

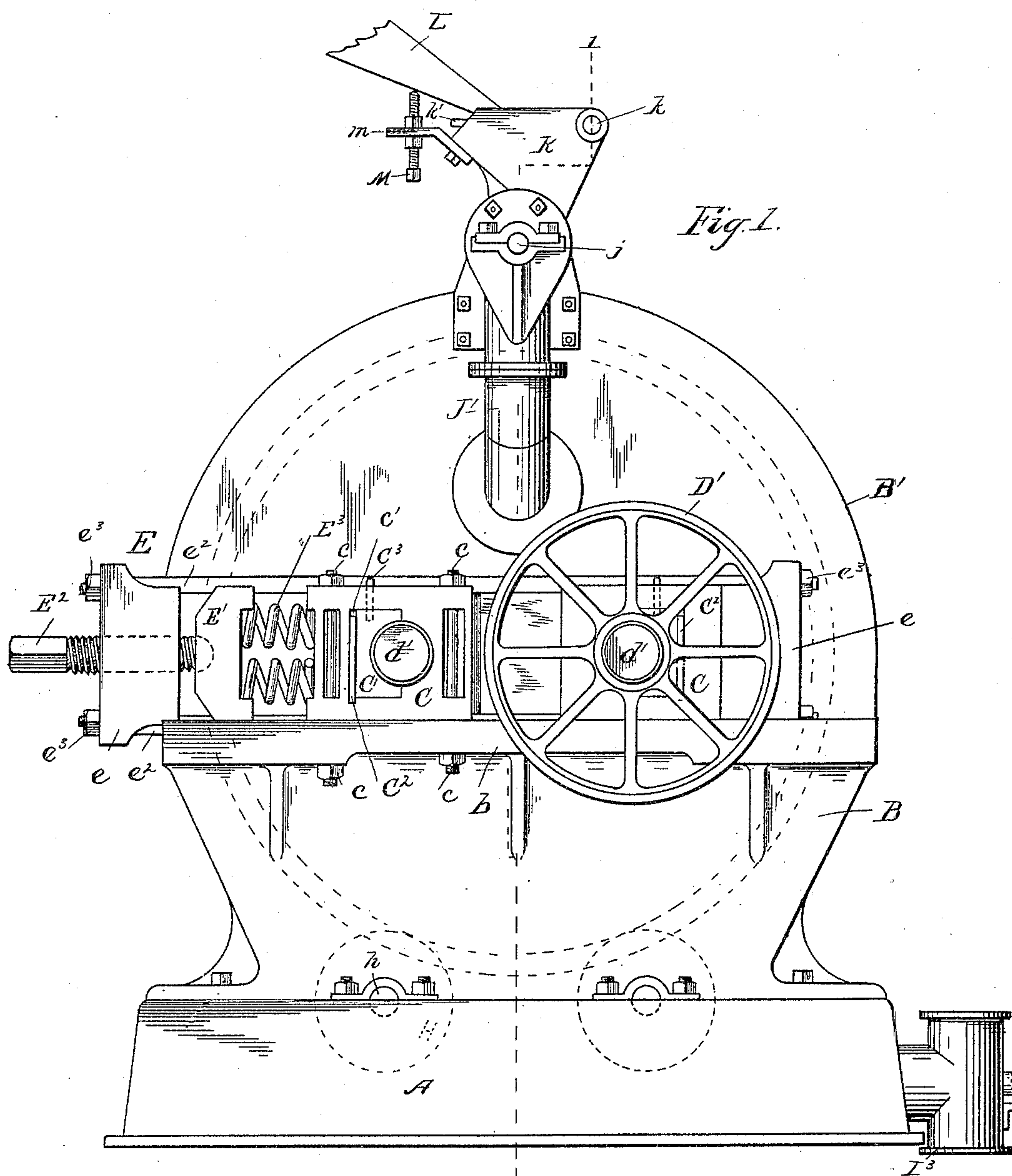
(No Model.)

4 Sheets—Sheet 1.

R. D. GATES.
PULVERIZING MACHINE.

No. 436,349.

