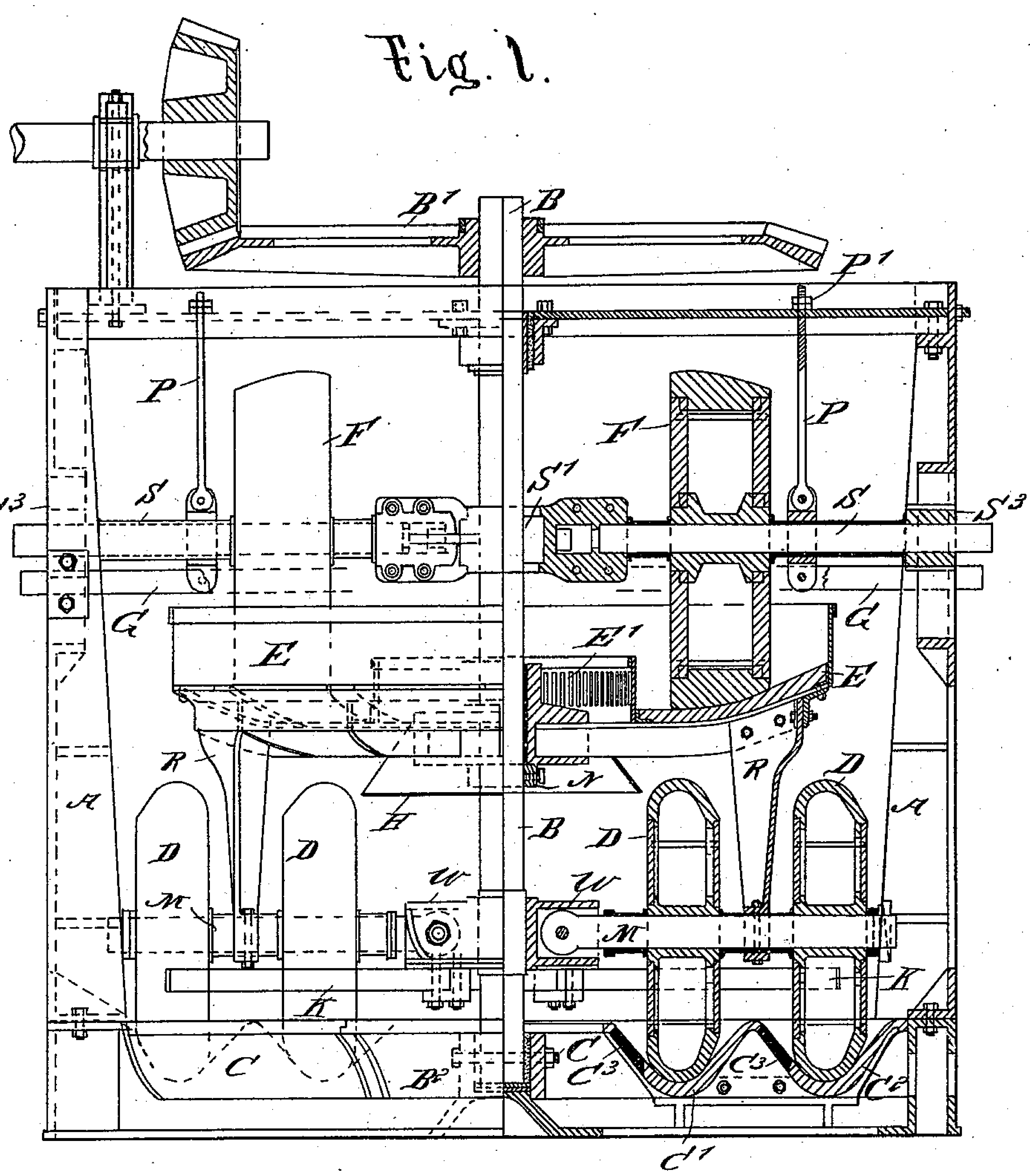
(No Model.) 4 Sheets—Sheet 1.

R. D. LANGLEY.

ROTARY GRINDING AND PULVERIZING MACHINE.

No. 548,072. Patented Oct. 15, 1895.

Fig. 1.



WITNESSES: Geo. C. Cheney. J. H. Gaplinger

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Fig. 2.

