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D. C. EBAUGH.

ROCK PULVERIZER.

No. 312,343. Patented Feb. 17, 1885.

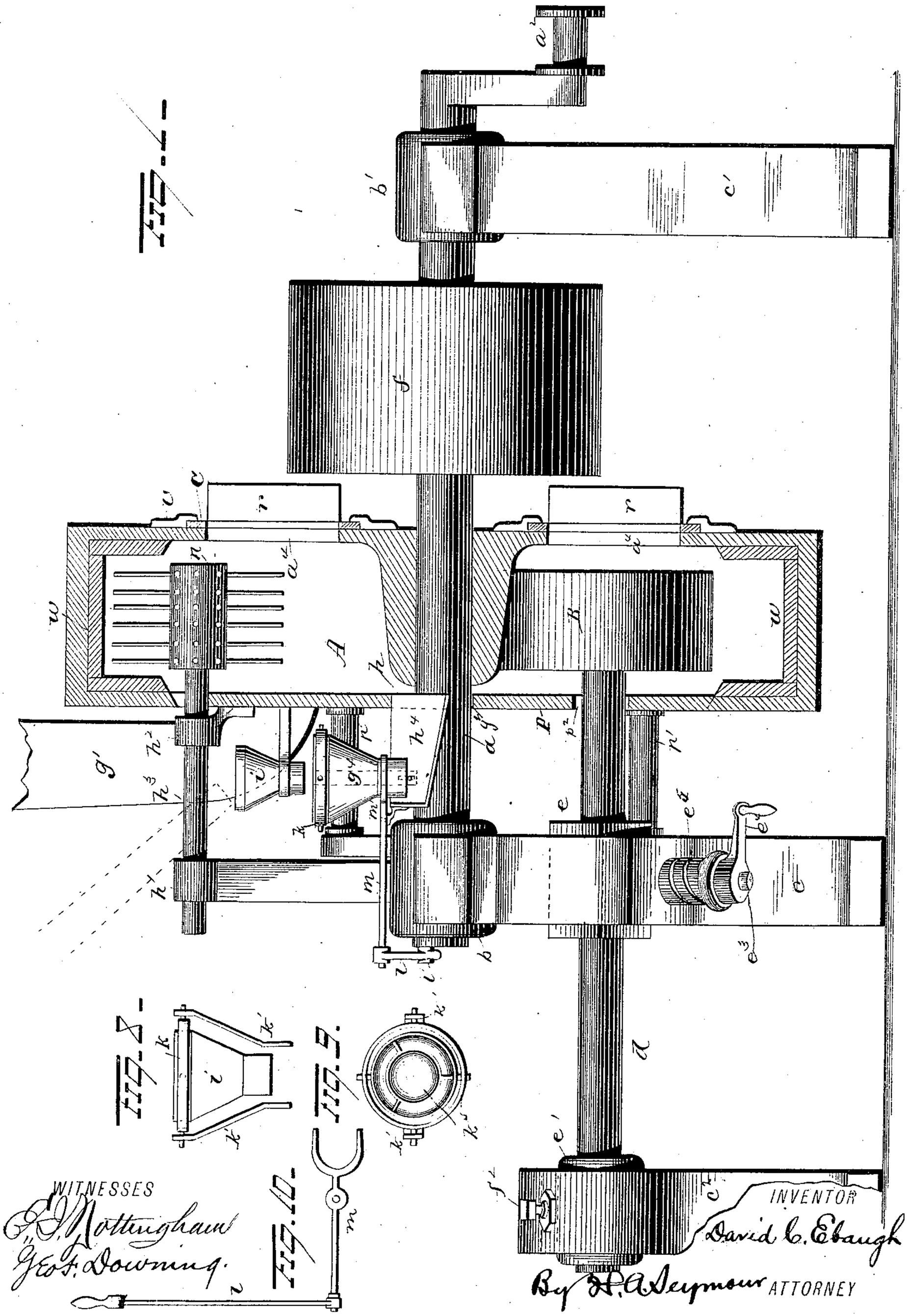

Fig. 8.

Fig. 9.

Fig. 10.

WITNESSES

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ROCK PULVERIZER.