Patented Sept. 16, 1890.



Witnesses.

B. M. Whitaker.
A. M. Best.

Inventor:
Ryerson D. Gates.

By Coburn V. Thacher
Atty's.

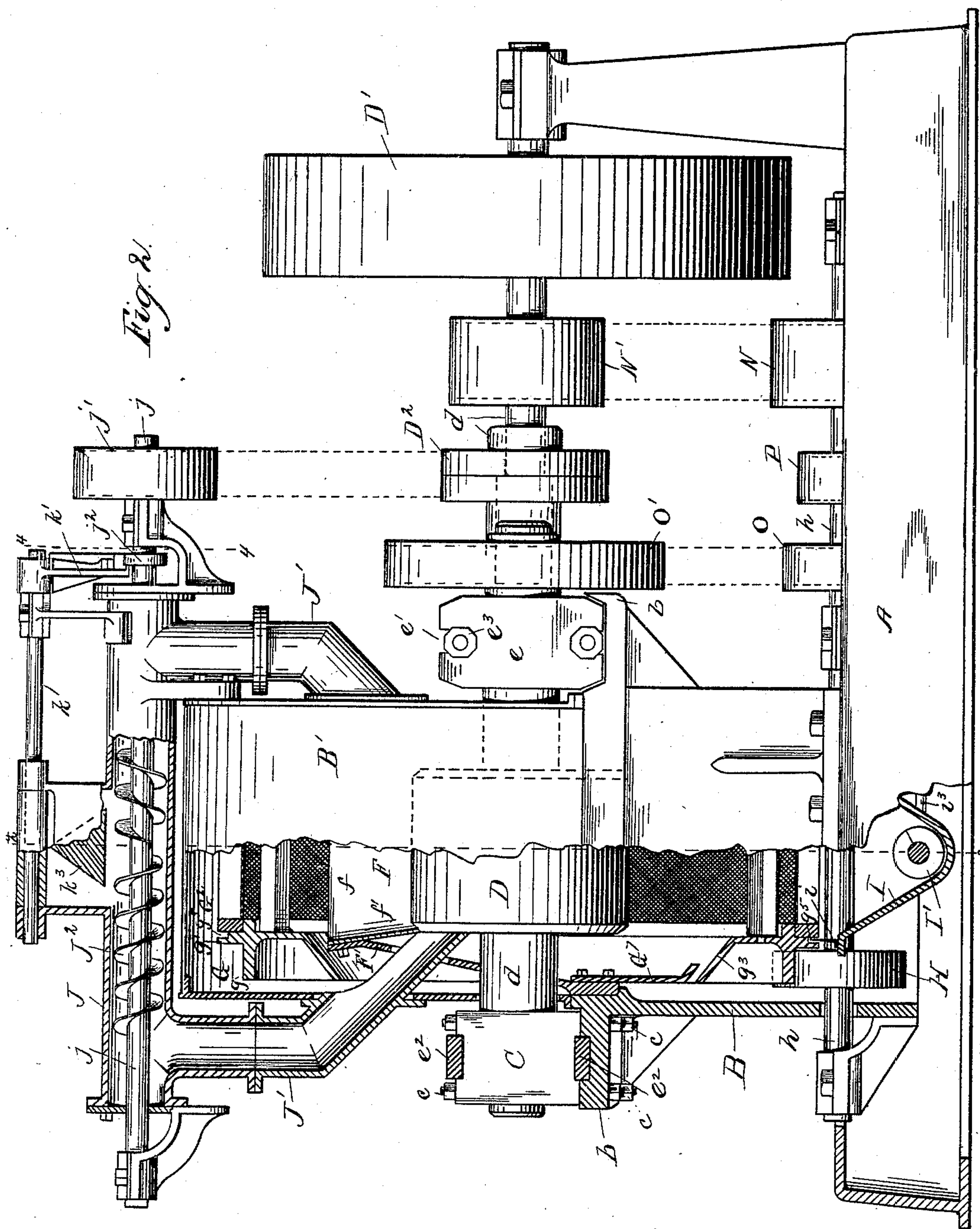
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