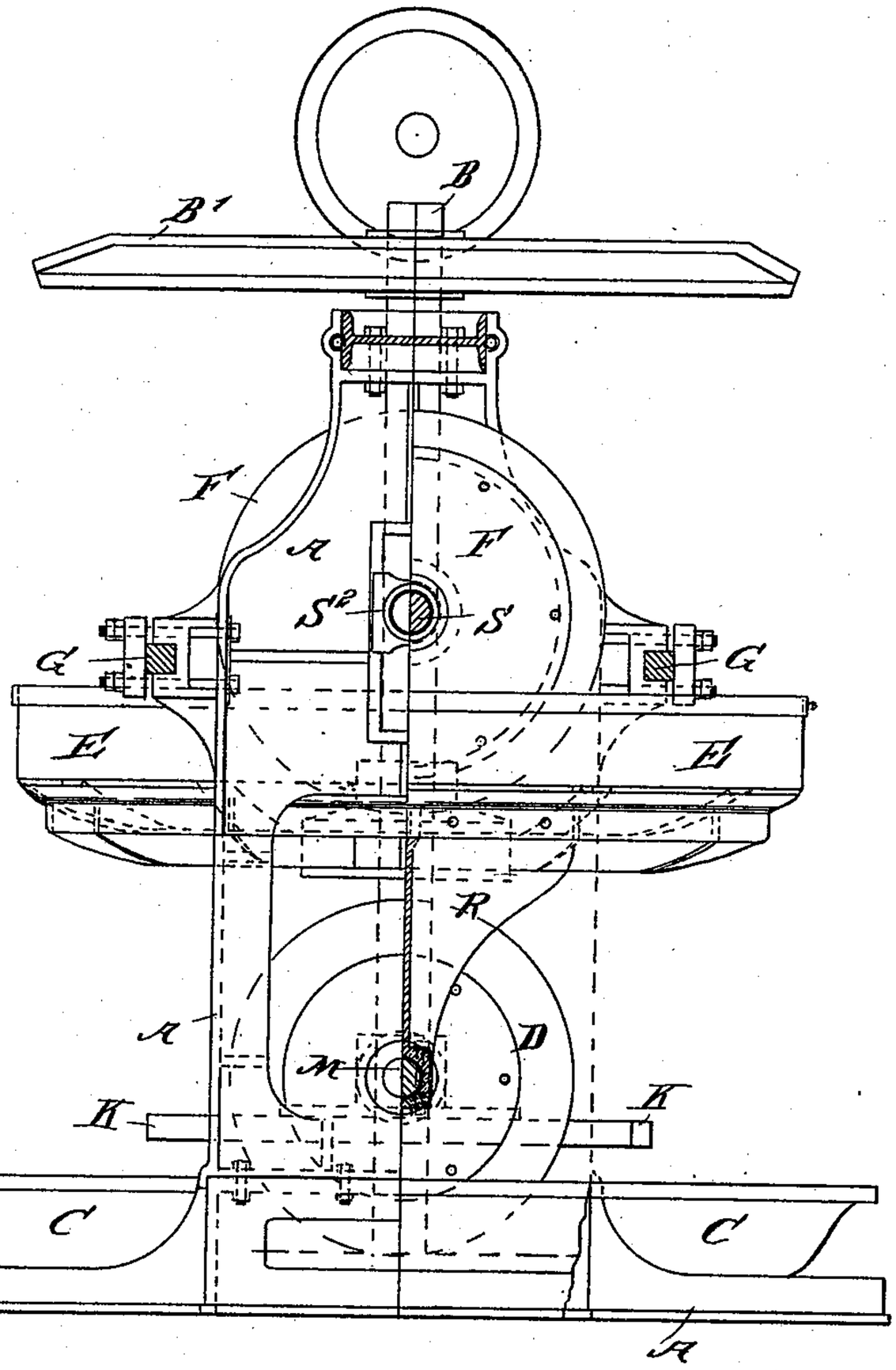

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Fig. 3.