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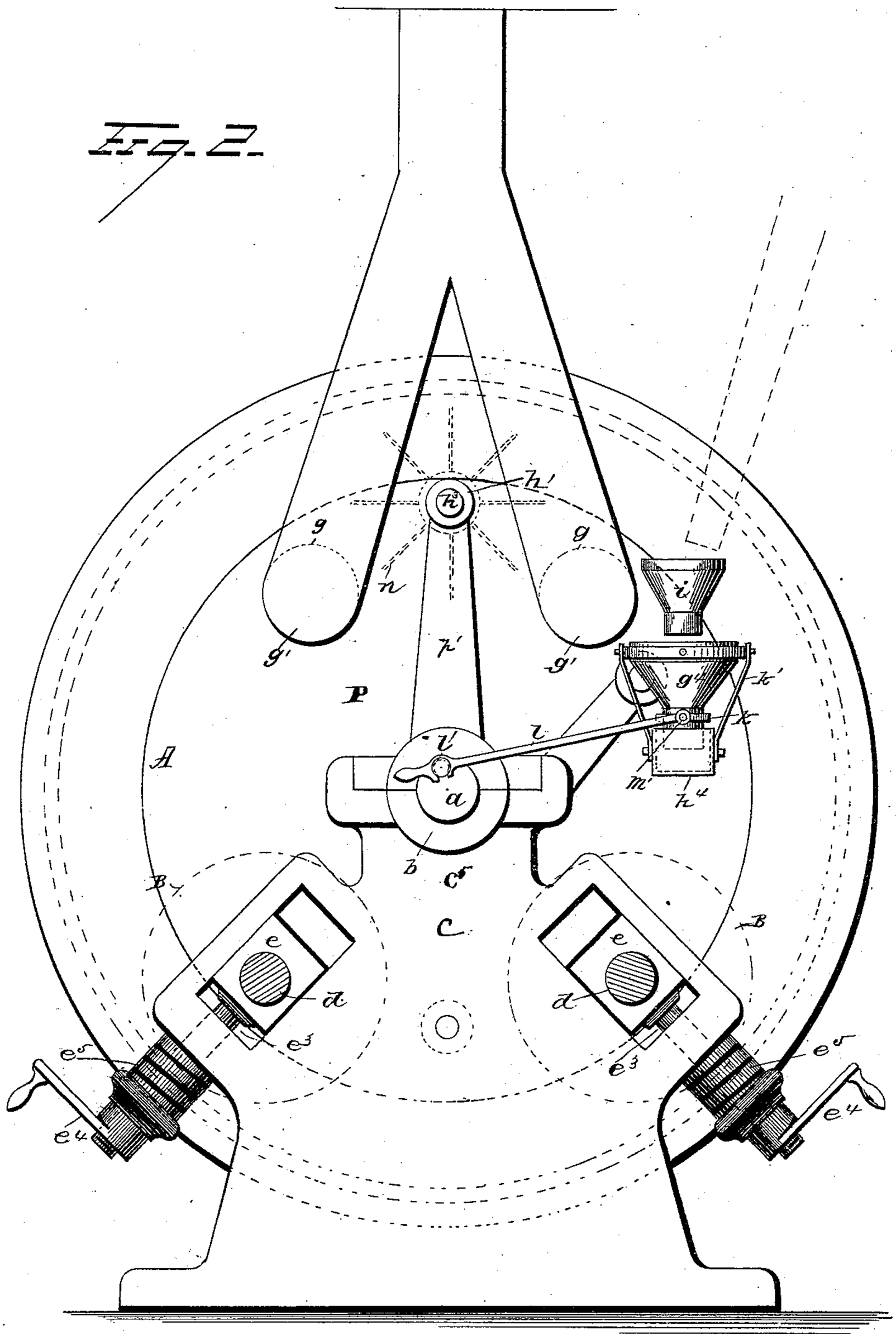
Fig. 2.



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6 Sheets—Sheet 3.

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ROCK PULVERIZER.

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FIG. 5.

