

No. 775,130.

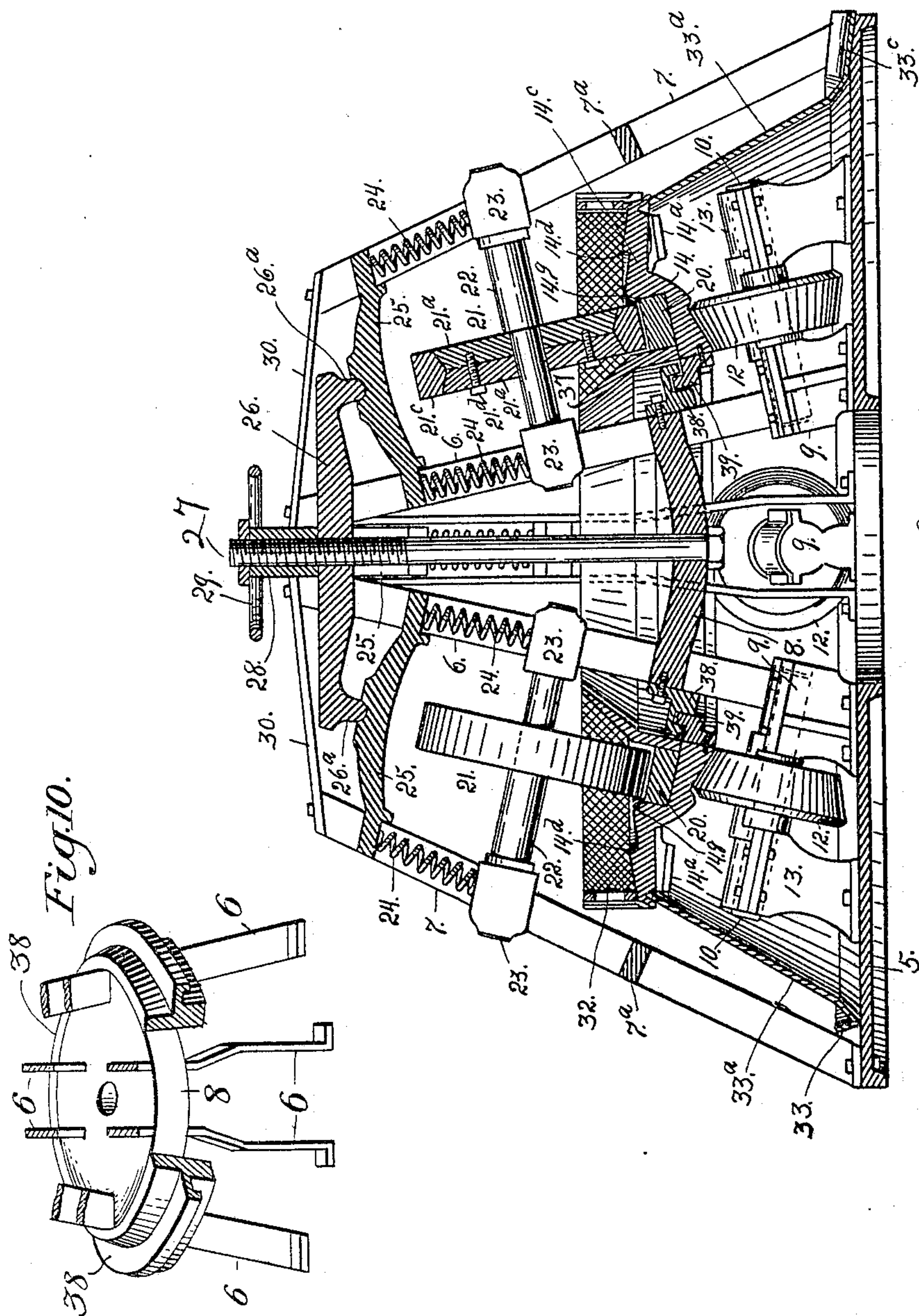
PATENTED NOV. 15, 1904.

J. H. ELSPASS.  
PULVERIZING MILL.

APPLICATION FILED APR. 27, 1904.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses

