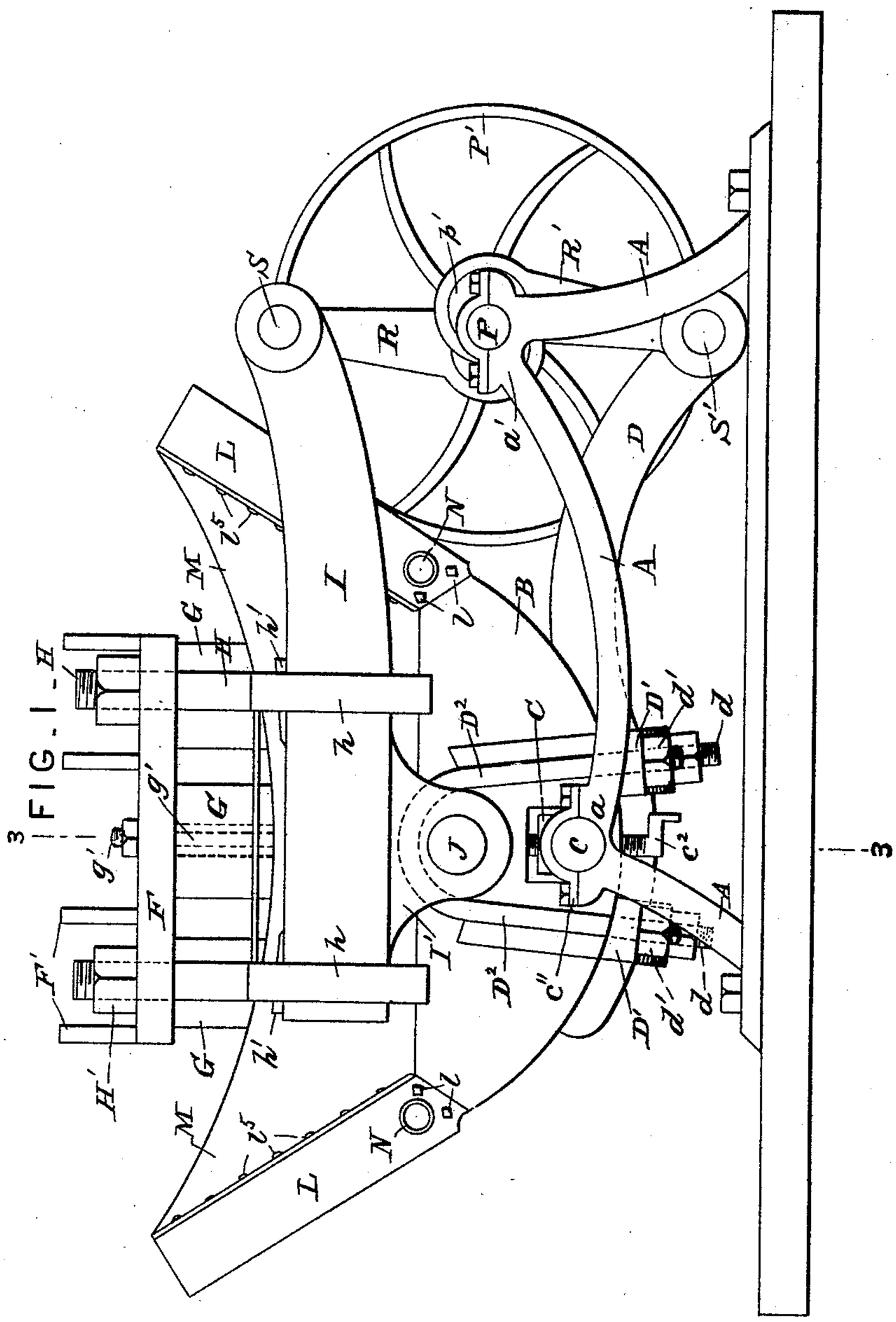
(No Model.)

4 Sheets—Sheet 1.

J. E. WESTLAKE.

ORE PULVERIZER.

No. 415,261. Patented Nov. 19, 1889.



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Inventor:
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(No Model.)

