

(No Model.)

3 Sheets—Sheet 1.

G. R. KING & A. RAYMOND.  
CENTRIFUGAL PULVERIZING MILL.

No. 579,588.

Patented Mar. 30, 1897.

FIG. 1.

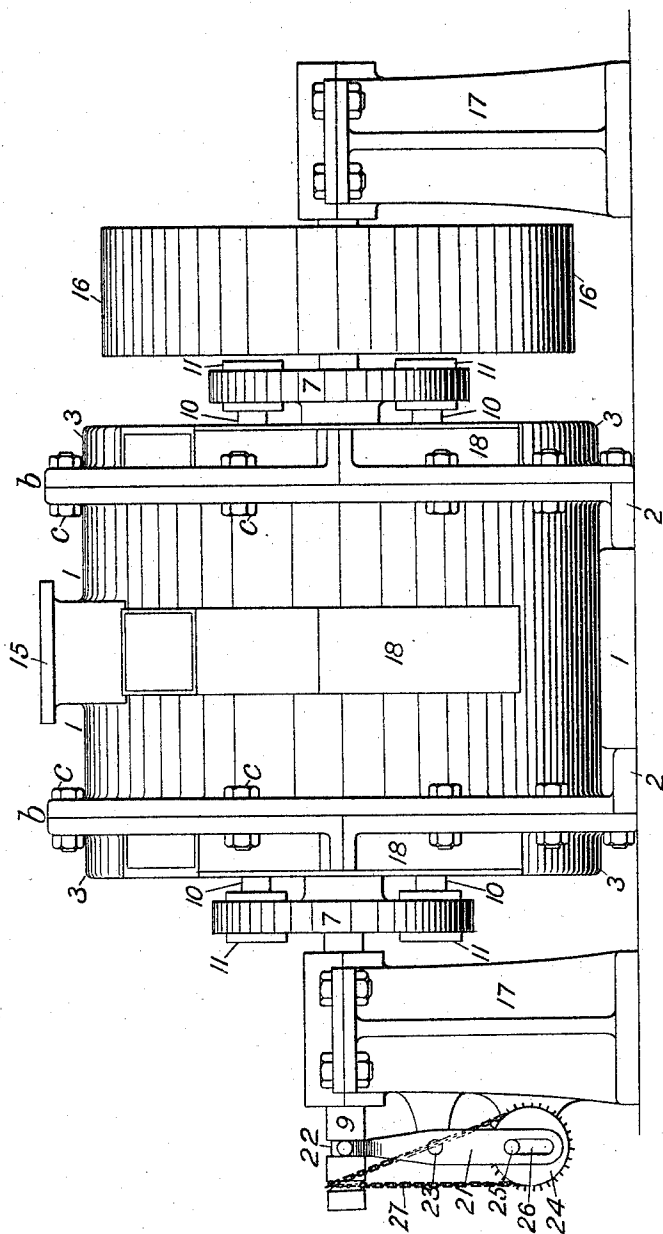
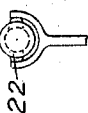


FIG. 2.



