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G. & A. RAYMOND.

PULVERIZER.

No. 415,421. Patented Nov. 19, 1889.

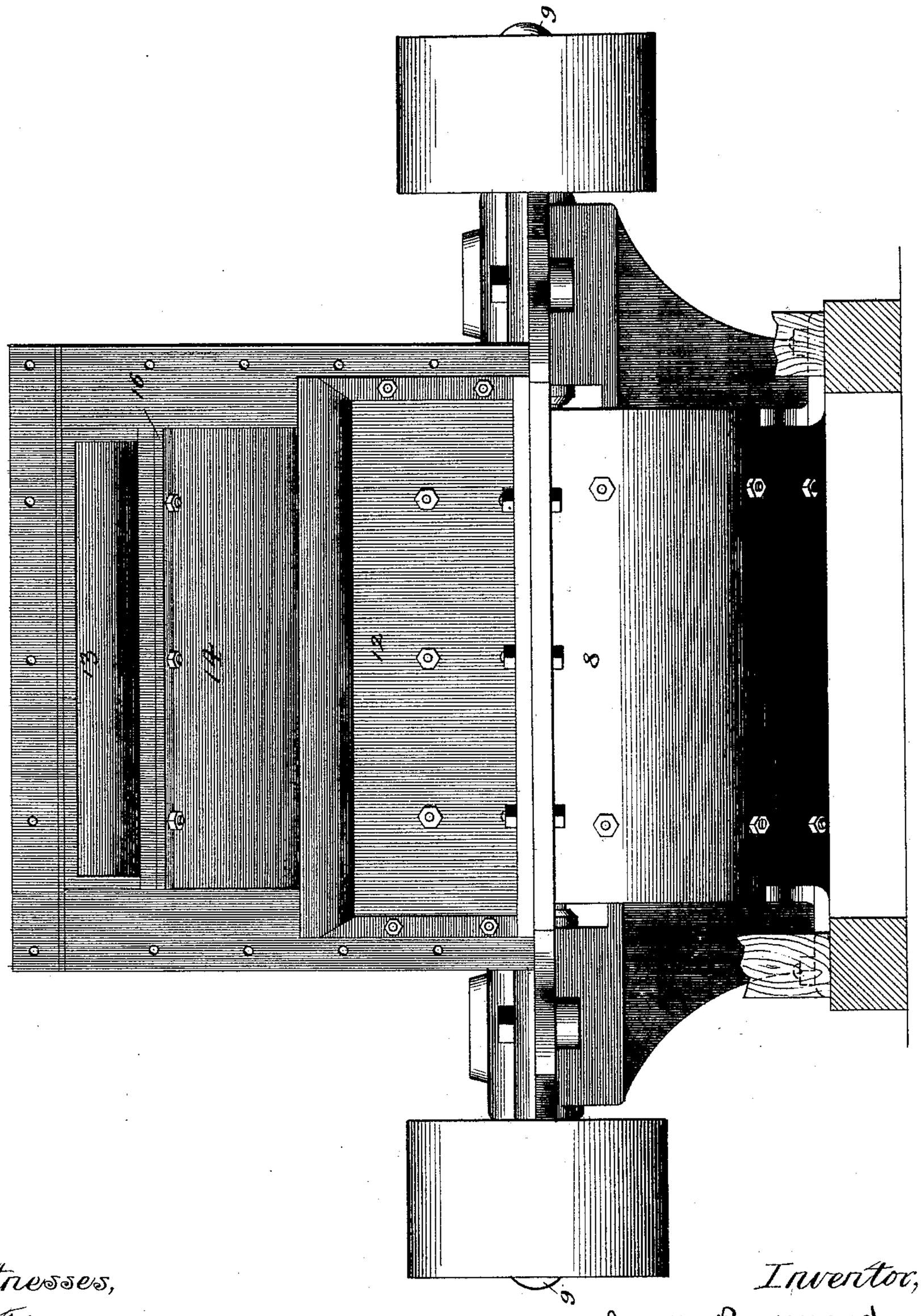

Fig. 1.