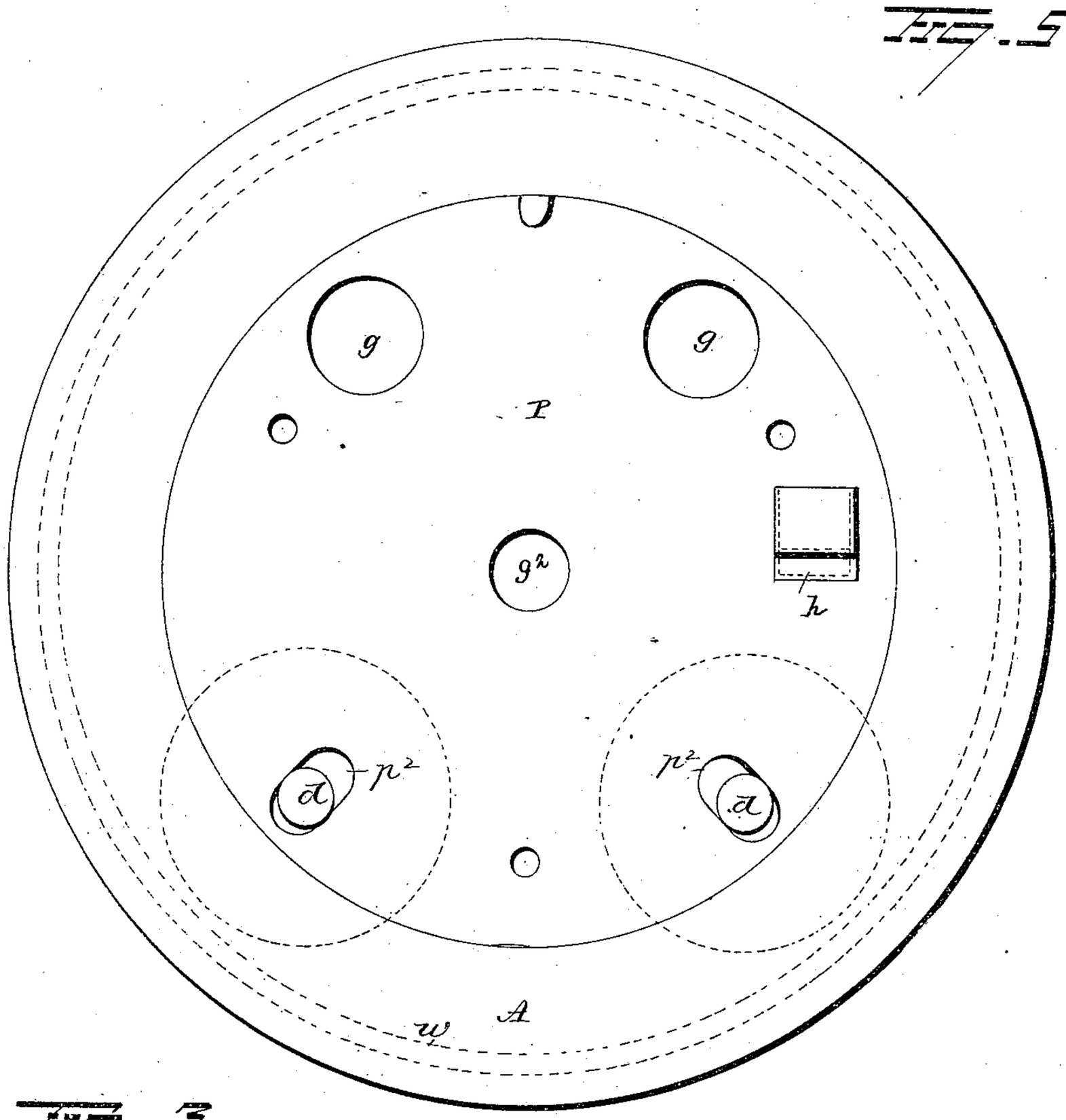
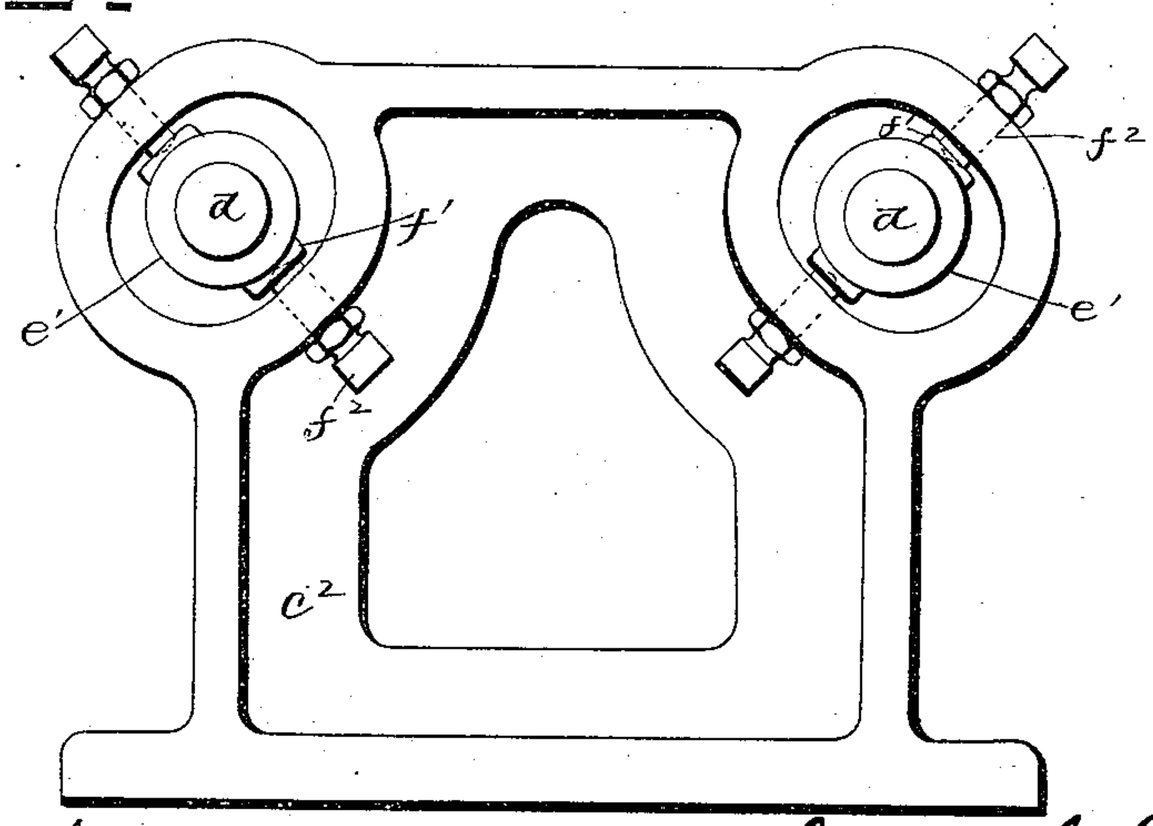


FIG. 3.