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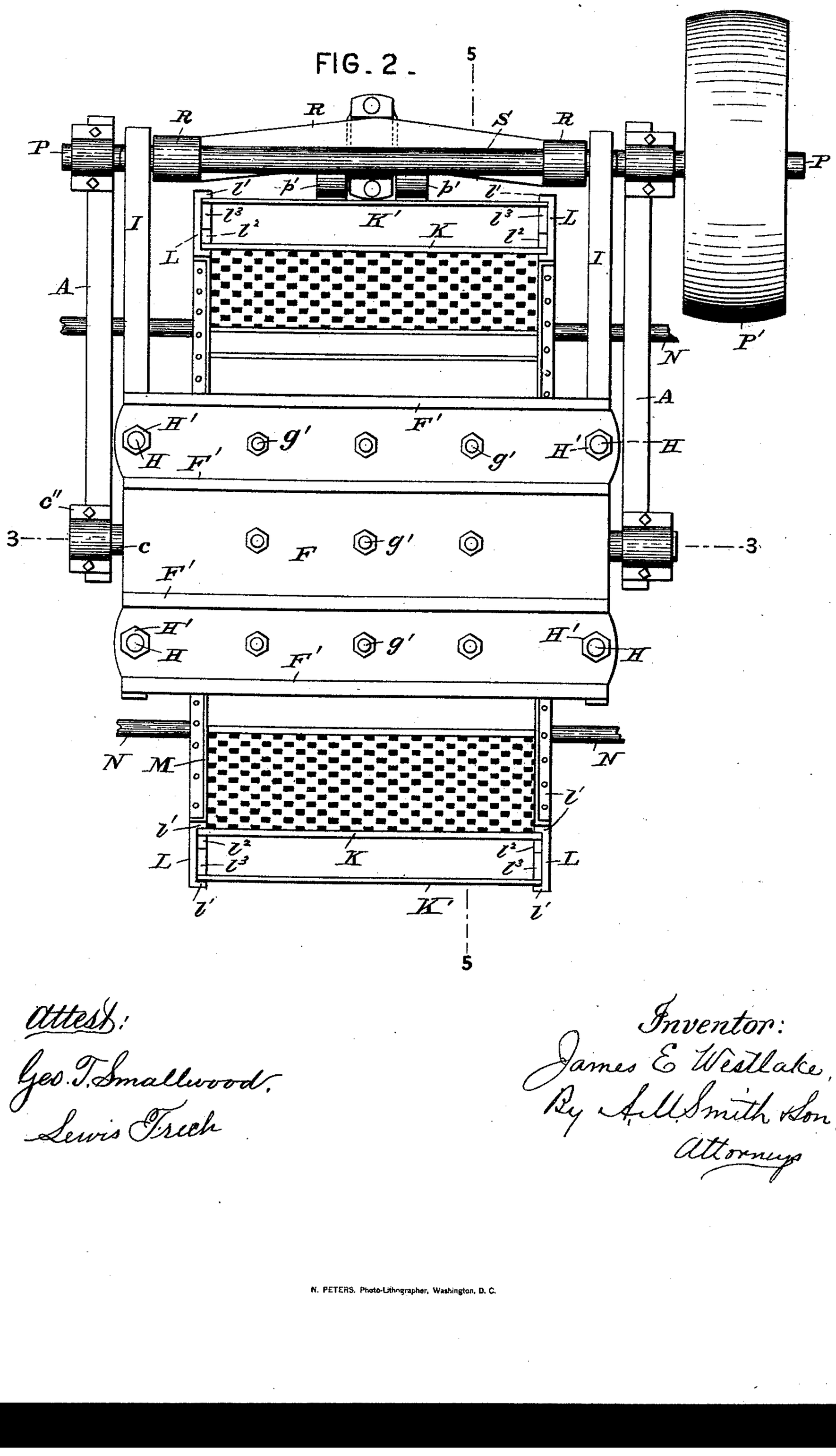
FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

J. E. WESTLAKE.

ORE PULVERIZER.

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FIG. 3.