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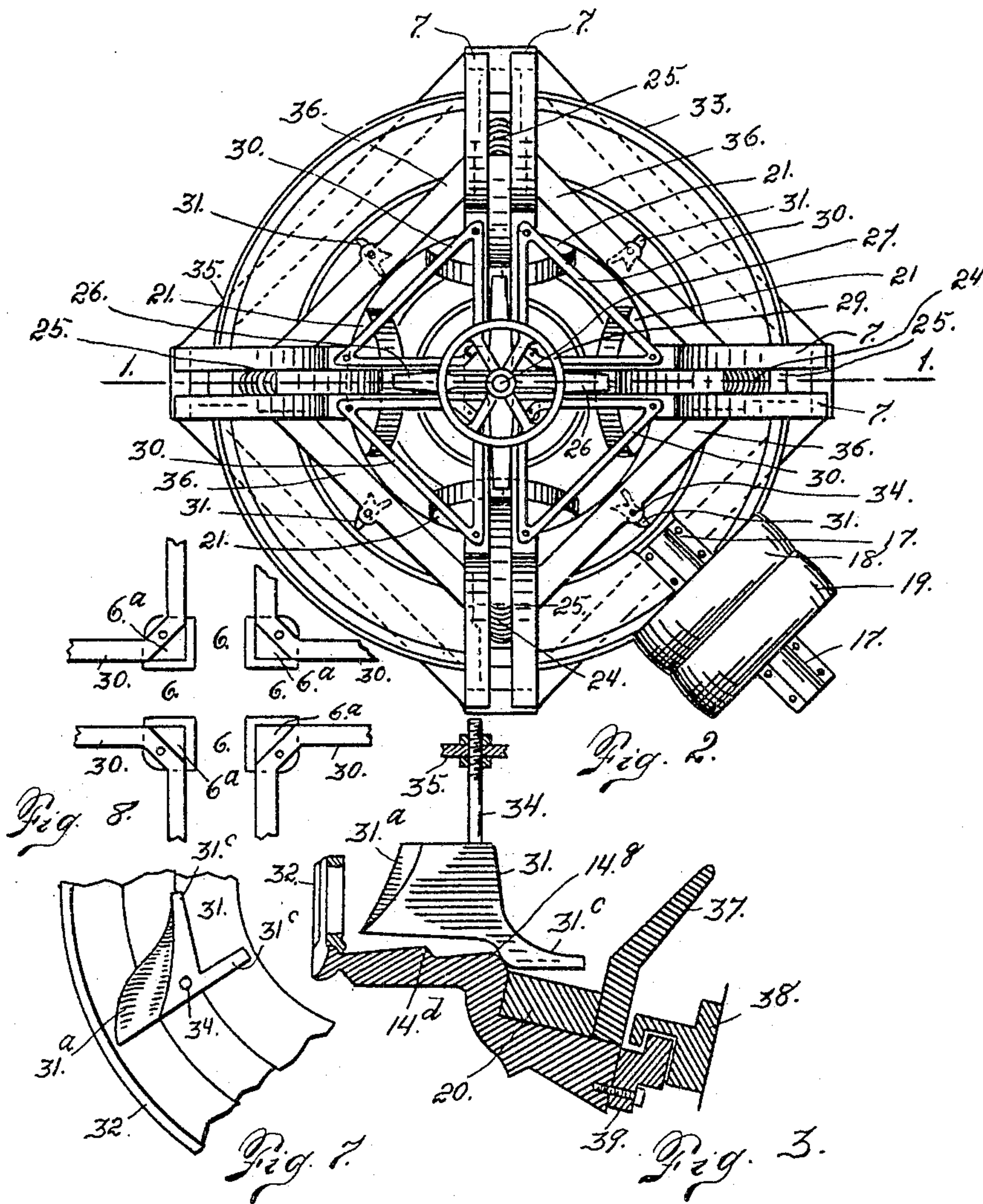
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3 SHEETS—SHEET 2.