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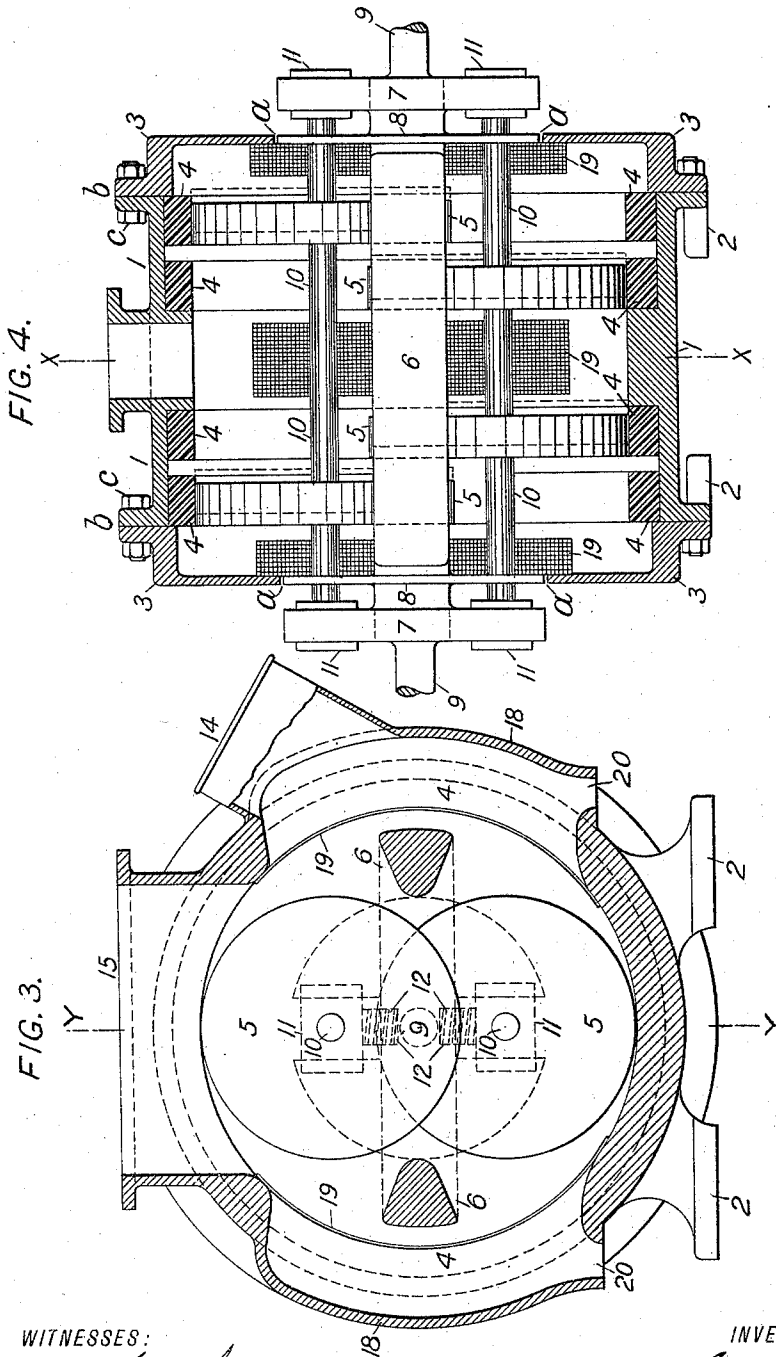
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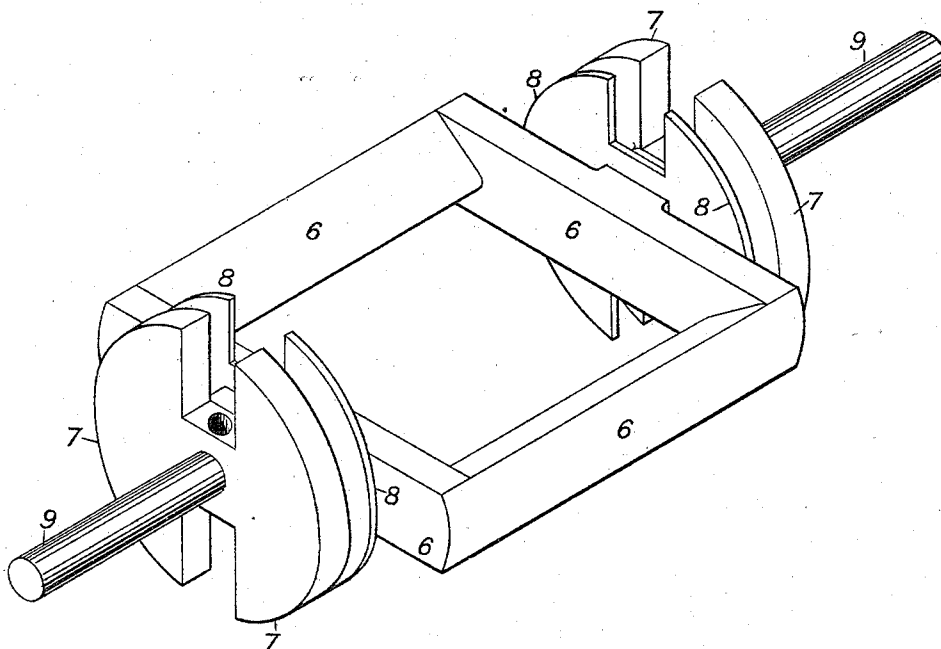
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FIG. 5.



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# UNITED STATES PATENT OFFICE.