WITNESSES

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(No Model.) 6 Sheets—Sheet 4.

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ROCK PULVERIZER.

No. 312,343. Patented Feb. 17, 1885.

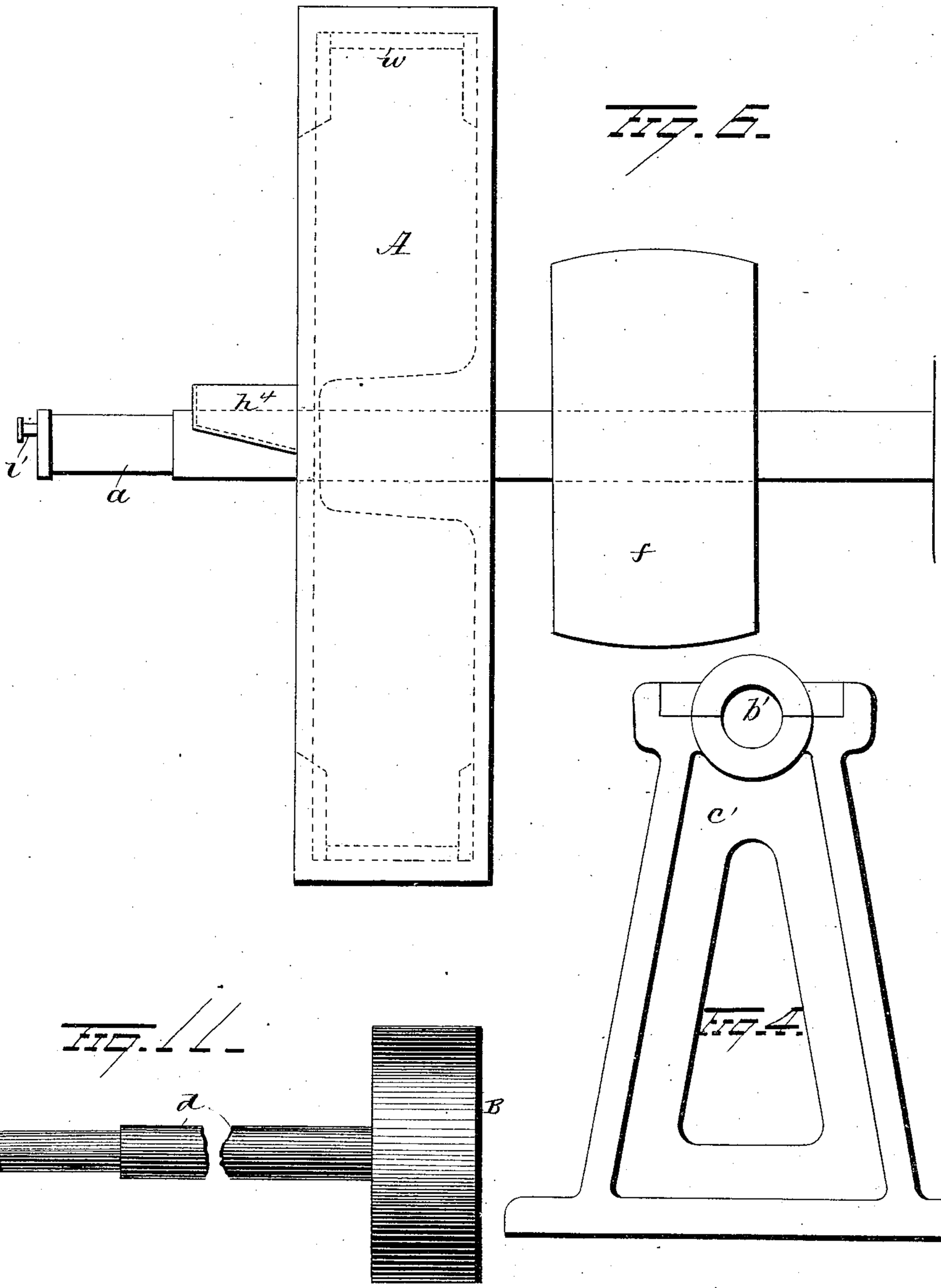

Fig. 6.

Fig. 4.

Fig. 1.

WITNESSES

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(No Model.)