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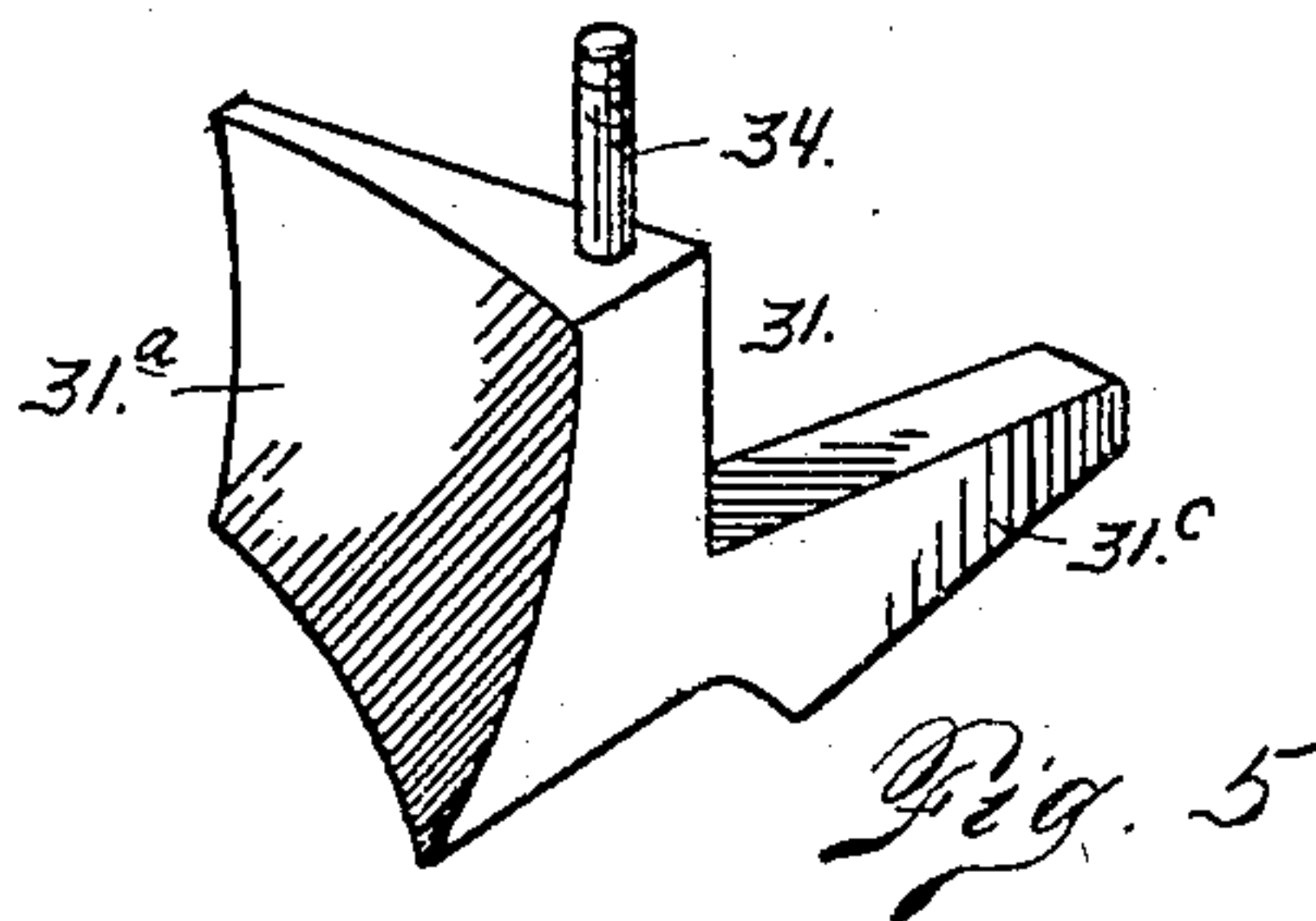
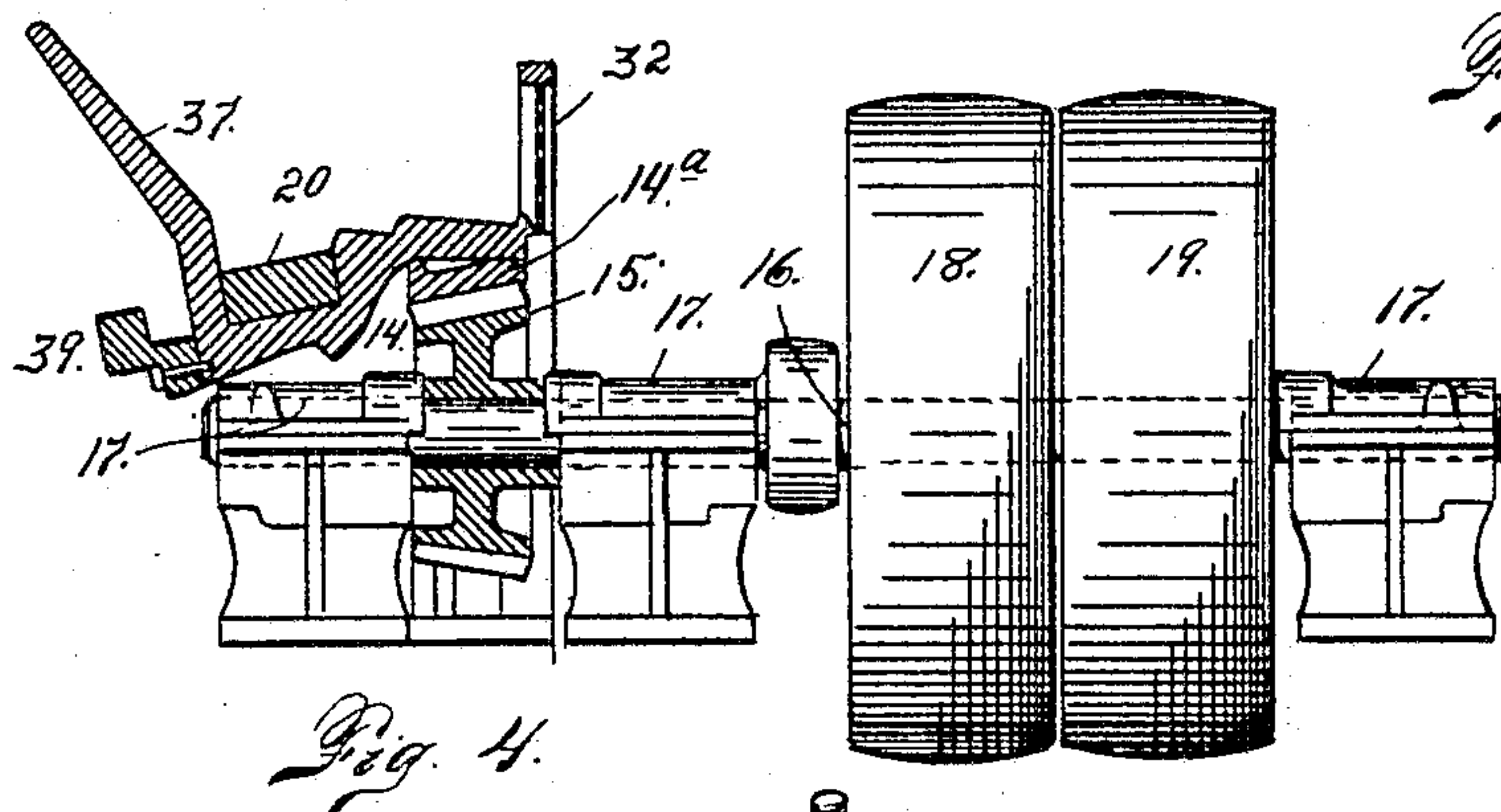