GEORGE R. KING, OF NEW YORK, N. Y., AND ALBERT RAYMOND, OF CHICAGO, ILLINOIS.

## CENTRIFUGAL PULVERIZING-MILL.

SPECIFICATION forming part of Letters Patent No. 579,588, dated March 30, 1897.

Application filed July 17, 1896. Serial No. 599,521. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE R. KING, residing in the city, county, and State of New York, and ALBERT RAYMOND, residing in the city of Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented a new and useful Vertical-Roller Pulverizing-Mill, of which the following is a specification.

Our invention relates to improvements in that class of pulverizing machines or mills which have for their object the reduction to a fine powder of various substances, as lime, gypsum, quartz, ores, coal, &c.

The objects of our invention are to simplify the construction and increase the durability and effectiveness of such mills and render them less expensive and less exhaustive of power to run them, all of which we attain by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a side elevation; Fig. 2, an end view of the carrying-shaft and a pin-fork which is part of the device for giving, when desired, a lengthwise or endlong movement to the rollers of the mill; Fig. 3, a transverse section on the line *xx* of Fig. 4; Fig. 4, a vertical section on the line *yy* of Fig. 3 with carrying-frame in elevation; Fig. 5, a carrying-frame consisting, preferably, of a single casting of steel, having disks for closing the ends of the mill and slotted heads for holding and operating the roller-shafts, as will appear in the following description.

Like numerals and letters refer to like parts throughout the several views.

1 is a cylindrical shell or case provided with suitable feet 2 to secure it to some proper foundation.

3 are annular heads provided with central circular openings extending from *a* to *a*. (See Fig. 4.) These annular heads and the cylindrical shell are provided with flanges *b b* and securely united together with the bolts *c c*, and taken together constitute the chamber in which the rollers operate.

4 are four flat-ring dies securely fastened to the inner surface of the said shell, and 5

are four mutually-balanced pulverizing-rollers, which revolve and travel one only on the inner surface of each of the said dies. These four rollers are rigidly mounted on the two roller-shafts 10 10, being two rollers on each shaft, each pair of the rollers being placed laterally on their respective shafts in such a position as to bring those on one shaft between those on the other, whereby rollers of much greater diameter can be employed in a shell of given dimensions than if they were placed opposite each other.

To render it possible to employ these large rollers and control them in the lengthwise or endlong direction and allow them the needed radial movement in traveling over the material in its different stages of reduction constitutes one of the objects and special features of our invention. This we accomplish by the rigid carrying and operating frame shown by Fig. 5. This entire figure represents a preferably single steel casting, which embraces the right-angle quadrangular frame proper, 6 6, the slotted closing-disks 8 8, which (when in position) close the central openings at the annular heads 3 3 of the cylindrical shell 1, and the slotted carrying-head pieces 7 7, in which are carried and operated the roller-shafts and also the two short protruding shafts 9 9, on which the entire movable parts of the mill are supported and actuated. Within the slots of these slotted head-pieces are suitable radially-sliding bearing-boxes 11 11 for holding and carrying the roller-shafts 10 10. To give the rollers a constant radial action and keep them in yielding contact with their respective dies, spiral springs 12 12 (see Fig. 3) are placed under these bearing-boxes, whereby the roller-shafts can radially tilt or rock to accommodate the radial movement of the rollers caused by their rolling over material of different degrees of reduction.

17 are supports for carrying the two protruding shafts 9 9, one of which shafts being sufficiently elongated to take the driving-pulley 16.

14 is an opening in the side of the cylindrical shell to receive a return-current of air when

dry material is to be pulverized, and 15 is an opening over which is mounted, when dry material is to be reduced, some sort of dry separator, either of which openings (14 or 15) can be utilized as a hopper, into which the material to be pulverized can be fed to the mill.

On the sides of the cylindrical shell and annular heads 3 3 are protrusions or shields 18, between which and the shell proper are provided screens 19 and openings 20 (see Fig. 3) for discharging the material after it is pulverized and passed through the screens, these screens and discharge-openings being employed only when water is employed in the operation.