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Inventor,
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Albert Raymond
By. Offield and Towle, Attys

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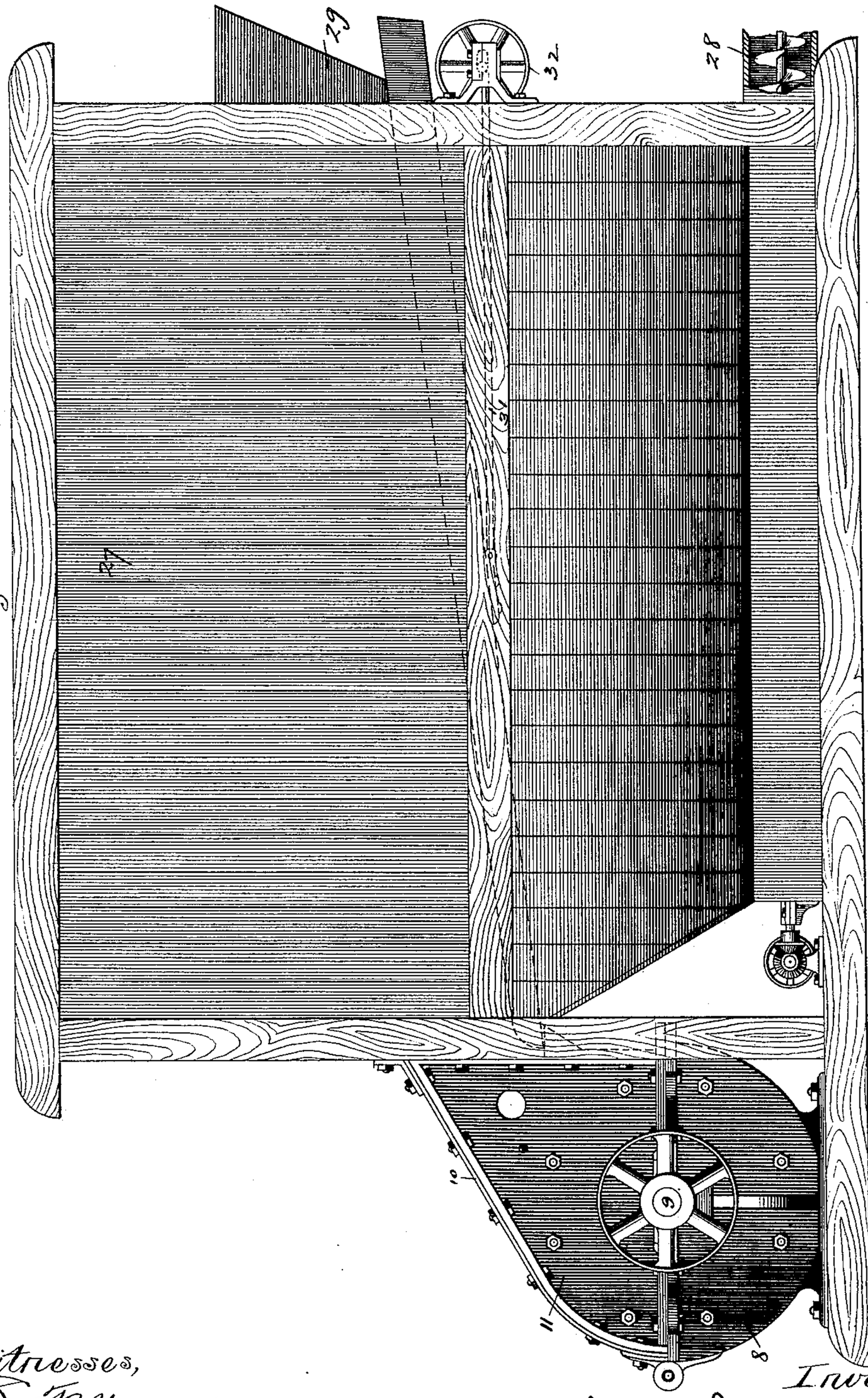

Fig. 2.

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(No Model.) 6 Sheets—Sheet 3.