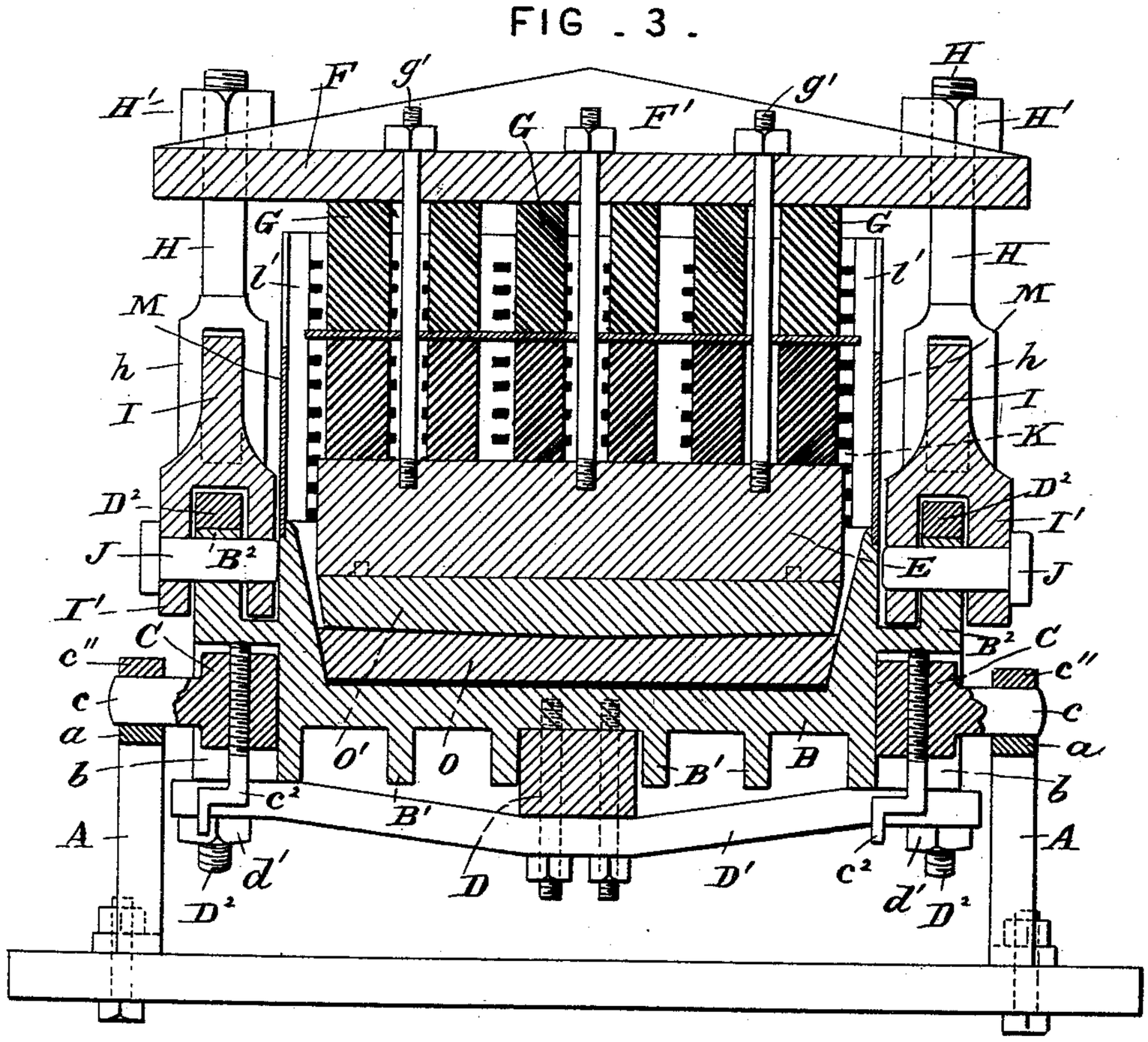
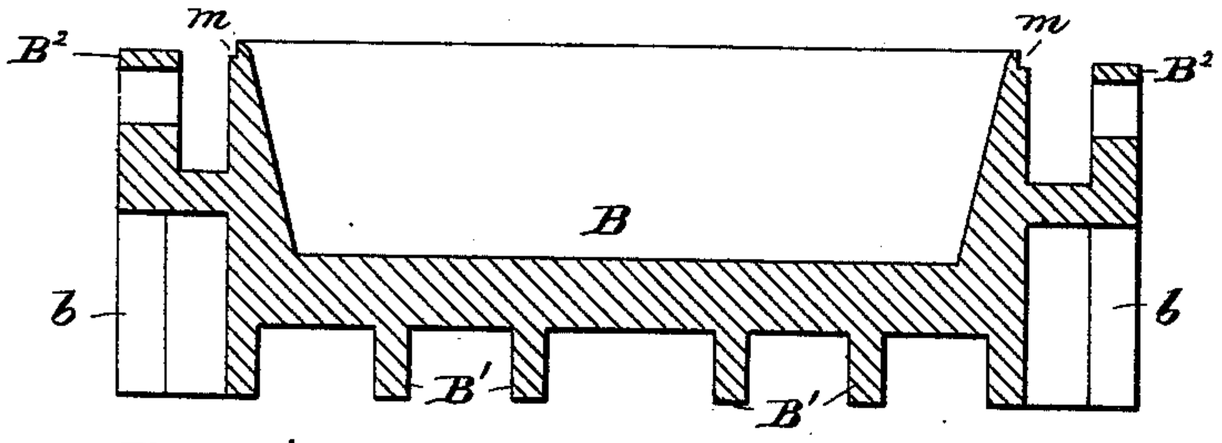
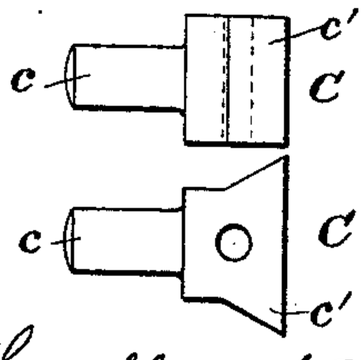
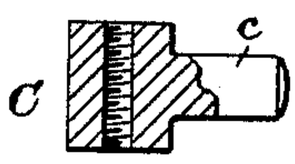