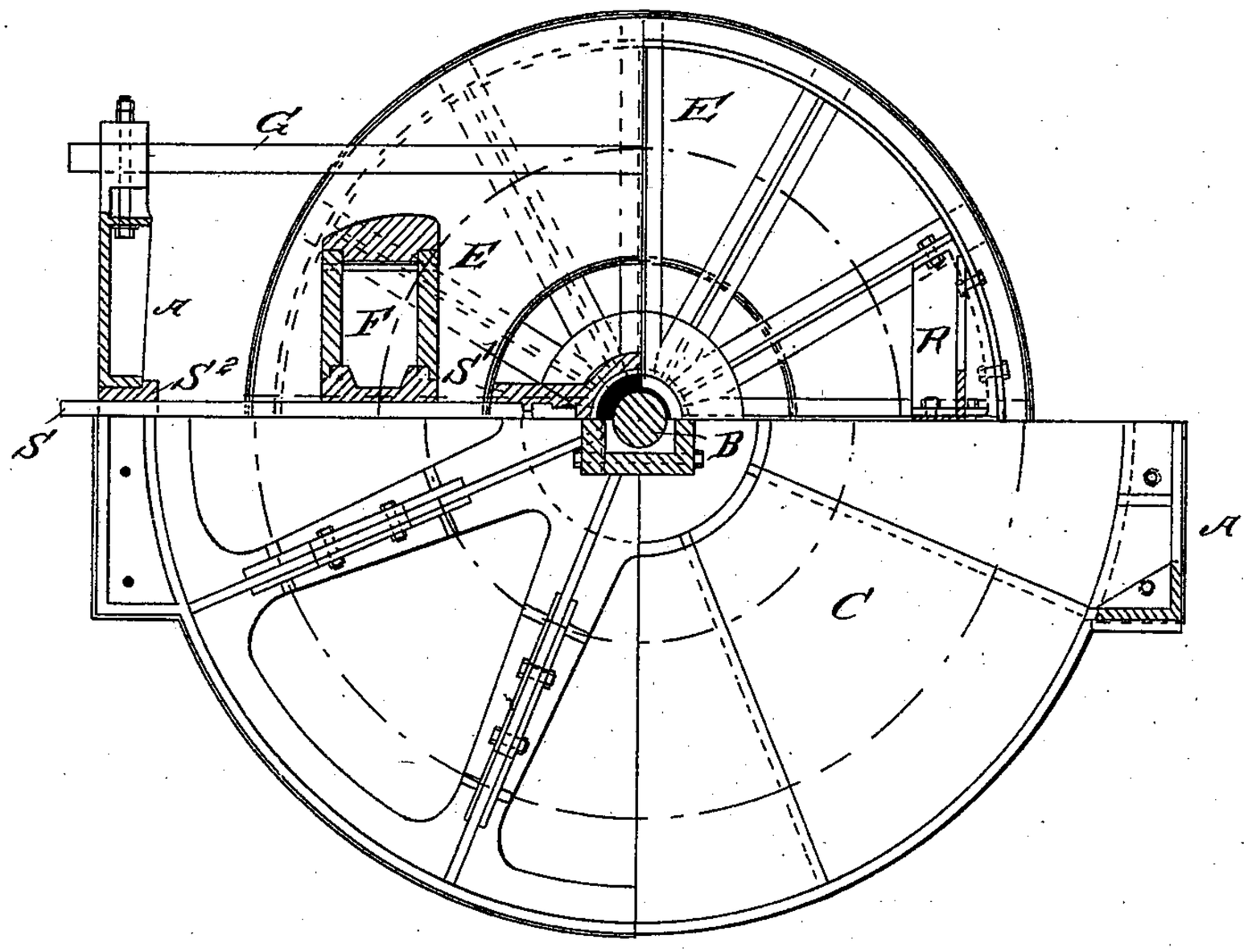
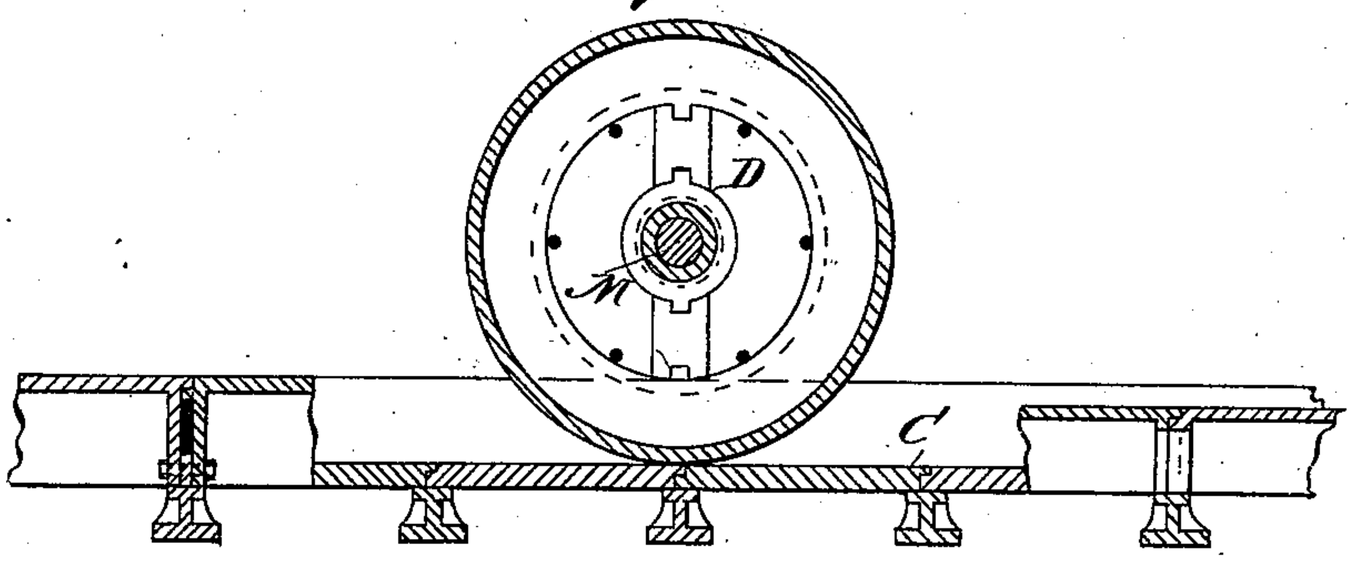