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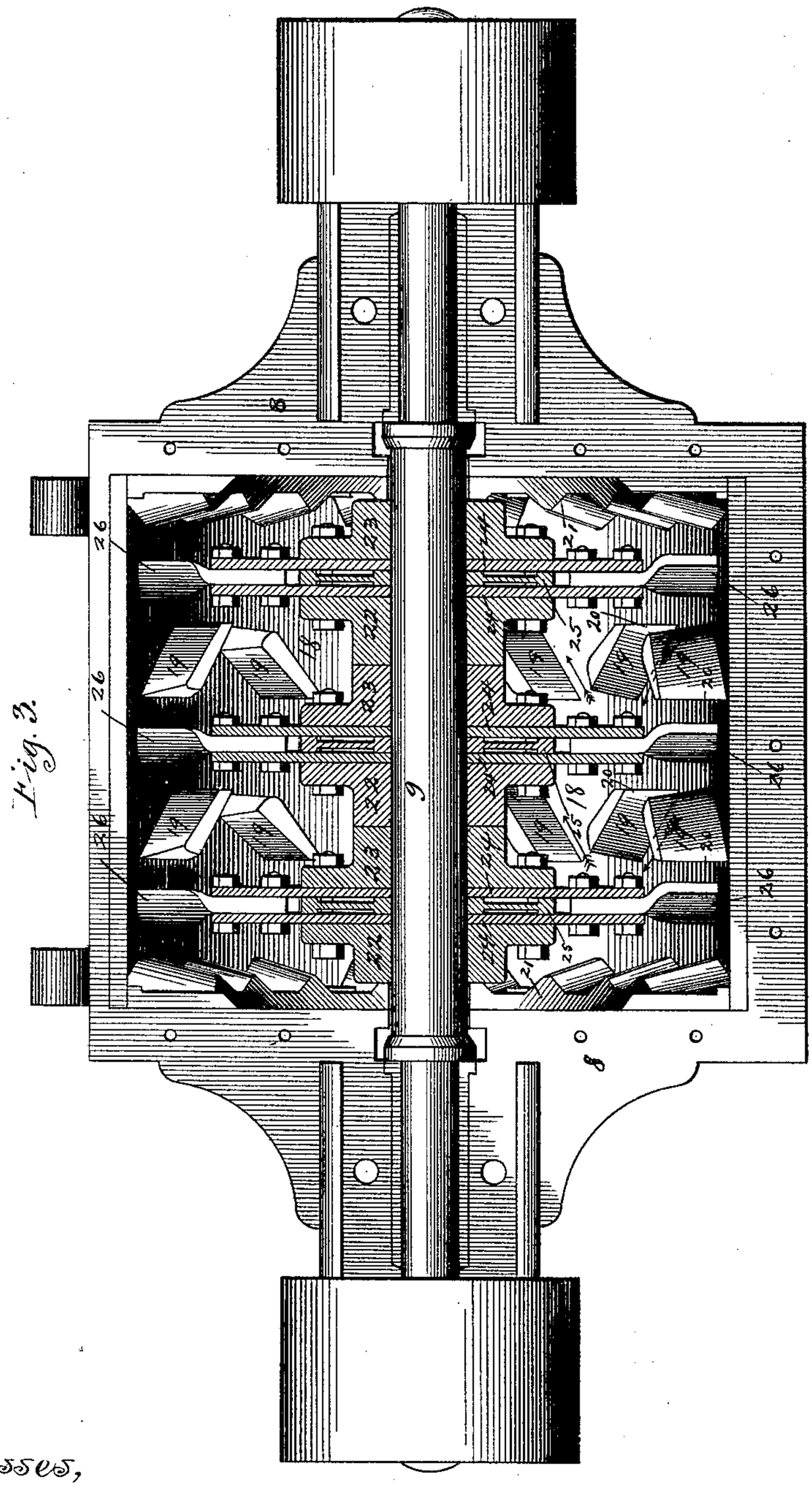

Fig. 3.

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PULVERIZER.