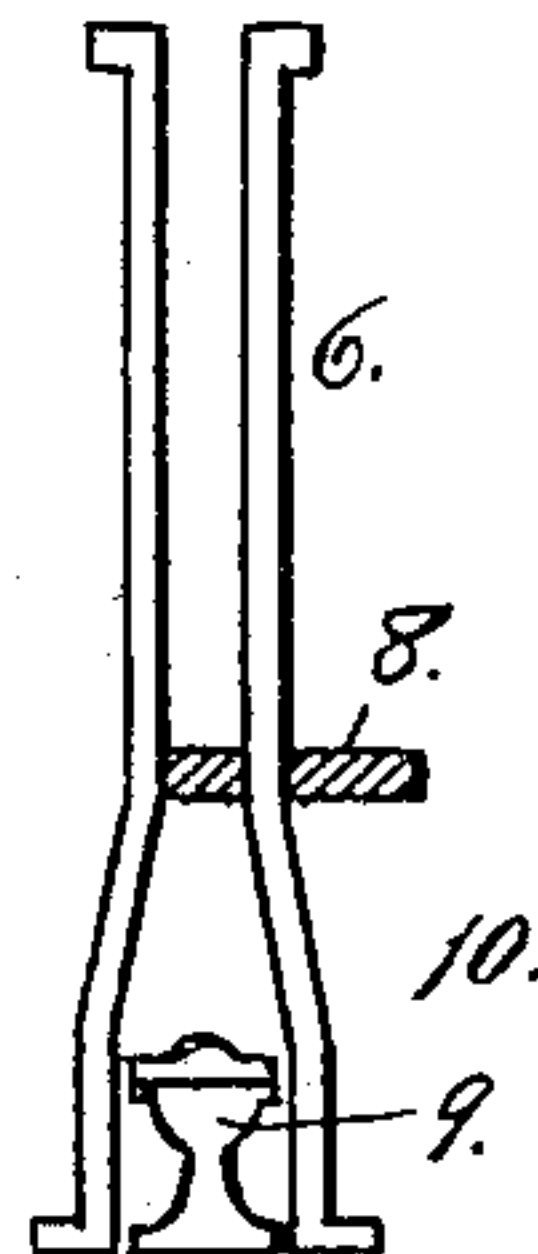
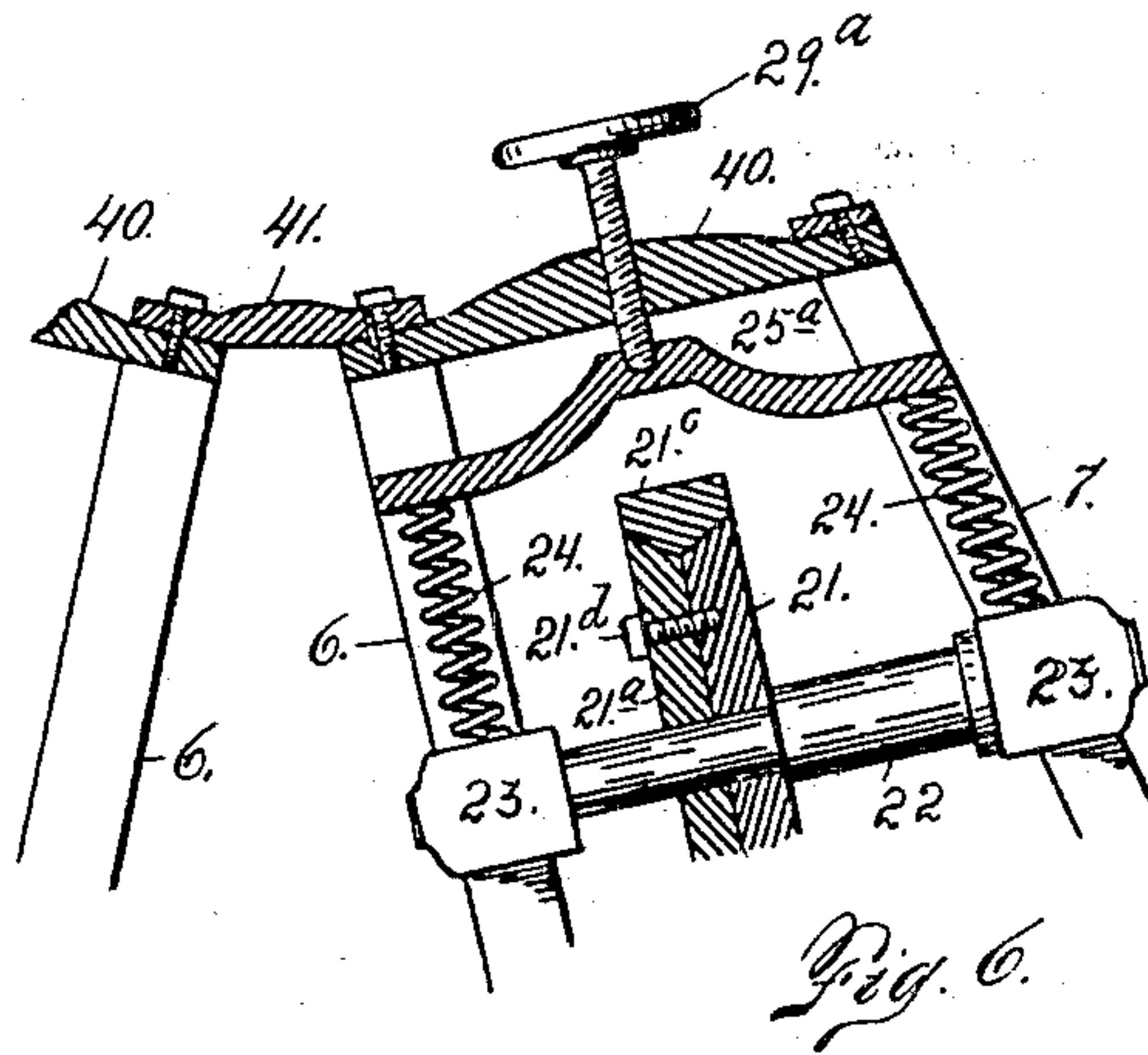
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NO MODEL.