6 Sheets—Sheet 5.

D. C. EBAUGH.

ROCK PULVERIZER.

No. 312,343. Patented Feb. 17, 1885.

FIG. 1.

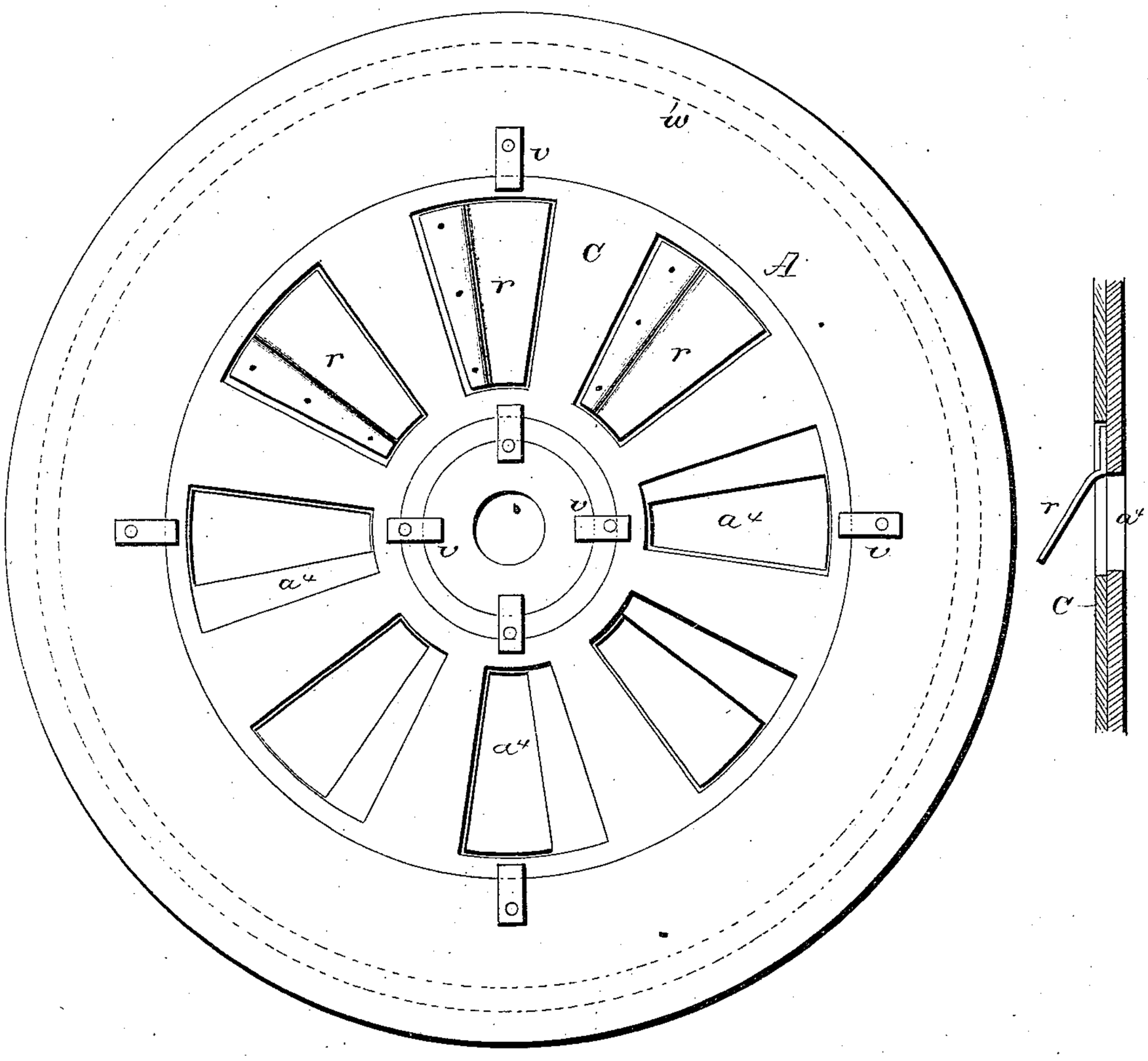

FIG. 2.

