

No. 624,136.

Patented May 2, 1899.

H. WALKER & W. JOHNSON.  
GRINDING, CRUSHING, OR PULVERIZING MILL.

(Application filed Dec. 13, 1897.)

(No Model.)

2 Sheets—Sheet 1.

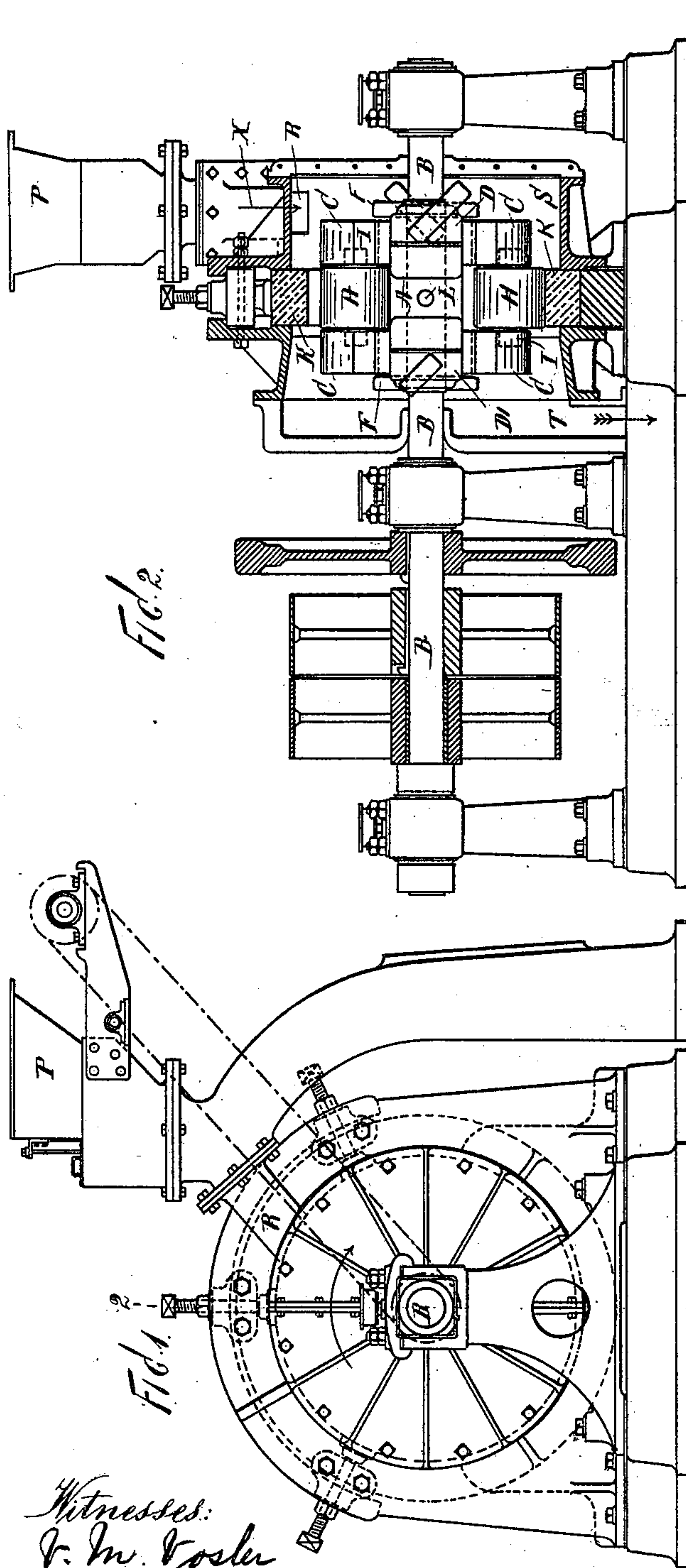


Fig. 2.

Fig. 1.