3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

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## PULVERIZING-MILL.

SPECIFICATION forming part of Letters Patent No. 775,130, dated November 15, 1904.

Original application filed January 29, 1903, Serial No. 141,075. Divided and this application filed April 27, 1904. Serial No. 205,211.  
(No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. ELSPASS, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles  
5 and State of California, have invented certain new and useful Improvements in Pulverizing-Mills; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the  
10 art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

15 My invention relates to improvements in pulverizing-mills, my object being to produce a construction of the roller class which shall effectually perform the pulverizing function and in which a large proportion of the values  
20 is saved in the mill, thus practically doing away with the necessity for passing the pulverized material over amalgamating-plates after it leaves the mill.

25 The construction whereby the aforesaid functions are performed will first be described in detail and the novel features subsequently pointed out in the claims.

30 This application is divided out of my application, Serial No. 141,075, filed January 29, 1903, for improvements in pulverizing-mills under Rule 106 of the Rules of Practice, the parts claimed in said application being disclaimed below.

35 In the accompanying drawings, Figure 1 is a vertical longitudinal section taken through my improved mill on the line 11, Fig. 2. Fig. 2 is a top or plan view of the machine. Fig. 3 is a fragmentary vertical section taken through the mortar, the parts being shown on a scale somewhat larger than in Fig. 2. Fig. 4 is a section taken through the mortar and the driving-gear of the operating-shaft. Fig. 5 is a perspective detail view of the plow, shown on a larger scale than in Fig. 3. Fig. 6 is a sectional view illustrating a modified form of construction. Fig. 7 is a fragmentary top view of the mortar, showing the plow in place. Fig.

8 is a top view illustrating the upper extremities of the four inner posts, shown in detail. Fig. 9 is a detail view of one of the inner posts, 50 shown on a smaller scale. Fig. 10 is a perspective view of the plate 8 and its connections, including the centering-ring 38. The posts connected within the plate are sectionized and broken away above the plate. 55

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a suitable bed upon which are mounted two sets of inclined posts, one set being inner posts (designated 6) 60 and the other set being outer posts, (designated 7.) As shown in the drawings, there are four posts of each set, the structure shown being a mill having four pulverizing-rolls. Of course in a mill having more rolls or roll- 65 ers there would be two additional posts for each roller added—that is to say, one inner post and one outer post—since each roller requires a pair of posts. The inner posts are inclined or lean toward each other as they extend upwardly from the bed-plate. These posts are bifurcated or slotted, being of the construction shown in detail in Fig. 9, and are connected intermediate their extremities by a plate 8, this plate and the four posts thus con- 75 stituting an integral casting.