WITNESSES

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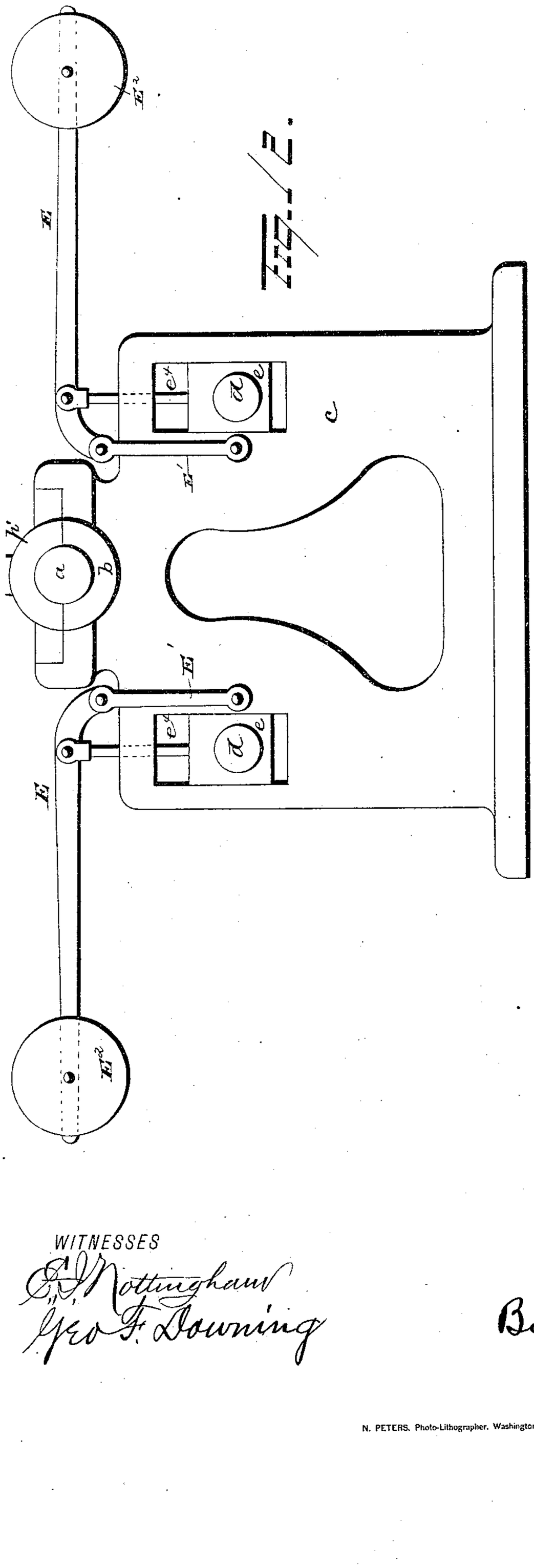
(No Model.)

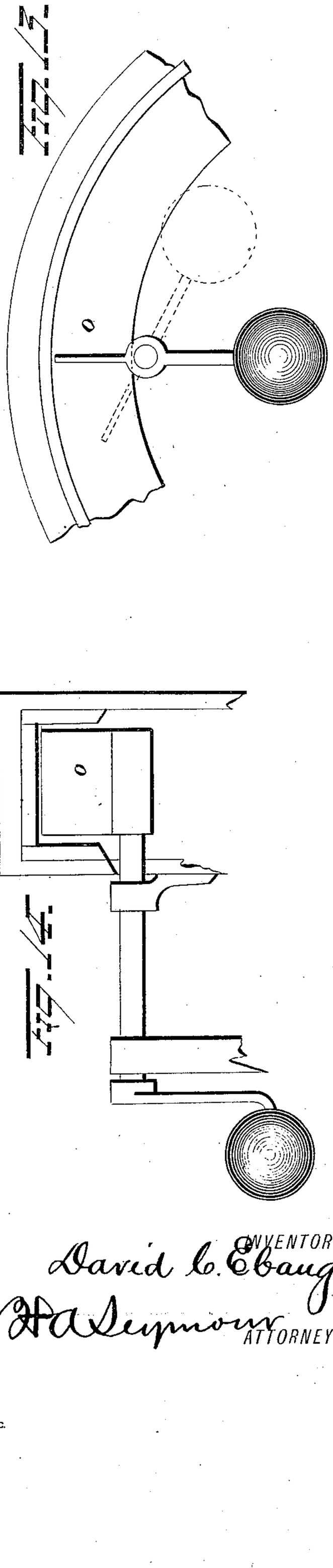
6 Sheets—Sheet 6.

D. C. EBAUGH.

ROCK PULVERIZER.

No. 312,343. Patented Feb. 17, 1885.





WITNESSES

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Geo. F. Downing

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UNITED STATES PATENT OFFICE.

DAVID C. EBAUGH, OF CHARLESTON, SOUTH CAROLINA.

ROCK-PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 312,343, dated February 17, 1885.

Application filed August 4, 1884. (No model.)

To all whom it may concern:

Be it known that I, DAVID C. EBAUGH, of Charleston, in the county of Charleston and State of South Carolina, have invented certain new and useful Improvements in Rock-Pulverizers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in rock-pulverizers.

A great number of machines have been devised for pulverizing rock, but all have defects, such as wear of the bearings when the latter are exposed to the action of the rock, or a small output or capacity in proportion to the power required, or both of these objectionable features combined.