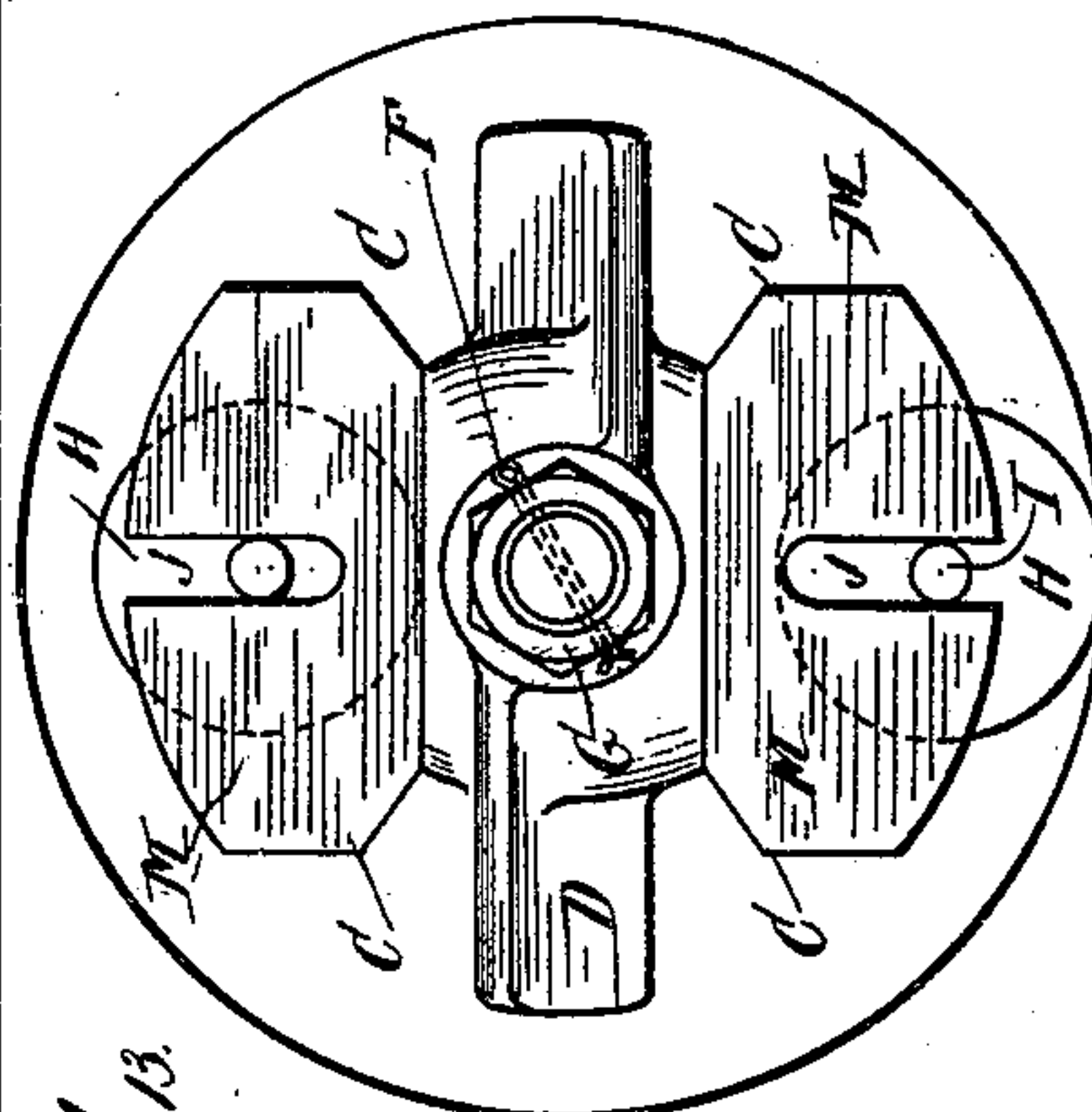


Fig. 13.