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

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Fig. 5.

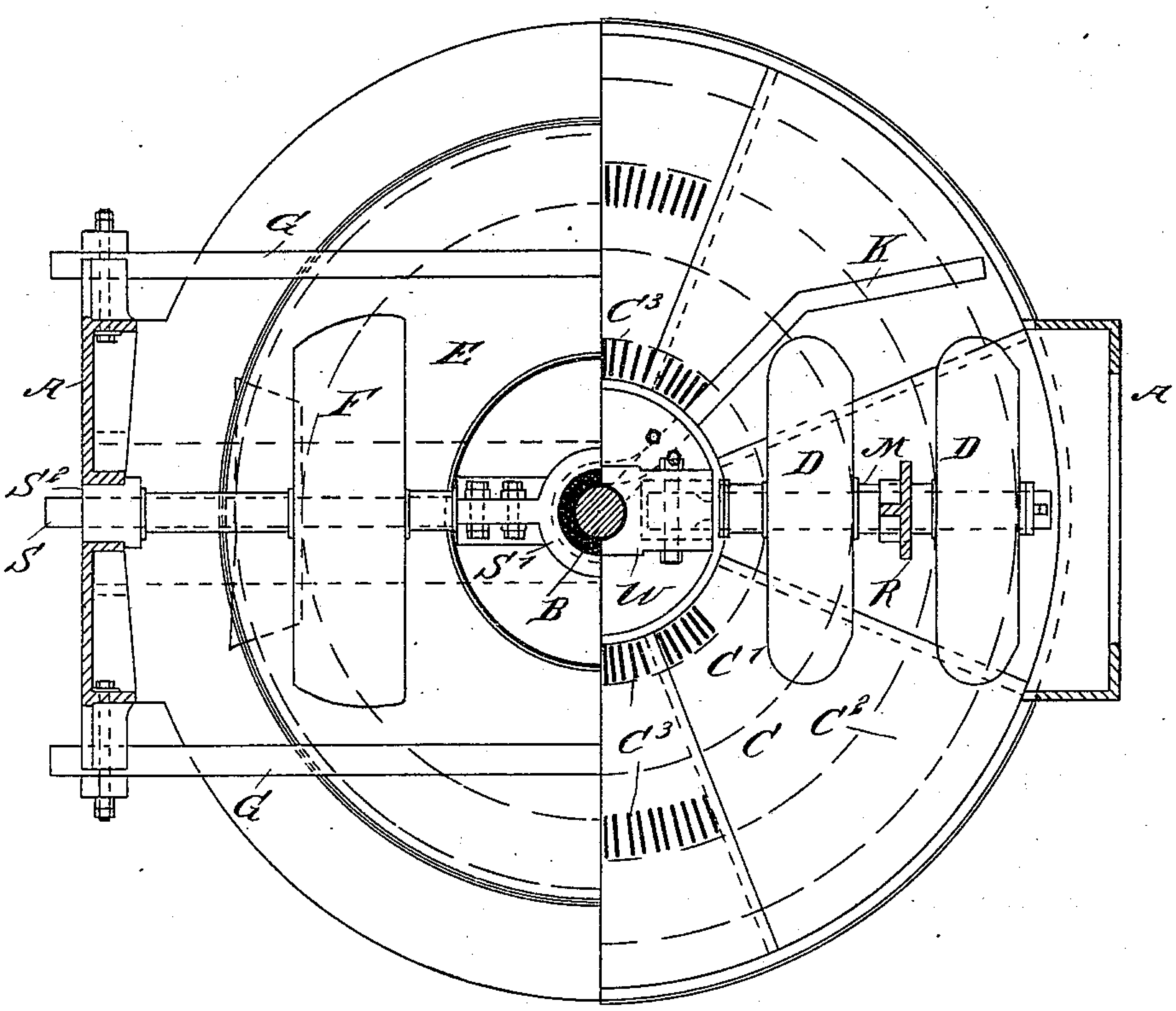


Fig. 6.