An additional feature of our device, but not indispensable to the construction and operation of the mill as far as above described, is the giving of the rollers a to-and-fro lengthwise or endlong motion as they revolve around on their respective dies. This we accomplish by giving such a lengthwise or endlong motion to the carrying-frame, as shown in Fig. 5, in which are mounted and operated the roller-shafts. The device shown for executing this lengthwise or endlong motion of the rollers (though we do not limit ourselves to this precise method) is seen on the left of Fig. 1, which consists of the lever 21, provided with a pin-fork at the top (see Fig. 2) working in a groove 22, cut in the left-hand protruding shaft 9. This lever has its fulcrum on the pin 23 and is operated at the other end by a crank-disk 24, the pin of which, 25, works in the slot 26 of the lever. The crank-disk may be operated by a sprocket-chain connecting the shaft 9 to the crank-disk 24, as shown in Fig. 1, whereby the extremely-limited lengthwise motion of the shaft and rollers is produced, as indicated by the dotted lines in Fig. 4, drawn parallel with the sides of the rollers. As will be seen, this motion is but slight, only sufficient to cover the face of the dies by the tread of the rollers to prevent, as well, the tread of the rollers from constantly traveling in the same track, and thereby prevent the rollers from wearing a groove in the dies and thus increasing their durability. This motion is so limited in scope and so slow of action that the sprocket-chain connecting the shaft with the crank-disk will easily effect the operation.

Having pointed out the several parts of our device and substantially alluded to the functions of the same, it is not necessary to further describe the operation of our mill, only by pointing out some of the advantages attained by the peculiar construction thereof.

By means of the quadrangular frame with the protruding shafts 9 9 and slotted head-pieces for carrying the roller-shafts we attain, first, the placing of all the working parts of the mill except the rollers outside of the shell, whereby they are not cut and worn and obstructed by the material to be and being pul-

verized; second, by the employment of rollers of greater diameter than would be possible with an operating-shaft passing through the center of the shell, whereby the mill is made more effective, as rollers of larger diameter are more efficient; third, by placing the rollers side by side of each other instead of directly opposite each other each roller has its own die, whereby each roller is more thoroughly fed with the material to be crushed and triturated and the dies are not so rapidly worn; fourth, by the peculiar method of our construction a mill of a given number of rollers and capacity will not cost much if any more than half as much as such mills do as heretofore constructed.

We do not necessarily limit ourselves to the use of two roller-shafts, as three may be employed by making the rollers a little less in diameter. Neither do we limit ourselves to two rollers on a shaft, as one might be used on one of two shafts and two on the other by making the single roller equal in weight to the two on the other shaft, so that the one will counterbalance the two. In fact, it is found in practice that too many rollers running at high speed are not so effective as a smaller number, and that rollers less in width or thickness and larger in diameter are more efficient.

The advantage of giving a limited to-and-fro lengthwise or endlong motion to the rollers is to produce to some extent a slipping or rubbing action between the rollers and their respective dies, which we accomplish by the device illustrated and described. Besides, this lengthwise or endlong movement renders the same mill more effective and increases its durability.

What we claim as new and useful, and desire to secure by Letters Patent, is--

1. In a centrifugal-roller pulverizing-mill the quadrangular frame 6, having the slotted heads 7 7, slotted disks 8 8 and projecting shafts 9 9, in combination with the roller-shafts 10, rollers 5, dies 4, cylindrical shell 1 and annular heads 3, substantially in the manner and for the purpose described.

2. In a centrifugal-roller pulverizing-mill the quadrangular frame 6, having the slotted heads 7 7, slotted disks 8 8 and projecting shafts 9 9, in combination with the roller-shafts 10, having the radially-sliding bearing-boxes 11 and springs 12, the rollers 5, dies 4, cylindrical shell 1 having the annular heads 3 and pulley 16, substantially as and for the purpose described.

3. In a centrifugal-roller pulverizing-mill the quadrangular frame 6, having the slotted heads 7 7, projecting shafts 9 9, dies 4 and cylindrical shell 1 in combination with the lever 21, disk-crank 26 and sprocket-chain 27 substantially in the manner and for the purpose set forth.

4. In a centrifugal-roller pulverizing-mill

a central quadrangular roller-shaft frame in-  
closed within a cylindrical shell and having a  
clear open interior space within which rollers  
may be mounted of such large diameters that  
5 they extend past the axis of the carrier and  
past each other's peripheries, and having  
chamber-closing disks and slotted shaft-car-  
rying heads and protruding carrying-shafts,

substantially as and for the purpose de-  
scribed.

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