The four posts 6 are each open from the top downwardly to the plate 8, where a web is located connecting the two members. Below the plate 8 each post is also open, the 80 members being spread apart or widened to straddle the inner journal-box 9 of a shaft 10, upon which a bevel-faced or cone-shaped mortar-supporting roller 12 is mounted and made fast. The bevel or conical shape of each 85 mortar-supporting roller is such as to give the roller a perfect rolling contact on the track or part of the mortar-bottom which the roller engages. The outer extremity of this shaft 10 is journaled in a box 13, somewhat more 90 elevated than the box 9, whereby the shaft is inclined downwardly from its outer extremity and the weight of the mortar bearing on the bevel-faced roller is distributed on the shaft



to better advantage—hence the advantage of the inclined axis over the horizontal axis for these supporting-rollers. The under surface of the rotary mortar 14 is beveled to fit the face of the rollers 12, of which there is a suitable number properly distributed to give the traveling mortar the desired or necessary support. The journal-box 9 is closed at its inner extremity to hold the lubricating material.

The mortar is rotated by a bevel-gear 15, which meshes with a gear 14<sup>a</sup>, formed on the under surface of the mortar. This gear 15 is fast on a shaft 16, (see Fig. 4,) journaled in suitable boxes 17, and is provided with suitable fast and loose pulleys 18 and 19, whereby power may be transmitted to the shaft from any suitable motor.

The upper surface of the mortar is equipped with a steel die 20, whose face is inclined inwardly—that is to say, its outer edge is highest and its surface is gradually inclined downwardly toward its inner edge. The object of this inclination of the pulverizing-faces of the die is to overcome the tendency of the material acted on by the centrifugal force of the machine to accumulate or become thickest at the outer edge or circumference of the die and cause the pulverizing-rollers to wear unevenly. The pulverizing rolls or rollers occupy an inclined position to fit the inclined face of the mortar-die. These rollers are fast on shafts 22, whose extremities are journaled in boxes 23, slidably mounted in the posts. The posts 7, as well as the posts 6, are bifurcated or open to receive the boxes 23 of the roll-shafts. The outer posts 7 are connected by webs 7<sup>a</sup>, intermediate their extremities. Each shaft 22 occupies an inclined position, its outer extremity being highest. The journal-boxes 23 are engaged from above by coil-springs 24, the bifurcated post members forming housings for the springs.

Each pair of posts 6 and 7 is provided with a cross-head 25, whose extremities are slidable in the post and bear against the upper extremities of the springs. These cross-heads are adjustable from above by screw-pressure, whereby the springs 24 are made to bear on the boxes with sufficient tension to give the rollers 21 the desired pressure on the die, or rather on the material lying on the die, for pulverizing purposes. In the preferred form of construction (shown in Fig. 2) a centrally-located spider-shaped device 26 is slidably mounted in the upper portion of the four posts 6 and is provided with four arms whose outer extremities engage the respective cross-heads 25, each of which is provided with a central semispherical recess which is engaged by a depending projection 26<sup>a</sup> of counterpart shape formed on the spider-arm. The function of this spider is to apply an equal pressure to all the cross-heads, and therefore it may be termed a "pressure-equalizing" device, where-

by the tension of the springs acting on the boxes of the roll-shafts is made equal and uniform.

A central vertical shaft 27 is made fast at its lower extremity to the plate 8, connecting and formed integral with the four posts 6, as heretofore explained. This shaft 27 passes upwardly through an opening formed in the center of the spider 26 and protrudes above the same, its upper portion being threaded to receive a tension-nut 28, provided with a hand-wheel 29. This nut is arranged to bear against the spider 26 from above, and its adjustment determines the tension of the springs 24 through the instrumentality of the pressure-equalizing spider and the spring-engaging cross-heads.

At their upper extremities the posts 6 are close together and are open, as above stated, to receive the spider. At each corner the upper extremities of two post members form a right angle, and these two members are connected by a horizontal flange or web 6<sup>a</sup>. The posts 6 and 7 are connected and securely braced at the top by four triangular members or brace-bars 30, which are bolted to the post members, the arrangement being such that each of these braces engages a flange of two outer posts and a connecting corner-flange 6<sup>a</sup> of two inner posts.

Extending outwardly beyond the steel die of the revoluble mortar 14 is an annular ledge 14<sup>c</sup>, which is stepped and downwardly inclined. As shown in the drawings, this ledge is composed of two steps centrally divided by a circular ruffle or offset 14<sup>d</sup>. The upper surface of the ledge 14<sup>c</sup> occupies a higher plane than the pulverizing-face of the die, the face of the die and the face of the ledge being separated by an inclined shoulder 14<sup>e</sup>, up which the pulverized material works and passes to the surface of the ledge. Mounted above this ledge intermediate the rolls 21 is a number of plows 31, each composed of a share 31<sup>a</sup> and an inwardly-projecting part 31<sup>c</sup>. The share is supported a short distance above the ledge and is arranged to throw the upper stratum of material accumulating on the ledge toward and against the screen 32, surrounding the ledge, while the values which are heaviest are allowed to settle on the stepped or riffled ledge undisturbed by the plow. The pulverized material passes through the screen into a suitable annular trough 33, located at the base of the mill and connected with an amalgamating-plate 33<sup>a</sup>, over which the material passes on its way downward to the trough for the purpose of catching any free gold that may have escaped from the ledge. The part 31<sup>c</sup> of the plow projects inwardly above the pulverizing-surface of the die and acts to distribute the material evenly over the die and coöperates with the inclination of the pulverizing-face of the die to overcome the tendency of the material to accumulate in a thicker body



at the outer edge of the die. Each of these plows is supported by a depending arm 34, whose upper extremity passes through an opening formed in a part 35, projecting inwardly from a bar 36, whose extremities are secured to the outer frame-post 7. A nut is secured to the arm 34 both above and below the projection 36.