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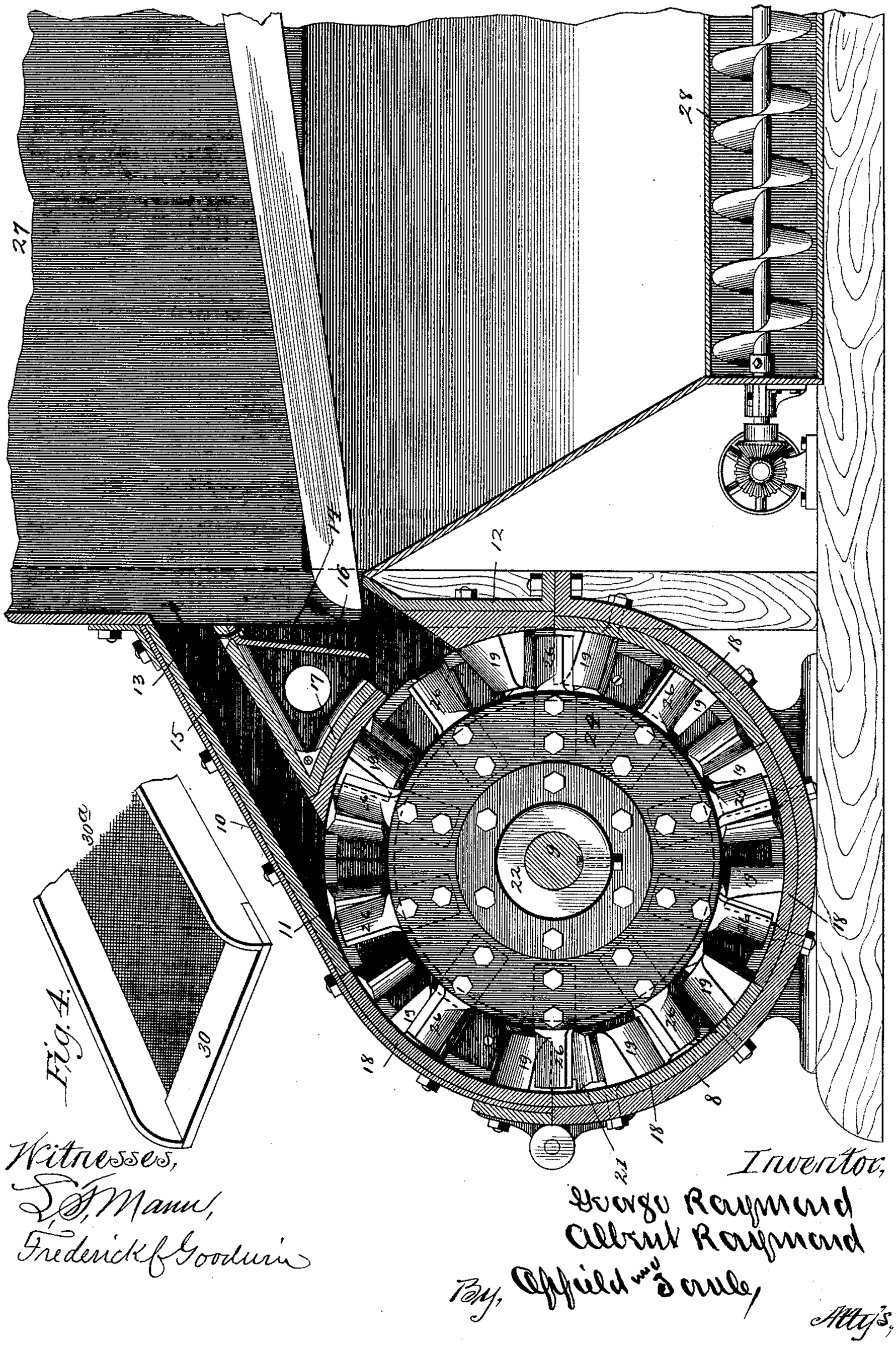

Fig. 4.

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(No Model.) 6 Sheets—Sheet 5.

G. & A. RAYMOND.

PULVERIZER.

No. 415,421. Patented Nov. 19, 1889.