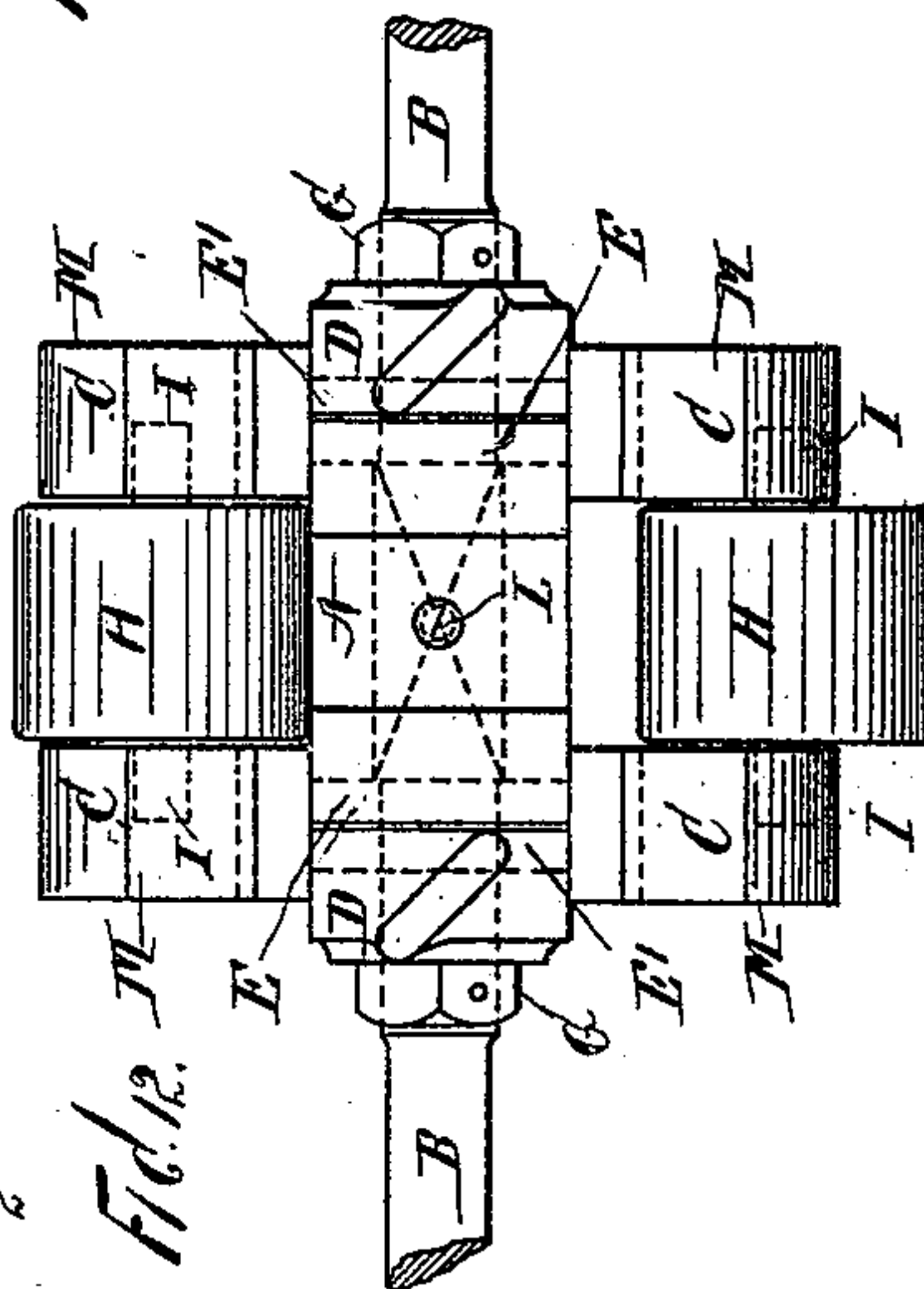


Fig. 12.