The inner edge of the mortar is surrounded by an upwardly-projecting flange 37, which is inwardly inclined to catch any adhering material which may fall from the rolls, being carried upwardly from the mortar.

The outer edge of the plate 8 and the inner edge of the mortar are provided with interlocking rings 38 and 39, whereby the mortar is properly centered and made to rotate in a true circle.

Each pulverizing-roller is composed of two parts 21<sup>a</sup>, connected by bolts 21<sup>c</sup>. These parts are beveled to form a groove in their periphery, the said groove being deepest at the center, whereby a steel tire 21<sup>d</sup>, whose inner surface is of counterpart shape, is locked in place on the roll. In assembling the parts the tire is first applied to one member of the roll, after which the other roll member is placed in position and the two members secured by the stud-bolts 21<sup>c</sup>.

From the foregoing description the use and operation of my improved pulverizing-mill will be readily understood. The mortar is rotated beneath the pulverizing-rolls through the instrumentality of the gear 15 meshing with the gear 14<sup>a</sup> of the mortar, the latter being supported by the bevel-faced wheels or rollers 12. The material to be treated is fed to the pulverizing-face of the die, where it is acted on by the rollers 21 and pulverized to the desired degree of fineness. Since the pulverizing-faces of the rollers 21 are parallel with their axes, the rollers have a grinding action in addition to the roller-pressure, since the outer circumference of the circular die travels faster than its inner circumference. The pulverized material works upwardly to the upper stepped surface of the ledge 14<sup>c</sup>, where a large percentage of the values is caught, the upper stratum of the pulverized material being continually thrown outward against and through the screen 32, whence it passes downwardly on the amalgamating plate 33<sup>a</sup> to the trough 33, from which it escapes by way of an outlet 33<sup>c</sup>.

Attention is called to the fact that the interlocking guide-rings 38 and 39, attached to the inner framework and the mortar, respectively, are so arranged that the guide-ring 39 on the mortar is lowermost, so that as the parts wear and the mortar moves downwardly there is no binding tendency between the interlocking rings, since the ring on the framework remains stationary and the ring on the mortar is free to move downwardly with the mortar, leaving a space between the engaging

parts of the rings, but having no binding tendency. This is believed to be an important feature in a structure of this class; but I hereby disclaim any right to this feature of the invention in the present application, it being claimed by me in a copending application above identified.

In the construction shown in Fig. 6, which is a fragmentary view of a modified form of construction, the cross-head 25<sup>a</sup> for each pair of springs 24 is provided with an individual pressure-screw 29<sup>a</sup>, threaded in the top plate 40, suitably secured to the top of the posts 6 and 7. In this case the inner posts 6 are connected at the top by a stationary plate 41. The upper extremity of each spring 24 is engaged by a sliding block 42, upon which the extremity of the cross-heads rests.

The mortar-centering-guide-ring construction described herein, and shown in the drawings is not claimed in this application, since it forms the subject-matter of an interfering application out of which this application is divided, as aforesaid.

Having thus described my invention, what I claim is—

1. In a pulverizing-mill, the combination with a suitable frame, of a circular rotary mortar whose pulverizing-face is highest at its outer edge and inclined downwardly to its inner edge, and pulverizing-rollers whose faces and axes are parallel with the pulverizing-face of the mortar.

2. In a roller pulverizing-mill, a circular rotary mortar having a surrounding screen and an annular ledge surrounding its pulverizing-face, said ledge being highest at its inner edge and downwardly inclined to its outer edge where it is provided with a shallow upwardly-projecting flange located below the screen, the said ledge being located within the screen whereby the material must pass over the ledge on its way to the screen.

3. In a roller pulverizing-mill, the combination of a circular rotary mortar having an annular stepped ledge surrounding its pulverizing zone and located within the screen surrounding the mortar whereby the material must pass over the ledge on its way to the screen, the pulverizing-face of the mortar being highest at its outer edge and downwardly inclined toward its inner edge, and pulverizing-rollers whose faces and axes are parallel with the pulverizing-face of the mortar.

4. In a roller pulverizing-mill, the combination with a suitable frame, of a circular rotary mortar whose pulverizing-face is highest at its outer edge and inclined downwardly toward its inner edge, said mortar having a surrounding screen and an annular stepped ledge surrounding its pulverizing-surface and within the screen surrounding the mortar, whereby the material in passing from the pulverizing-surface to the screen must travel over the said ledge, and pulverizing-rollers



whose faces and axes are parallel with the pulverizing-face of the mortar.