Fig. 5

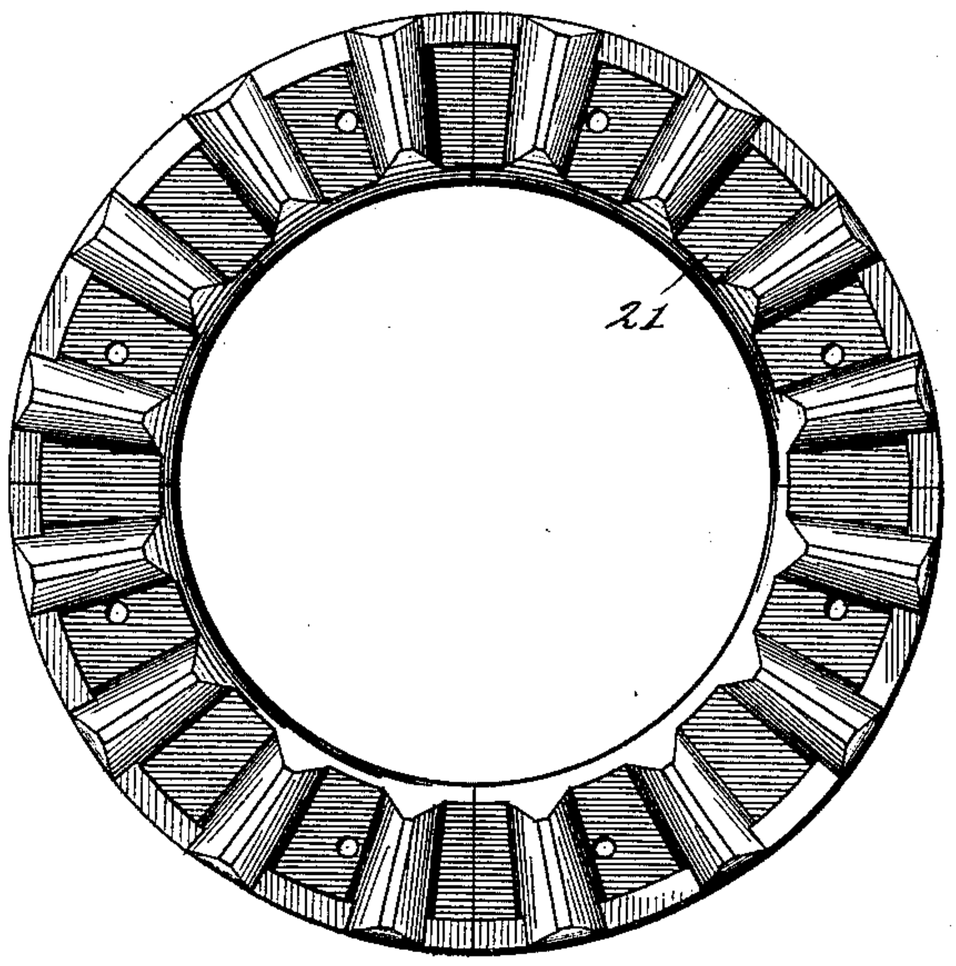
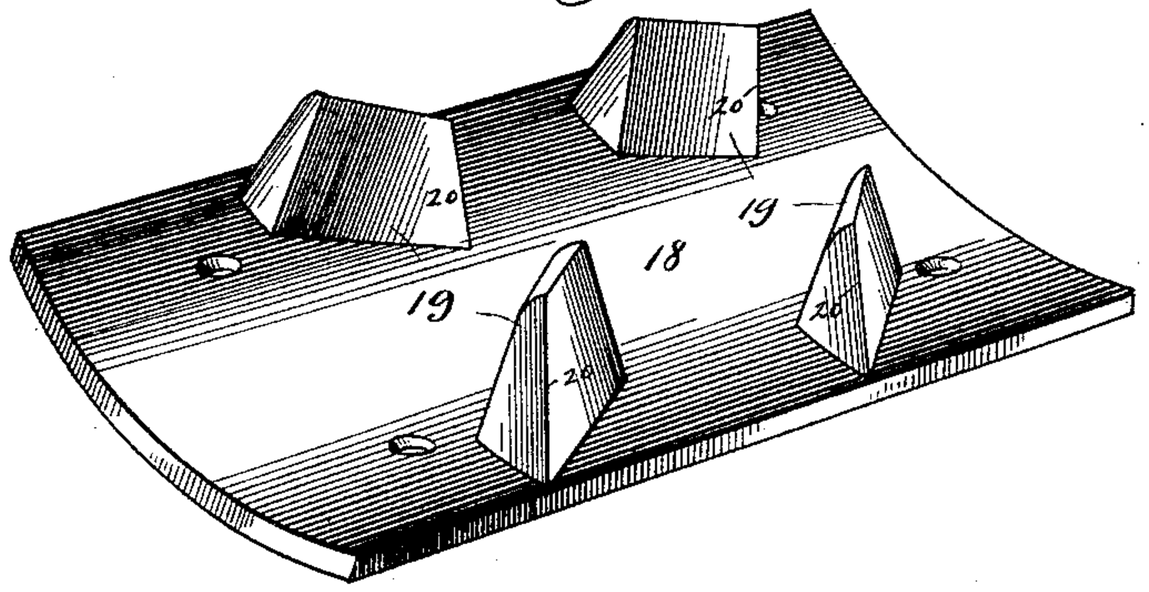


Fig. 6



Witnesses,
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(No Model.) 6 Sheets—Sheet 6.