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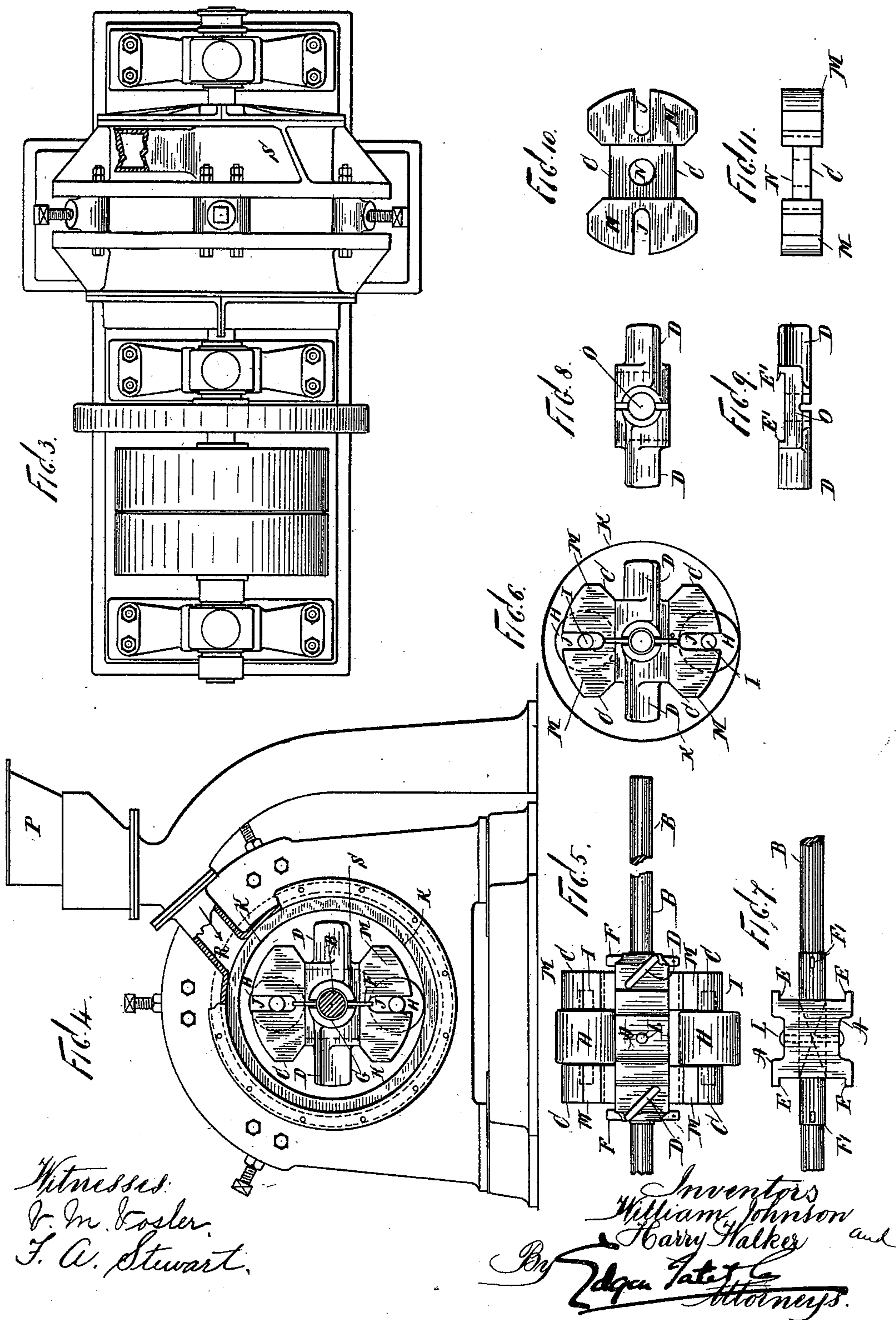
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## GRINDING, CRUSHING, OR PULVERIZING MILL.

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**2 Sheets—Sheet 2.**





# UNITED STATES PATENT OFFICE.

HARRY WALKER AND WILLIAM JOHNSON, OF LEEDS, ENGLAND.

## GRINDING, CRUSHING, OR PULVERIZING MILL.

SPECIFICATION forming part of Letters Patent No. 624,136, dated May 2, 1899.

Application filed December 13, 1897. Serial No. 661,656. (No model.)

*To all whom it may concern:*

Be it known that we, HARRY WALKER and WILLIAM JOHNSON, subjects of the Queen of Great Britain, residing at Leeds, in the county of York, England, have invented certain new and useful Improvements in Grinding, Crushing, or Pulverizing Mills, of which the following is a full and complete specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention is the same as that for which Letters Patent were granted in Great Britain June 23, 1896, No. 13,825, and relates to grinding, crushing, and pulverizing mills and to that class thereof in which the crushing, grinding, and pulverizing are effected by the rotation or centrifugal action of balls or rollers working within a cylindrical ring or casing; and the object of the invention is to render mills of this class more satisfactory and practical in their operation, as well as to enable a mill or pulverizer to work with a greater degree of practical efficiency than it has hitherto been capable of doing.