FIG. 4.







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(No Model.) 4 Sheets—Sheet 4.

J. E. WESTLAKE.

ORE PULVERIZER.

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FIG. 5.

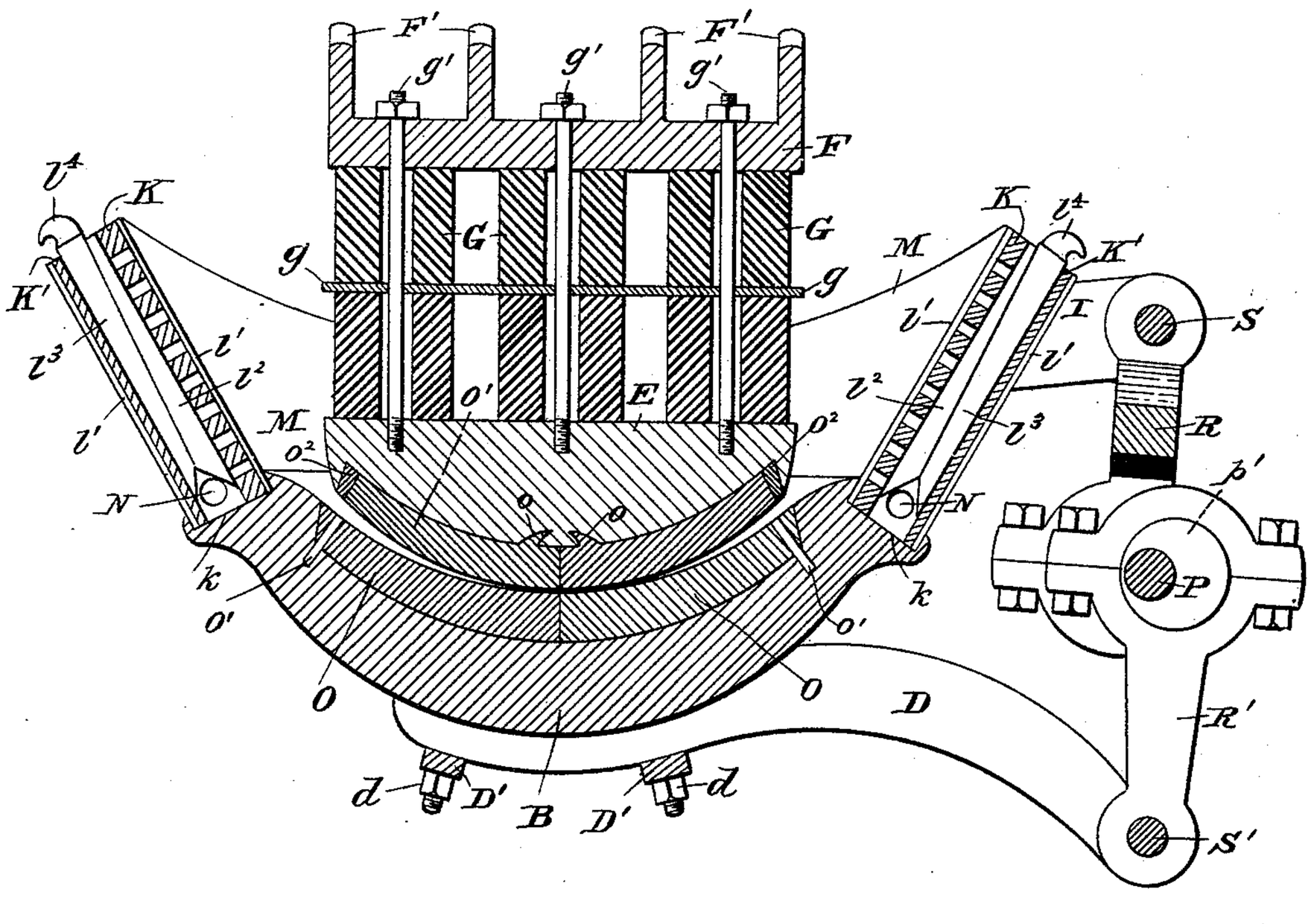
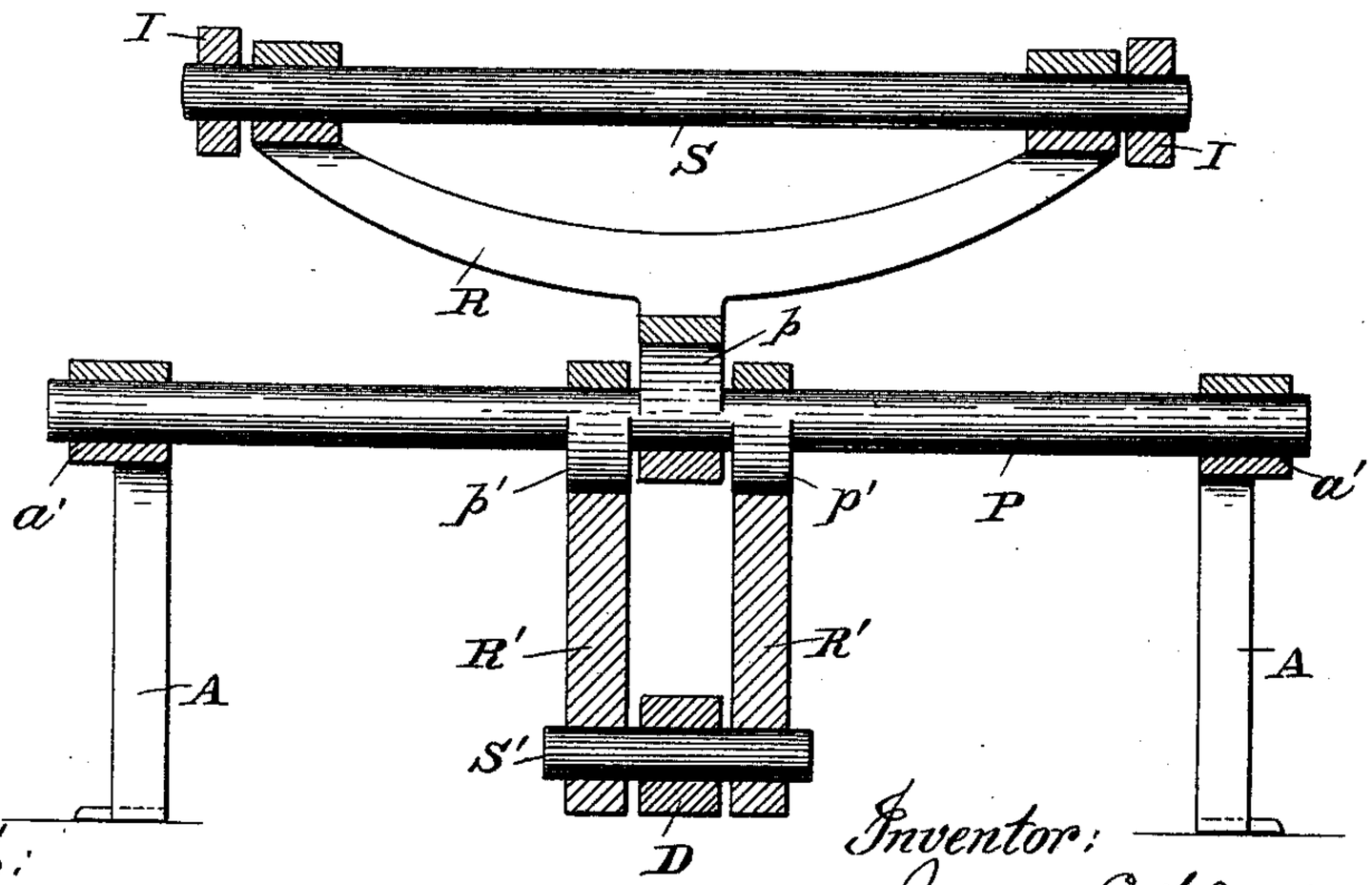