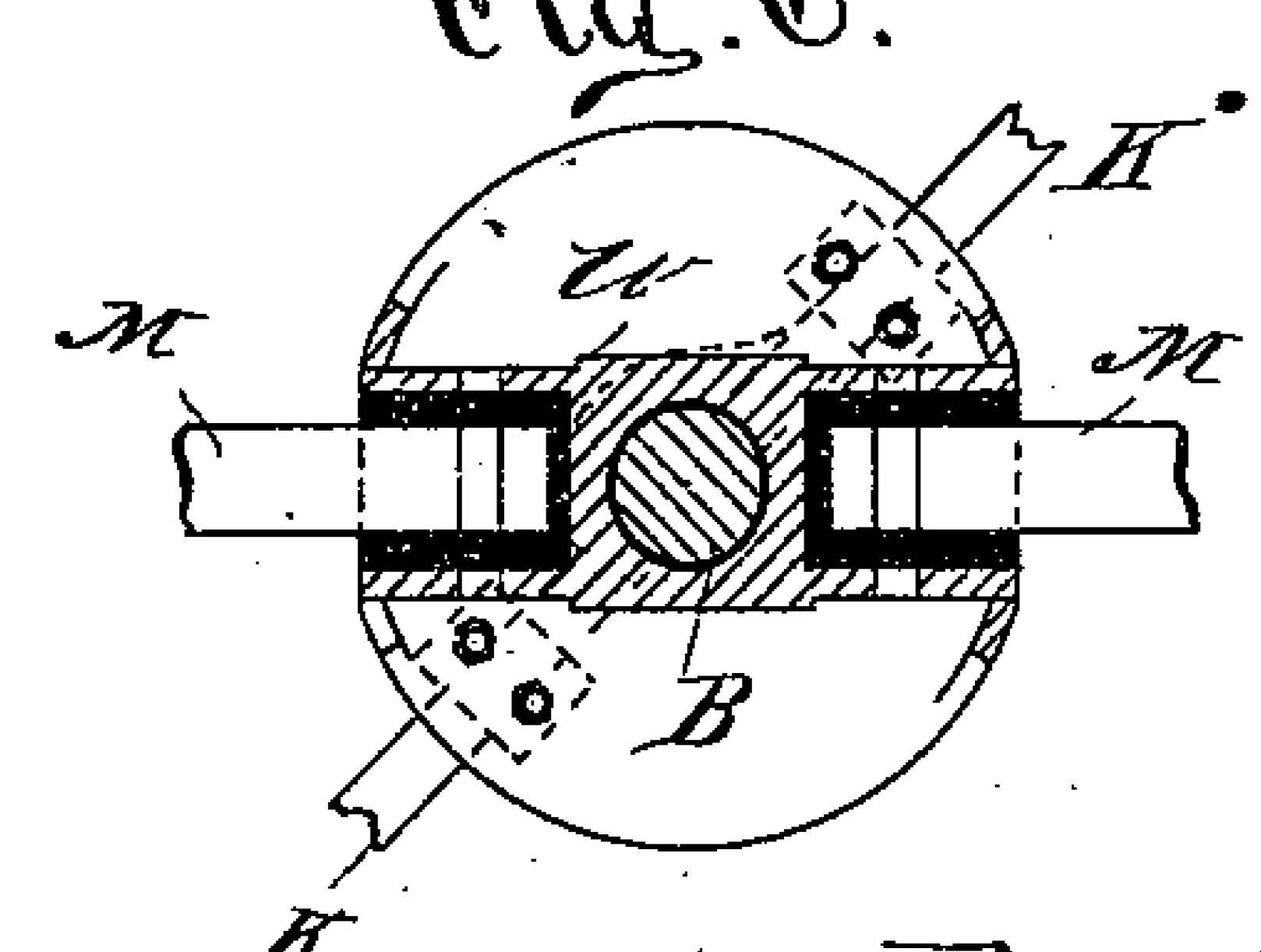