Further objects of this invention are to reduce the wear and tear on the fittings of the shaft and to make the fittings less costly than at present, but at the same time more efficient, and also to reduce the labor in taking off of the shaft and replacing thereon said fittings.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which—

Figure 1 is an end elevation of our improved crushing and pulverizing mill; Fig. 2, a horizontal section thereof on the line 2 2; Fig. 3, a plan view showing the feed-inlet broken away; Fig. 4, an end view similar to Fig. 1, part of the construction being shown in section and part of the feed apparatus removed; Fig. 5, a front elevation of part of the grinding apparatus detached; Fig. 6, an end view thereof. Figs. 7 to 11 represent details of the grinding apparatus detached, Fig. 9 being a side view of the detail shown in Fig. 8 and Fig. 11 a side view of the detail shown in Fig. 10; and Figs. 12 and 13 are respectively front and end elevations similar to Figs. 5 and 6, but on an enlarged scale.

In Figs. 1, 2, and 4 of the accompanying drawings one form of the feed apparatus is

shown, and the material to be treated is fed into the hopper P and passes through the chute R, which constitutes the inlet into the grinding-mill, and there the material is discharged into the chamber S, in which the grinding apparatus, which will be hereinafter described, is mounted and where it comes in contact with the propeller or stirrer B, hereinafter described, which throws the material between the face of the ring K and the rollers H, and after the material has been crushed or ground it is thrown by the discharging propellers or stirrers D into the outlet-cover T, which has its discharge or outlet through the bed-plate, the inlet and outlet being designated in Fig. 2 by the arrows X.

According to this invention the fittings consist of a center carrier A, fixed to the grinding-mill shaft B, together with solid drivers, arms, or carriers C, (hereinafter termed "drivers C,") and solid stirrers D, the center carrier A and stirrers D being provided with carrying ribs or jaws E. The cotters F and nuts G are used for securing and preventing any side movement of the fittings on the shaft.

Grinding rollers or balls (rollers H are shown in the drawings) fitted with spindles I work in the slots J, provided in the drivers C, as shown.

K represents the inside diameter of the grinding-ring, against which the rollers H are caused to come in contact by the centrifugal force generated in the revolving mill-shaft on which our improved fittings are fixed.

The shaft B is provided with a portion of its length nearest its center of a square section, or having any number of flat sides, the other portions of the shaft being turned up round to the required size. On the square portion of the shaft is fixed the center carrier A, (made of ordinary cast-steel or other suitable material,) which is provided with a hole of the same contour as the shaft at this point, said carrier A being provided with carrying-ribs E. This fitting is forced onto the shaft by hydraulic or other pressure and is permanent, no wear from the material under treatment affecting it. To provide against any side movement when compressing or fixing the other herein-described fittings on the shaft, a pin or rivet L is provided, which is driven



right through the carrier A and shaft B at right angles to the shaft itself.

On each side of the center carrier A and between the carrying ribs or jaws E are fixed the drivers C, having each of their ends or faces M made thicker than their centers to allow for any wear caused by the rollers H revolving against and between the driver-faces which come next to the sides of the rollers.

The holes N in the centers of the drivers C are provided with a bush of any suitable soft material capable of being machined and acted upon by cutting-tools, the other portion of this fitting being of a very hard and tough material which is calculated to resist wear and which cannot be machined, the holes themselves being bored to fit easily on the shaft B.

The carrying ribs or jaws E on the center carrier A only grip part of the thickness of the drivers C in the center at their thinnest portions.

After the drivers C are in position the propellers or stirrers D, which are provided with corresponding carrying ribs or jaws E', like those of the center carrier A, and which are made with a center bush O of soft material in exactly the same manner as the drivers C, (the other portion of the stirrers consisting of the same hard material as the drivers C,) are placed next to and outside of the drivers C, the carrying ribs or jaws E' gripping half the thickness of the drivers in the same manner as the ribs of the center carrier A.

To hold the drivers C and stirrers D firmly on either side of the center carrier A, cotters F are driven into holes F' in the shaft, the said holes having draw to permit of the cotters themselves being partly recessed into the propeller-bosses.

In place of the cotters suitable nuts G may be used to secure the fittings one to the other, the results being practically the same as with the cotters F.