The object of my invention is to remedy these defects by providing a rock-pulverizer adapted to economically and rapidly reduce the material to any degree of fineness; and with these ends in view my invention consists in the parts and combinations of parts, as will be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the machine, partly in section. Fig. 2 is an end elevation of same. Fig. 3 is an end elevation of the self-adjusting roller-boxes. Fig. 4 is an end elevation of one of the main-shaft bearings, the corresponding bearing being shown in end elevation at C^5, Fig. 2. Fig. 5 is an end elevation of the cylinder, showing the fixed head, hopper, roller-shaft openings, and openings for delivery-pipe. Fig. 6 is a side elevation of the cylinder with its shaft and pulley. Fig. 7 is an end elevation and section of cylinder opposite to that shown in Fig. 5. Figs. 8, 9, and 10 are the hopper, hopper-frame, and shaking lever and rod. Fig. 11 shows one of the rollers and its shaft. Fig. 12 is the main bearing, with roller-boxes set to work vertically and weighted by levers and weights, instead of springs, as shown in Figs. 1 and 2. Figs. 13 and 14 is the scraper, with weight to be used instead of the brush, as shown in Figs. 1 and 2, if desired.

A represents a revolving case or cylinder of any desired size, mounted on shaft *a*, journaled in boxes *b b'*, secured to the upper ends of the standards or supports *c c'*, located on opposite sides and some distance from said cylinder. The shaft *a* is provided at one end with a crank, a^2, by which it is connected directly to an engine and with a pulley, *f*, which latter can be connected by means of a countershaft to a suitable fan or other device. If desired, the crank a^2 can be dipensed with and the cylinder driven by a belt passing around pulley *f*. The cylinder A is provided with an open side, into which the stationary disk P is placed, and on its opposite side with a series of smaller openings, a^4, through which air is admitted into the cylinder.

C is a circular ring provided with openings registering with the openings a^4 of the cylinder, and secured to said cylinder by the guides *v*. This ring C is also provided with a series of outwardly-projecting wings, *r*, adapted to direct and force the air into the cylinder. Thus it will be seen that by turning the ring or damper C the size of the air-openings a^4 can be increased or diminished, and consequently supply more or less air, as necessity demands. The perimeter of the cylinder and the inner faces of the sides for a distance from said perimeter are lined with the hardened metallic plates *w*, on which the rollers B rest and move. These rollers B are rigidly secured to shafts *d*, which latter are journaled in boxes *e* and *e'*, located to one side of the cylinder A. The boxes *e* are supported in guides, either inclined or vertical, formed in the standard *c*, and secured to the screw-threaded rods e^3, projected outwardly from said standard, as shown in Fig. 2, or to the rods e^4. (Shown in Fig. 12.)

In the construction shown in Fig. 2 the outer ends of the rods e^3 are screw-threaded and provided with the nuts or cranks e^4, between which and the standard *c* the heavy spiral springs e^5 are introduced. Thus it will be seen that by turning the nuts or cranks in one direction the roller or rollers, as the case may be, will be held down in close contact with the hardened plates *w*, and by turning the nuts or cranks in the opposite direction the roller or rollers will be permitted to rise freely and accommodate themselves to inequalities in the thickness of the stock being treated. By this arrangement the degree of fineness of the

material being pulverized can be regulated without stopping the machine. The outer ends of the shafts *d* rest in the bearings *e'*, which latter are provided with the seats *f'*, in which the supporting-screws f^2, journaled in the standards c^2, rest. Those screws are inclined to correspond with the movement of the bearings *e*, and hence as the bearings *e'* are only supported at two points, they permit the shafts *d* to rise and fall without binding or straining any of the parts. The shafts *d* can be driven by any suitable gearing; but I prefer to dispense with such gearing and rotate the rollers B by their contact with the cylinder A.

In Fig. 12 the rods e^4 are pivotally connected at their outer ends to the horizontal levers E, the inner ends of which are pivotally connected to the upper ends of the links E'. Weights E^2 are adjustably secured to the levers E, and by moving the weights out and in the pressure on the boxes *e* can be increased and diminished as necessity demands. When the levers and weights are employed, the screws f^2 would be placed in horizontal positions on opposite sides of the shafts.

P is a disk or plate rigidly secured to the arms *p'*, projecting outwardly from the standard *c*. This plate closely fits within the opening in the cylinder, and is provided with oblong openings p^2 for the passage of the shafts *d*, with the openings *g* for the lower ends of the bifurcated exhaust-pipe *g'*, the feed-opening *h* opening for shaft h^3, and with the central opening, g^2, for the passage of the shaft *a*. The standard *c* is provided at its extreme upper end with a bearing, *h'*, in which, together with the bearing h^2 of the plate P, is journaled the shaft h^3, carrying the wire brush *n*. This brush runs in contact with the hardened metallic plates of the cylinder, and removes the rock or ore adhering thereto. Instead of employing the brush, the weighted scraper *o* (shown in Figs. 13 and 14) can be employed and answers the same purpose. The plate P is provided near one side with the delivery-opening *h*, through which the stock is fed to the machine through the spout or gutter h^4. Above the spout h^4 is located the movable hopper g^4. This hopper is pivotally secured to the ring *k*, which latter is pivotally secured at points between the pivots of the hopper to the upwardly-extending arms *k'*. The arms *k'* are adjustably secured at their lower ends to the spout h^4, to enable the hopper g^4 to be elevated and lowered for a purpose to be hereinafter described.

