the said driving-roller between the said first-named disks, a shaft extending through the bores of the disks, a hub, and disks secured to the outer ends of the said hub, substantially as described.

6. In a pulverizer, the combination with the frame including pillow-blocks provided with rearwardly-inclined upper ends and having outwardly-extending shoulders at the lower ends of said inclined portions, a positively-driven shaft journaled in the pillow-blocks, a roller mounted on said shaft, bearing-blocks mounted upon the said inclined portions of the pillow-blocks, a shaft journaled in said bearing-blocks, a roller mounted on said shaft and driven by frictional contact with the first-mentioned roller, securing-bolts passing through said bearing-blocks and through slots provided therefor in the inclined portions of the pillow-blocks to permit the adjustment of said blocks, and steadying-bolts passed through the bearing-blocks and through the outwardly-extending lugs of the pillow-block at right angles to the securing-bolts, substantially as described.

7. In a pulverizer, the combination of a pair of pillow-blocks formed at their upper ends with inclined portions, and having outwardly-extending shoulders at the lower end of said inclined portions, bearing-blocks mounted on said inclined portions, securing-bolts passing through said bearing-blocks and through slots provided therefor in the inclined portions of the pillow-blocks to permit the adjustment of said bearing-blocks, steadying-bolts passed through the bearing-blocks endwise thereof and through the outwardly-extending lugs of the pillow-blocks, means on said steadying-bolts for holding the blocks in their adjusted position, a shaft journaled in the bearing-blocks, a roller mounted on said shaft, a drive-shaft journaled in the pillow-blocks, and a roller on said drive-shaft coacting with the first-mentioned roller.

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