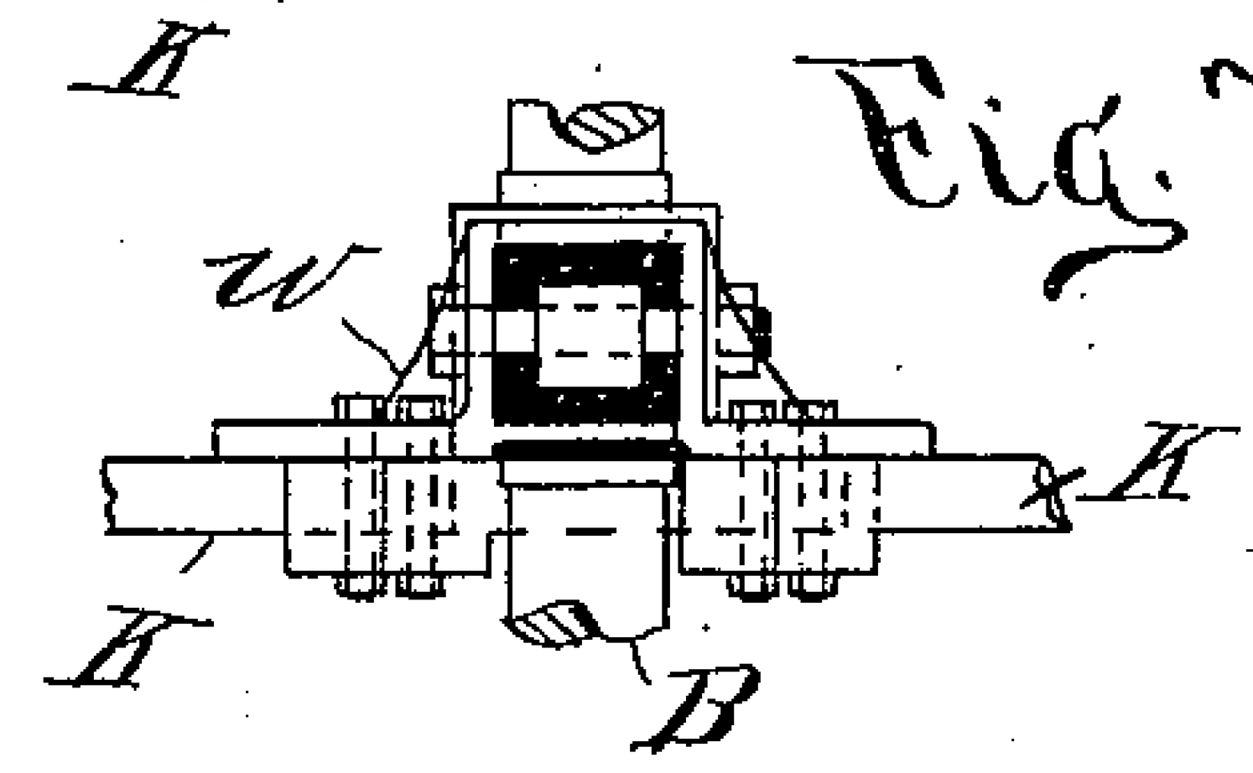


Fig. 7.