FIG. 6.



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UNITED STATES PATENT OFFICE.

JAMES E. WESTLAKE, OF ALBUQUERQUE, TERRITORY OF NEW MEXICO.

ORE-PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 415,261, dated November 19, 1889.

Application filed February 4, 1889. Serial No. 298,556. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. WESTLAKE, a citizen of the United States, and a resident of Albuquerque, county of Bernalillo and Territory of New Mexico, have invented a new and useful Improvement in Ore-Pulverizers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to an improvement in machines for pulverizing ore and bringing the same into the proper condition for effecting a separation of gold, silver, or other metal therefrom; and to the above purpose it consists in certain features of construction and arrangement, hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 represents a side elevation of my improved machine complete. Fig. 2 is a plan view of the same, showing the perforated end plates or screens, discharge-spouts, &c., and eccentrics and pulleys on the driving-shaft. Fig. 3 is a transverse vertical section on the line 3 3 of Figs. 1 and 2. Fig. 4 is a detail view of the mortar in section, showing, also, the trunnion-blocks in plan elevation and section. Fig. 5 is a longitudinal vertical section on the line 5 5, Fig. 2, illustrating the relative arrangement of the mortar and muller, the manner of securing the end screens and plates in position, and the arrangement of the springs on the muller. Fig. 6 shows the arrangement of the driving-shaft, its eccentrics, the levers for operating the muller and mortar, and the interposed links connecting said levers with the driving-shaft.

A A represent the base and frame of my machine, upon which the mortar, muller, driving-shaft, and connections are mounted. This frame is provided at suitable points *a* and *a'* with half-sleeves or journal-boxes—the former for the reception of the mortar-trunnions or stud-shafts upon which the mortar rocks and the latter for the main driving-shaft.

B indicates the mortar, made in substantially concavo-convex form, which is cast or forged, as preferred, and provided with stiffening-ribs B' on its under side and lugs or ears B^2, as shown in Figs. 3 and 4, for a purpose hereinafter set out. The mortar B is supported by means of blocks C, the form of which is best illustrated in the detail view, Fig. 4. These blocks are formed with trunnions or stud-shafts *c*, projecting laterally from them and journaled in the boxes *a a*, above described, being held therein by the cap-pieces *c''*. The blocks C are dovetailed in form, or have the inclined portions *c'*, and the mortar is provided with a slot or recess *b* on either side of a form corresponding to the shape of said blocks. Said blocks thus form guides upon which the mortar is adapted to slide and be adjusted by means of screws c^2, which pass through screw-threaded perforations in the guide-blocks C and bear at their upper ends beneath the mortar.

D represents the lever by which the mortar is rocked. Said lever extends beneath the mortar, to which it is secured by means of truss-rods D' D', extending transversely of the machine, and tap-bolts *d*, passing through both truss-rods and lever D and screwing into the mortar, as is shown in Fig. 3.