G. & A. RAYMOND.

PULVERIZER.

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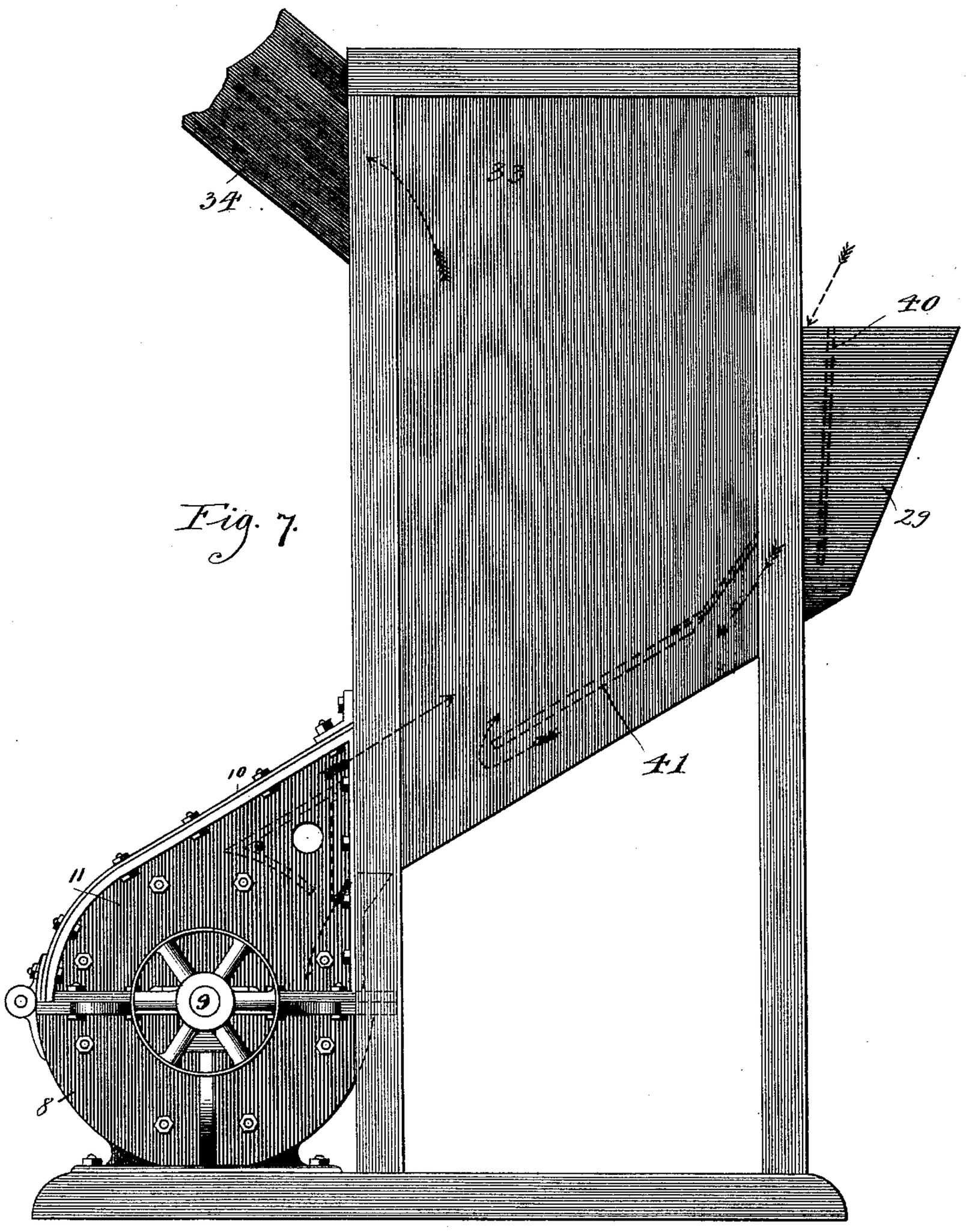

Fig. 7.

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UNITED STATES PATENT OFFICE.