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UNITED STATES PATENT OFFICE.

RICHARD DURRANT LANGLEY, OF BRIGHTON, SOUTH AUSTRALIA.

ROTARY GRINDING AND PULVERIZING MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,072, dated October 15, 1895.

Application filed January 21, 1895. Serial No. 535,689. (No model.)

To all whom it may concern:

Be it known that I, RICHARD DURRANT LANGLEY, engineer and cement-manufacturer, a subject of the Queen of Great Britain, and a resident of Brighton Road, Brighton, in the Province of South Australia, have invented an Improved Rotary Grinding and Pulverizing Machine, of which the following is a specification.

This invention has reference to means for crushing and grinding or pulverizing ores or other materials in a wet or in a dry state, and the machine hereinafter described has been designed to economize power and secure the perfect reduction of material, as aforesaid.

The principle of my invention is the utiiization of the weight of an upper part of the machine for the purpose of securing greater attrition in the action of a lower set of rollers, and I have illustrated and described a machine by which this result may be conveniently and economically attained. This is effected by having an upper and a lower pan and accompanying rollers worked by a vertical shaft, the upper pan receiving the ore or material first and its rollers partly reducing it, whence the crushed ore is conveyed to the lower pan, where the lower rollers reduce it to the ultimate fineness required. The upper pan, which is supported by legs or brackets resting upon the axles of the lower rollers, encircles the main shaft of the machine and is free to slide up and down, but is provided with a key or feather, so that it is rotated with the shaft. The rollers of the upper pan are supported upon axles which have no radial motion, but are free to slide up and down in guides in the main frame. The lower rollers are moved round in the grooves of the lower pan, which is stationary, by axles attached to the central vertical shaft.

The machine is so constructed that the weight of the upper part is utilized, as hereinafter described, for the ultimate grinding of the material by the lower rollers, thereby reducing the weight required in the lower rollers themselves, and consequently the power and weight of metal required to secure the quick and fine reduction of material to ultimate fineness. The pressure upon the material in the lower pan is increased or lessened by (*a*) using the total weight of the upper rotary pan and all rollers; (*b*) using the weight of the upper rotary pan and the lower rollers; (*c*) using the weight of the lower rollers only.

In order that my invention may be clearly understood, I will now describe the machine by reference to the accompanying drawings, in which—

Figure 1 is a side view, half an outside view and half a vertical section. Fig. 2 is an end view, partly in section. Fig. 3 is a plan view, partly a section through upper roller, partly a view of under side of upper pan, partly a view of the bed plate, and partly a view of the lower pan. Fig. 4 is a section of the lower roller and of the lower pan and bed-plate. Fig. 5 is a plan, partly over upper pan and rollers and partly over lower pan and rollers. Figs. 6 and 7 are cross-section and side view, respectively, of the driving-boss of the lower rollers.

Within a suitable frame A is a central vertical shaft B, which has at the top a bevel-wheel B′, driven by suitable gearing, the bottom being supported in a footstep or bearing B^2. A lower pan C is fixed at the base of the machine and is stationary, being provided with two annular grooves C′ C^2, round which the rollers D D D D are carried by means of the axles M M. These are secured to a driving-boss W on the central shaft B by a hinge connection, which allows them to move a little vertically. The boss W encircles the shaft and is secured thereto and is provided with sockets, in which the ends of the axles are secured by horizontal pins. Above the lower rollers is an upper pan E, which encircles the central shaft B and is so fitted as to be free to slide up and down the shaft, but is provided with a feather or key, so that it is rotated with the shaft. This upper pan is supported upon two legs or brackets R R, which rest upon the axles M M of the lower rollers. The rollers F F of the upper pan are fitted upon axles S S, which do not have a radial motion, but are supported in bearings S′, S^2, and S^3. The bearing S′ encircles the central shaft B and is free to move up and down, while the bearings S^2 and S^3 move up and down in slots in the frame A.