The hopper g^4 is provided at its upper open end with a saucer-shaped receptacle, k^5, considerably smaller than the upper end of said hopper, onto which the stock falls as it leaves the stationary hopper *i*. The lower end of the stationary hopper *i* rests in close proximity to the saucer-shaped receiver k^5, and hence it will be seen that by elevating the hopper g^4 the supply of material to the cylinder A can be partly or wholly cut off, as desired. The lower end of the hopper g^4 is connected to one end of the lever *m*, pivoted at *m'*, while the opposite end of said lever is connected to one end of the pitman *l*, the opposite end of which is removably secured to a wrist-pin, *l'*, secured eccentrically to the shaft *a*. Thus it will be seen that when the machine is in motion the hopper g^4 can be rocked or oscillated, which movement will prevent the material from clogging in said hopper. The exhaust-pipe is connected to a fan, by means of which the air is exhausted from the cylinder.

This machine is adapted more particularly for pulverizing phosphate rock; but by slightly changing its structure without departing from the principle, the machine can be employed for pulverizing ores, &c.

The rock to be pulverized is introduced into the cylinder through the opening *h* and falls behind the roller or rollers. The rotation of the cylinder carries it under the roller and pulverizes and presses it into a mass, which sometimes adheres to the metallic plates. As the cylinder revolves the pulverized material is thrown up by centrifugal force, and, coming between the draft-openings in the case and the inner ends of the exhaust-pipe, is drawn out through the latter. The material adhering to the perimeter of the cylinder is knocked off by the brush or scraper, and, falling, is taken up by the current of air and discharged. The heavier particles not completely pulverized fall to the bottom and are again acted on by the rollers, and so on continuously.

In this machine all the bearings are located outside of the cylinder, and hence are only exposed to wear common to all machinery, while in other machines employed for the same purpose the bearings are exposed to the flying particles of rock and grit and soon become worn and useless.

This device is exceedingly simple in construction, is durable in use, and can be manufactured at a comparatively small cost.

It is evident that slight changes may be made in the form and arrangements of the several parts described without departing from the spirit and scope of my invention; hence I do not wish to limit myself strictly to the description herein set forth; but,

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

1. The combination, with a rotary cylinder having an open face, and dampers located opposite said open face, of a stationary plate closing the opening in said cylinder, exhaust-pipes connected with the interior of the cylinder, and crushing-rollers.

2. The combination, with a cylinder mounted on a shaft, and crushing-rollers located in said cylinder, of a clearing device for removing the adhering particles of rock from the perimeter of the cylinder and supported in bearings located outside of the cylinder, substantially as set forth.

3. The combination, with a cylinder open at one face or side and provided with a series of air-supply openings, stationary supports outside of the cylinder, and a plate for closing said open face rigidly secured to said supports, and provided with an oblong opening, of exhaust-pipes secured to the stationary plate and communicating with the cylinder, a shaft passing through said oblong opening in the stationary plate, and a crushing-roll secured to the shaft inside of the cylinder, substantially as set forth.

4. The combination, with a cylinder having a large opening in one face thereof, a stationary plate closing said opening and a series of small air-supply openings in its opposite face, of an exhaust-pipe passing through the stationary plate, crushing-rollers located within the cylinder, and a scraper located above the crushing-rolls, substantially as set forth.

5. The combination, with a rotating cylinder having an open face, and a stationary plate for closing the opening in said cylinder, of standards located to one side of the cylinder, shafts journaled in bearings in said standards and passing through the stationary plate, and crushing-rollers secured to said shafts.

6. The combination, with a rotating cylinder having an open face, a stationary plate for closing the opening in said face, and crushing-rolls, of a stationary hopper, a movable hopper, and a spout leading from the movable hopper to the interior of the cylinder.

7. The combination, with a cylinder mounted on a shaft and having an open face, and hardened metallic plates lining the perimeter and a portion of the side faces of said cylinder, of a stationary plate closing the opening in said face, and crushing-rolls located within the cylinder, and journaled in bearings outside of said cylinder, substantially as set forth.

8. The combination, with the cylinder and the stationary plate forming one face of the cylinder, of the standards located to one side of the cylinder, the adjustable bearings *e* and *e'*, the rods connected to said bearings, screw-threaded nuts secured on said rods, springs for forcing the bearings *e* downwardly, the shafts *d*, and the crushing-rolls, all of the above parts operating substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DAVID C. EBAUGH.

Witnesses:
S. G. NOTTINGHAM,
G. W. EBAUGH.