GEORGE RAYMOND AND ALBERT RAYMOND, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE RAYMOND BROTHERS IMPACT PULVERIZER COMPANY, OF SAME PLACE.

PULVERIZER.

SPECIFICATION forming part of Letters Patent No. 415,421, dated November 19, 1889.

Application filed September 4, 1888. Serial No. 284,585. (No model.)

To all whom it may concern:

Be it known that we, GEORGE RAYMOND and ALBERT RAYMOND, of Chicago, Illinois, have invented certain new and useful Improvements in Pulverizers, of which the following is a specification.

Our invention relates to pulverizing machinery in which the reduction takes place within a pulverizing-chamber, and the effective agents for imparting motion to the material undergoing reduction and for the pulverization thereof are beater-arms set radially upon a rotating shaft, assisted by projections or attrition-surfaces disposed about the peripheral wall of the pulverizing-chamber.

Our improvements further relate to a pulverizing-machine so constructed that the feeding, discharging, and sifting of the material is automatic, and the material is caused to enter and leave the pulverizing-chamber on the periphery thereof, and to travel substantially around the chamber in zigzag lines.

In the drawings, Figure 1 is a rear elevation showing the form of pulverizer which we prefer, and particularly the feed and discharge openings thereof. Fig. 2 is a side elevation, a part of the conveyer-trough being in section, of a pulverizer having a bolting-chamber through which the material is fed and in which the ground product is separated. Fig. 3 is a plan view, partly in section, of the pulverizer, the upper portion of the casing being removed to show the interior construction. Fig. 4 is a vertical sectional view in elevation of the pulverizer and bolting-chamber, a part of the latter being broken away. Fig. 5 is a face representation of an annular lining-plate for the end of the pulverizing-chamber. Fig. 6 is a perspective view of a section of lining-plate for the peripheral wall of the chamber, and Fig. 7 is a side elevation of a pulverizing-machine intended to be used in connection with a suction-fan to remove the pulverized material.

In the drawings, 8 represents a semi-cylindrical casing forming the lower portion of the pulverizing-chamber, upon extensions whereof are formed journal-bearings for a rotatable shaft 9, carried centrally across the pulverizing-chamber, and having suitable belt-pulleys. The upper portions of the casing are preferably formed in four parts, comprising a top portion 10, two end portions 11, and a rear wall 12. The various portions of the casing are secured together, preferably, by headed bolts and nuts, as shown in the drawings. The casing 10 is projected in a straight line from a point on the periphery between the vertical and the longitudinal axes of the machine, and the end walls are projected correspondingly to provide feed and discharge passages 13 14, respectively. These two passages are separated by a divisional wall or partition, which may be triangular in form, as shown in Fig. 4, one of its sides 15 extending parallel to the casing 10. Another 16 forms a deflecting-surface for the incoming feed, and a curved portion 17 forms a part of the periphery of the pulverizing-chamber.

The peripheral wall of the pulverizing-chamber is lined with sectional plates 18, which will preferably be made of equal length with the chamber and of any convenient width, three of equal width being shown in the drawings covering the casing 8, while the upper portion of the chamber having its continuity broken by the passages 13 14, the lining-plates will be made to correspond in their width and curvature. Each of these lining-plates will be provided with a number of projections 19, which are so disposed as to cause the material undergoing reduction to pass around the chamber in a zigzag course. We prefer to construct the plates 18 and the projections 19 of chilled iron. The projections may be cast integral with the plates and of any form desired; but we prefer to make them substantially pyramidal in cross-section, one side being slightly concave and one corner, as 20, being sharp. These projections are disposed in rows circumferentially of the chamber and at an angle to the longitudinal axis of the chamber, or in zigzag lines, as clearly shown in Fig. 4, the sharp edges or corners projecting opposite to the direction of motion of the material, so that the material will not find lodgment thereon, but will be deflected with slight friction.