D^2 are pieces of strap-iron which pass up over the lugs B^2 of the mortar and at their lower ends pass through perforations in the trusses D', being secured thereto by nuts *d'*. By the construction described the mortar is thoroughly braced and made adjustable up or down, for a purpose that will appear.

E represents the muller or grinder shoe of my machine. It may be of cast or wrought iron, and is convex on its lower or working face.

F represents the beam or upper plate of the machine, which is located directly above the muller-plate, and is provided with strengthening-ribs F'.

G G represent a series of springs located between the upper plate F and lower plate E of the muller. Said springs may be of any well-known form, made from metal or other material; but I have found in practice that the best results can be obtained by employing heavy columns or cylinders of hard rubber, which I have accordingly represented in the drawings. A sufficient number of these are employed to give the required pressure for crushing and pulverizing the ore, and for securing evenness in the action of said springs I employ a plate *g*, which I interpose

between the vertical series of springs, as indicated in Figs. 3 and 5. The springs, as well as the plate *g*, are held in place by means of bolts *g'* passing through the same. On either side of the beam F bolts H extend downward, being secured at their upper ends to said beam by nuts H', as shown, and provided at their lower ends with eyes *h*, which embrace and receive lever-arms I, one on either side of the machine. The levers I are secured within these eyes by means of wedges *h'*, as indicated in Fig. 1. The relative distance between the working-faces of the muller and mortar and the amount of pressure of the muller may be adjusted by turning the nuts H' or changing the wedges *h'*. The levers I are each provided with downwardly-projecting twin lugs or ears I', which embrace the lug B^2 on the mortar, and also the straps D^2. Said lugs or ears I', and also the lug B^2, are perforated to receive a pin J, for uniting the parts. The levers I being rigidly connected with the muller, a pivotal connection is thus established between the mortar and muller, the pin J being the pivot.

K K represent two perforated end plates or screens, and K' K' two aprons located outside of the screens. The lower edges of said plates rest in grooves or recesses *k* in the ends of the rocking mortar B.

L L indicate plates made from double angle-iron, and secured to the mortar by bolts or screws *l*, the flanges *l'* of said angle-irons extending inward, one inside of the screen K and the other outside of the apron K', and the screens K and aprons K' being held in place between the flanges *l' l'* by means of suitable wedges l^2 l^3, inserted between the screens and aprons, as best shown in Fig. 5. These wedges when driven in tightly serve to bind the screens K and aprons K' against the flanges of the angle-iron. One of said wedges l^3 is provided with a hook l^4, for facilitating the removal of the same.

M M are two side plates, the lower edges of which are secured in rabbets *m m* in the mortar and the ends secured to the angle-irons L by screws or rivets l^5, as shown, whereby additional strength is given to the support of the screens and aprons.

N N indicate discharge pipes or spouts projecting outwardly from the angle-irons L. Said spouts may be of any desired length and their entrance to the space between the screens K and aprons K' is located slightly above the bottom of said space, whereby a settling-trough is formed for the reception of the heavy particles of ore which work their way through the screens. The ore mixed with water or quicksilver, or both, passes out through the discharge-spouts N, by which it is conducted to suitable amalgamating plates or pans, for a purpose well understood. Amalgam or quicksilver may be introduced in the mortar proper, and also in the settling-trough described, if desired.

In order to prevent too rapid wear upon the working-faces of the mortar and muller where very hard ore is operated upon, I employ face-plates O and O', of adamantine steel or other hard material, which are secured, the lower ones O O to the mortar and the upper ones O' O' to the muller. Said plates may, if preferred, be let into recesses in the muller and mortar and are secured in place and held from displacement by means of suitable spurs *o*, entering recesses in the muller or mortar, and keys or wedges *o' o²*, as shown, or other equivalent fastening devices. These plates O and O' are also preferably tapered toward their centers, as illustrated at o^3 in Fig. 3, in order to cause the ore to feed toward the center of the mortar-chamber for the better operation of the machine.