5. In a roller pulverizing-mill, a circular rotary mortar having a surrounding screen and an annular pulverizing-face downwardly inclined from its outer edge; and a ledge surrounding said face and downwardly inclined from its inner edge, the said ledge being located within the area surrounded by the screen of the mortar whereby the material must pass over the ledge on its way to the screen.

6. In a roller pulverizing-mill, the combination with a suitable frame, of a circular rotary mortar provided with a pulverizing-face which is highest at its outer edge and inclined downwardly toward its inner edge, pulverizing-rollers whose faces and axes are parallel with the pulverizing-face of the mortar, an annular stepped ledge surrounding said pulverizing-face, a screen outside of said ledge, and a plow supported on the frame and having a share located a short distance above the ledge and arranged to throw the upper stratum of pulverized material outwardly against the screen, said plow also having an inward projection occupying a position above the pulverizing-face of the mortar and having a tendency to throw the material inwardly and distribute it evenly over the said pulverizing-face.

7. In a roller pulverizing-mill, the combination of a rotary mortar, pulverizing-rolls engaging the mortar in operative relation, the mortar being surrounded by a screen at its outer edge, an inwardly-flared upwardly-projecting flange at its inner edge, said flange being arranged to catch any material that may fall from the rollers after being carried upwardly, the axes of the rollers being downwardly inclined from their outer extremities whereby the rollers are tilted inwardly bringing their upper portions above the inwardly-flared flange.

8. The combination with a suitable framework composed of inner and outer posts, of a mortar mounted to rotate between the two sets of posts, the pulverizing-face of the mortar being downwardly inclined from its outer circumference, and pulverizing-rollers whose faces and axes are parallel with the pulverizing-face of the mortar.

9. In a roller pulverizing-mill, the combination of a framework and of outer and inner inclined posts, a rotary mortar located between the two sets of posts, pulverizing-rollers cooperating with the mortar, each roller having a shaft provided with journal-boxes slidable vertically in a pair of posts composed of one inner post and one outer post, the said roller-shafts being downwardly inclined from their outer extremities, and their pulverizing-faces being parallel with their axes, springs engaging the shaft-boxes from above and located in the posts which form housings for

the springs, a cross-head slidably mounted in each pair of posts and engaging from above the springs bearing upon the journal-boxes of each roller-shaft, and means for applying downward pressure to the cross-heads to give the springs the required tension.

10. The combination with a suitable framework, of a rotary mortar suitably supported, pulverizing-rollers cooperating with said mortar, shafts upon which the pulverizing-rollers are made fast, the journal-boxes of the shafts being slidable vertically in the framework, coil-springs engaging the said boxes from above, a cross-head slidable in the framework and bearing upon the springs of each roller-shaft, and a pressure-equalizing device vertically slidable in the frame and simultaneously engaging all the cross-heads.

11. In a pulverizing-mill, the combination of a framework composed of inner and outer posts, a mortar mounted to rotate between the two sets of posts and suitably supported, pulverizing-rollers engaging the mortar in operative relation, shafts upon which the rollers are made fast, journal-boxes for the shaft extremities, the said boxes for each shaft being slidably mounted in an inner and an outer post, the said post being bifurcated to receive the said boxes, springs mounted in the posts and engaging the said boxes from above, a cross-head engaging the two springs bearing upon the boxes of each shaft, and a pressure-equalizing device vertically slidable in the inner posts and simultaneously engaging all of the said cross-heads, and means centrally applied to the pressure-equalizing device for forcing the latter downwardly.

12. In a pulverizing-mill, the combination of a framework, a mortar mounted to rotate and suitably supported, pulverizing-rolls engaging the mortar in operative relation, shafts on which the rolls are made fast, said shafts being vertically movable in the frame, journal-boxes for the shafts, springs engaging the journal-boxes from above, a cross-head engaging the two springs of each shaft, a vertical shaft centrally located and made fast on the frame, an equalizing-plate through which said shaft passes, said plate engaging all the cross-heads, and a nut screwed upon the upper extremity of the shaft and bearing against the equalizing-plate which is vertically slidable on the shaft.

13. In a roller pulverizing-mill, the combination with a suitable frame, of a circular rotary mortar having a surrounding screen, an annular ledge surrounding its pulverizing-face, a wall leading upwardly from the pulverizing-face to the ledge and terminating at the inner circumference of the ledge, said ledge being within the screen surrounding the mortar and composed of two faces divided by a circular riddle or offset located intermediate its inner and outer circumferences.

14. In a roller pulverizing-mill, a circular



rotary mortar having a surrounding screen and an annular ledge surrounding its pulverizing-face, said ledge being highest at its inner edge and downwardly inclined to its outer edge.

15. In a pulverizing-mill, the combination of a circular rotary mortar having a pulverizing-face, a surrounding screen and a ledge located between the screen and the pulverizing-face whereby the material under treatment must travel over the ledge in passing from

the pulverizing-face of the mortar to the screen, and pulverizing-rollers engaging the pulverizing-face of the mortar, the said ledge being highest at its inner edge and downwardly inclined toward the screen.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. ELSPASS.

Witnesses:

DENA NELSON,  
A. J. O'BRIEN.