The drivers C are cut out the same on both sides, as shown in Figs. 6 and 7, and can be reversed—that is to say, when one side of a driver has been worn on its face at M by the roller H it can be taken off the shaft B and turned around, thereby bringing the worn face outside and unworn face from the outside to the inside and next to the roller H. By reversing the drivers C (which are the fundamental fittings) they can be completely worn out before being replaced. This movement also allows of both sides of the slots J being thoroughly worn out, making each side of the slots to lead and drive alternately.

When the grinding-rollers H are in position between the driver-faces M, the spindles I do not rest on the bottom of the slot or jaw, but are kept a certain distance up the slot quite free and clear of the bottom slot, the roller itself being in contact with center carrier A when they are in their back position.

It will be readily observed that when the rollers H are forced back, with their spindles

I, up slots J by coming in contact with the material being ground the shock, blow, or weight of such movement, combined with the dead-weight of the roller itself, is not taken up by the spindles, which are clear of the slot or jaw bottoms, but by the rollers, which are the largest bodies or sections and which come in contact with the center carrier A.

The length of the roller-spindles I, as shown in dotted lines in Figs. 1 and 8, is such as to only allow of their working in half the thickness of the driver end or slot J, thereby leaving half the distance through the slot or jaw unworn and practically new when the drivers C require to be reversed, after which the unworn portion of the slot J is brought into use.

Four distinct wears can be obtained from the driver-slots J—first, by running the mill backward, and, secondly, by running the mill forward before changing or reversing the drivers C; thirdly, by running the mill backward, and, fourthly, by running the mill forward after the drivers C have been reversed. The spindles I only bear upon one-fourth of the wearing portion of the slots J when first put to work, the remaining three-fourths being milled according to the running backward and forward of the mill and the reversing of the drivers C.

It will readily be seen that the herein-described fittings are safe in their working, as there are no small renewable parts to break loose inside the mill. By dispensing with such small parts and employing our herein-described fittings having a small amount of machine-work expended upon them in manufacture it will enable them to be used and replaced at a small cost as compared with other systems. Moreover, the interlocking or clutch arrangement obtained by this invention allows the fittings to be attached and detached to and from the aforesaid shaft in a very short space of time by the person or persons using the mill.

Having fully described our invention, we claim as new and desire to secure by Letters Patent—

1. In a mill having a casing and rotatable shaft extending therethrough, said shaft being provided with a carrier rigidly secured thereto, drivers mounted upon said shaft and interfitted with the ends of said carrier, stirrers mounted upon said shaft and interfitted with the outer sides of said drivers, and rollers carried by said drivers.

2. In a mill having a casing, a rotatable shaft, a carrier mounted upon said shaft and having end ribs, drivers mounted upon said shaft and fitting between the ribs of said carrier, stirrers mounted upon said shaft and having ribs on their inner faces interfitted with the outer sides of said drivers, and rollers carried by said drivers.

3. In a mill having a casing and a rotatable shaft, a carrier mounted upon said shaft and



having end ribs, drivers mounted upon said shaft, the intermediate portion of said drivers being reduced and fitting between the ribs of the carrier, the outer ends of said drivers having open slots, stirrers mounted upon said shaft and having ribs on their inner faces engaging the outer side of the reduced portions of the driver, and rollers mounted in the open slots of said drivers.

10 4. In a mill having a casing and a rotatable shaft, a carrier permanently and rigidly secured to said shaft, and a driver and a stirrer on each side of said carrier, the driver interfitting with the ends of the carrier, and said  
15 stirrers interfitting with the drivers, and said drivers and stirrers being removably secured upon said shaft.

5. In a mill having a casing and rotatable shaft, a carrier upon said shaft, drivers upon  
20 said shaft at each end of said carrier, said drivers consisting of a reduced intermediate portion and enlarged end portions and being

symmetrical, stirrers upon said shaft and interfitting with the outer sides of the reduced portion of the driver, open slots in the end  
25 portion of said drivers, and rollers having spindles extending into said open slots, the length of the spindle being about half of the width of the end portions of the drivers.

In testimony that we claim the foregoing as  
30 our invention we have signed our names, in presence of the subscribing witnesses, this 24th day of November, 1897, by the said HARRY WALKER and this 6th day of December, 1897, by the said WILLIAM JOHNSON.

HARRY WALKER.  
WILLIAM JOHNSON.

Witnesses as to Harry Walker:

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