P represents the driving-shaft of the machine, and P' the driving-pulley thereon. Said shaft is provided with eccentrics *p* and *p'*, for imparting motion to suitable links R and R'. The link R is of bifurcated form, as best shown in Fig. 6. Its lower end embraces the eccentric *p* on the driving-shaft, and its upper bifurcated end is connected with the lever-arms I of the muller by means of a through shaft or rod S. The links R', of which there are two by preference, at their upper ends embrace the eccentrics *p'* on the driving-shaft and at their lower ends connect with the lever D of the mortar by a through bolt or pin S' or equivalent. The eccentrics are by preference arranged in such relation to the shaft P that when said shaft is rotated the muller and mortar, through the medium of the links R and R', will be caused to rock simultaneously in opposite directions.

In lieu of the eccentrics on the shaft, said shaft may be provided with cranks; or other equivalent mechanism may be employed for imparting the desired movements to the muller and mortar.

By the arrangement described, whereby the muller and mortar are caused to rock upon different centers, a grinding or rubbing and sliding movement of the muller within the mortar is produced, which is found very effective in reducing the ore to a finely-comminuted state, and this sliding or rubbing movement may be increased or diminished by the adjustment of the centers of motion of the muller and mortar, as described.

Having now described my invention, I claim as new—

1. In a machine for pulverizing ore, the combination, with the frame, of the concave mortar pivoted in said frame, a convex muller having an independent pivotal connection with said mortar, and means for rocking said muller and mortar simultaneously in opposite directions, for the purpose and substantially as described.

2. In a machine for pulverizing ore, the combination, with the frame, of a convex mortar pivoted therein and having a vibratory or rocking motion, a rocking muller piv-

oted to said mortar and the superposed power-springs, and bolts connecting said muller and mortar, arranged substantially as specified.

3. In a machine for pulverizing ore, a pivotally-supported mortar provided with a lever-arm, and a convex muller working therein and having a lever-arm and superposed springs, in combination with a common shaft, two eccentrics or crank-arms thereon, as described, and the links interposed between said shaft and the mortar and muller for imparting motion thereto, for the purpose described.

4. In a machine for pulverizing ore, the concave mortar having a stationary pivot and provided with a lever rigidly secured thereto, and a convex muller having a traveling pivot, and also having a lever rigidly secured to it, in combination with a common shaft having eccentrics and the interposed link-connections for operating said mortar and muller.

5. The combination, in a machine for pulverizing ore, of the frame, the mortar pivoted therein, and the muller rocking within said mortar, and having a fixed pivotal connection therewith located above and independent of the pivot of the mortar, substantially as and for the purpose described.

6. In a machine for pulverizing ore, the combination, with the frame, of a mortar pivoted therein, a muller pivoted thereto on an independent center, and the guide-blocks and screws for changing or adjusting the pivotal center and height of both muller and mortar, as and for the purpose described.

7. The pivoted mortar, the convex muller rocking in said mortar, and the beam F, secured to said muller, in combination with lever-arms secured rigidly to the muller and pivotally connected with the mortar, and the superposed springs located above the muller and beneath the beam F, for pressing the muller down upon the mortar, and means for simultaneously rocking said mortar and muller in opposite directions, substantially as described.

8. The combination of the pivoted mortar, the convex muller pivoted on a different center therefrom, lever-arms rigidly secured to said muller, and the superposed springs for uniting and pressing said muller and mortar together, and means, substantially as described, for simultaneously rocking said muller and mortar in different directions.

9. The combination, with the mortar, of the fixed trunnion-blocks upon which said mortar moves, and means, substantially as described, for adjusting said mortar relatively to said trunnion-blocks, for the purpose specified.

10. The combination, with the mortar, of trunnions C and means, substantially as described, for adjusting the mortar relatively to said trunnions.

11. The combination, with the muller, the beam adjustably connected therewith, and springs interposed between said beam and the muller, as described, of the eyebolts H, lever I, mortar B, having a pivotal connection with the muller, and means, substantially as described, for imparting motion to said muller and mortar.

12. The pivoted mortar provided with a lever for actuating it, in combination with the muller provided with twin levers I I, the bifurcated link R, and links R′, and the driving-shaft having the eccentrics or cranks for rocking the mortar and muller simultaneously in opposite directions, as specified.

In testimony whereof I have hereunto set my hand this 26th day of January, A. D. 1889.

JAMES E. WESTLAKE.

Witnesses:
CHARLES H. KEYES,
ROBERT J. CARTMELL.