The annular lining-ring 21 (shown in Fig. 5)

has a corrugated surface, and its substance is of a width equal to the height of the projections 19. This ring is preferably cast in a number of sections for convenience in placing them, and all of these lining-plates are provided with holes to adapt them to be riveted or bolted to the casing. The shaft 9 has hubs formed each in two parts 22 23, between which are placed two steel or iron disks 24 of the required diameter. A washer 25, placed between these disks and bolted thereto, provides a space between them to receive the beater-shanks. The beaters 26 have straight shanks of the same thickness as the washer 25, which are adapted to be clamped between the outer edges of the disks 24 by bolts or rivets. The beaters are turned at an angle to the direction of motion, so as to sweep the material toward the ends of the chamber, and the several beaters, having a common support—*i. e.*, carried by the same hub—are alternately disposed, as shown in Fig. 3. These beaters are arranged to operate close to the periphery of the chamber and between the rows of projections, and from their arrangement with reference to the direction of their motion, as well as with reference to the said projections, it is apparent that the material will have imparted to it a sinuous or zigzag motion, and that it will thus be subjected to a succession of blows from the beaters and rapidly reduced, whereas if the beaters simply swept the material around the chamber in straight lines the reduction, if effected at all, would be much slower.

We prefer to connect the pulverizer to a bolting-chamber 27, which has an opening registering with the feed and discharge openings of the pulverizer. This chamber has its sides and one end inclined or hopper-shaped toward the bottom, and it is provided with the usual conveyer 28. The feed-hopper 29, as shown, is secured upon the side of the separator opposite the pulverizer, and the material is fed to the pulverizing-chamber by a feed-trough 30, having a perforated bottom 30^a, which serves as a screen to separate the fine from the coarse material. The reciprocation of this trough is effected by means of a pitman 31, having a crank-connection with a driving-wheel 32, driven by suitable gearing.

Constructed as above described, the operation is as follows: The material is fed into the hopper, and, dropping down on the trough, is fed forward by the reciprocation of the latter until it discharges into the pulverizing-chamber through the feed-passage 14, entering the chamber, so as to be caught at once by the rotating beaters. These beaters are rapidly revolved within the chamber and generate therein strong currents of air, which take up the material and cause it to move rapidly about the chamber. The material, being heavier than the air, will be thrown to the periphery of the chamber, and, as before explained, will have its direction of motion constantly changed by the projections 19, acting in conjunction with the beaters. A constant stream of material, pulverized and unpulverized, will be thrown out of the chamber by the action of the beaters, and, in obedience to the law of centrifugal force, into the bolting-chamber, and will there drop down upon the screen conveyer. The fine material will pass through the mesh of the screen and reach the conveyer, while the coarser particles will be carried down with the ingoing feed and discharged again into the pulverizing-chamber.

It may be found expedient to use the pulverizer herein described in connection with a suction-fan to take the material out of the pulverizer. In such case we prefer to employ a separating-chamber such as 33, Fig. 7, having a discharge 34, to which the suction-fan is connected. In this instance the feed-hopper 29 will have a partition such as shown by dotted lines 40, Fig. 7, and a partition 41 is also preferably placed within the separating-chamber. The material passes outside the partition 40 and the air inside, and a strong current of air will be drawn upwardly from the end of partition 41, as indicated by the bent arrow, and this current, joining that issuing with the material from the pulverizer, will draw off the finer particles, while the heavier will fall by gravity, as before, and again reach the pulverizer.

It will be seen that from the feeding of the material into the machine until its discharge therefrom in a pulverized condition the entire action of the apparatus is automatic.

We find this machine superior to any other known to us for the reduction of some materials, such as sawdust, &c.

While we prefer to use the sectional lining-plates, it is evident that they may be dispensed with and that the projections may be upon the inner face of the casing.

We claim—

1. In a pulverizer, the combination, with a cylindrical separating-chamber having projections on its peripheral wall disposed angularly with reference to each other, whereby to provide zigzag passages for the material undergoing reduction, of a rotatable shaft within said chamber, provided with beaters adapted to operate close to the peripheral wall of the chamber and between the projections thereof, substantially as described.

2. In a pulverizer, the combination, with a pulverizing-chamber, of a sectional lining therefor provided with projections having forwardly-projecting thin edges and arranged in rows circumferentially of the chamber, and an operating-space between said rows, and a rotatable shaft within said chamber, provided with beaters adapted to operate within the spaces between the rows of projections, substantially as described.

3. In a pulverizer, the combination, with a cylindrical separating-chamber having pro-

jections in its peripheral wall disposed angularly with reference to each other, whereby to provide zigzag passages for the material undergoing reduction, of a rotatable shaft within said chamber, provided with beaters set at an angle to the longitudinal axis of the machine and adapted to operate close to the peripheral wall of the chamber and between the projections thereof, substantially as described.

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