The method of operation of my machine is as follows: The ore or material to be reduced is fed through a spout or hopper into the upper pan E, where it is rapidly crushed between the faces of the rollers F F and the face

of the pan. After being crushed suitable scrapers, which are fixed upon the stationary bars G, come into operation and scrape the broken material through openings E′ in the inner face of the pan, whence it falls upon the cone H, which deflects it, so that it falls between the lower rollers into the grooves C′ C^2, in which they work and is there ground to the requisite degree of fineness. After being ground the material is pushed through openings C^3 in the inner sides of the grooves C′ and C^2 by suitable scrapers fixed upon bars K, secured to the driving-boss W of the lower rollers and rotating with it. The material falls into a hopper or chute, and thence by an elevator it is carried to a centrifugal or other separator or sieves, where any portions not sufficiently ground are eliminated and returned to the pan for further reduction.

I prefer to work the machine as above described, but in dealing with certain kinds of material it may not be necessary to use all the weight upon the lower rollers.

For some material the weight of the lower rollers alone may be sufficient, in which case I support the upper pan with its rollers upon a collar or clamp N, (see Fig. 1,) secured to the central shaft B. This collar or clamp may be in two or more parts bolted together and held in position by set-screws or cotters, as preferred. When not thus used, the collar or clamp is secured lower down the shaft. For other material it may be preferred to use the weight of the upper pan without that of its rollers. This is accomplished by supporting the axles of the upper rollers from the top of the frame by means of the brackets or straps P (see Fig. 1) at a sufficient height to still allow them to operate in the upper pan. When greater pressure is required upon the lower rollers, the nuts P′ are slackened until all the weight or any desired portion is taken by the pan.

Thus by the use of my one machine the hardest material may be reduced to fine powder and work thereby accomplished which generally requires the use of two or more machines, and great economy is effected in the operation.

All the working parts are so designed as to be easily, quickly, and economically replaced, and the machines can be made of any size and weight required.

The whole of my grinding-machine is inclosed within a dust-proof casing, while all the driving-gear is above the same, so that the driving-gear is entirely free from dust and grit and the wear consequent thereon.

I do not confine myself to the precise number and shape of rollers or of the pans and grooves therein, nor to the means of adjusting the weight and bearing of the upper parts, nor to any particular means of rotating the vertical shaft, nor to other details of construction, which may be varied without departing from my invention; but,

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In crushing, grinding or pulverizing machinery, two pans provided with rollers, one pan and its rollers being beneath the other pan and one set of rollers and one pan being arranged to rotate independently of the other set of rollers and the other pan, the rollers of the lower pan being connected to rotate with the upper pan and adapted to bear the weight thereof, substantially as set forth.

2. In crushing, grinding or pulverizing machinery, two pans provided with rollers, one pan and its rollers being beneath the other pan and one set of rollers and one pan being arranged to rotate independently of the other set of rollers and the other pan, the rollers of the lower pan being connected to rotate with the upper pan and adapted to bear the weight thereof and also the weight of the upper rollers, and means for adjusting the upper rollers vertically, whereby they are caused to bear with more or less weight on the upper pan, substantially as set forth.

3. In crushing, grinding or pulverizing machinery, two pans having rollers, one pan being above the other and being provided with legs connected to the rollers of the lower pan, one set of rollers and one pan being rotative independently of the other set of rollers and the other pan substantially as set forth.

4. In crushing, grinding or pulverizing machinery, two pans having rollers, one pan being above the other, means for rotating the upper pan, and a connection between the rotary upper pan and rollers of the lower pan adapted to operate said rollers from the upper pan, substantially as set forth.

5. In crushing, grinding or pulverizing machinery, the combination of a rotatively mounted shaft, an upper pan and a lower pan, each provided with rollers, the upper pan being connected to the rollers of the lower pan and adapted to rotate with and be supported thereon, and means for vertically adjusting the position of the upper pan, substantially as set forth.

6. In crushing, grinding or pulverizing machinery, the combination of a frame, a rotatively mounted shaft therein, an upper pan movable with the shaft, a lower pan, rollers in the upper and lower pans, the rollers of the lower pan having their axles pivotally connected to the rotatively mounted shaft, and connected to and adapted to support the upper pan, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of November, 1894.

RICHARD DURRANT LANGLEY.

Witnesses:
CHARLES NICHOLAS COLLISON,
ARTHUR GORE COLLISON.