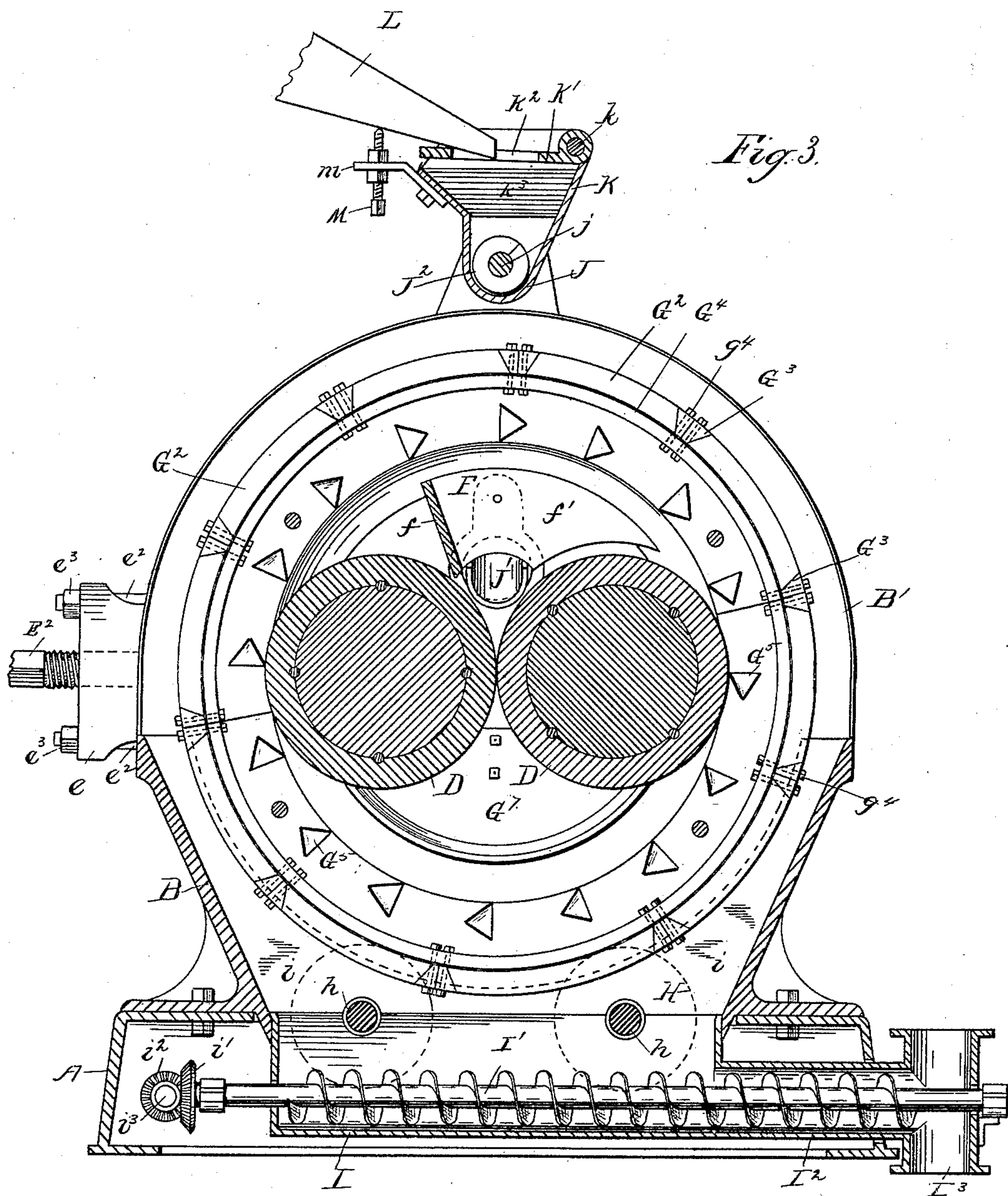
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(No Model.)

4 Sheets—Sheet 4.

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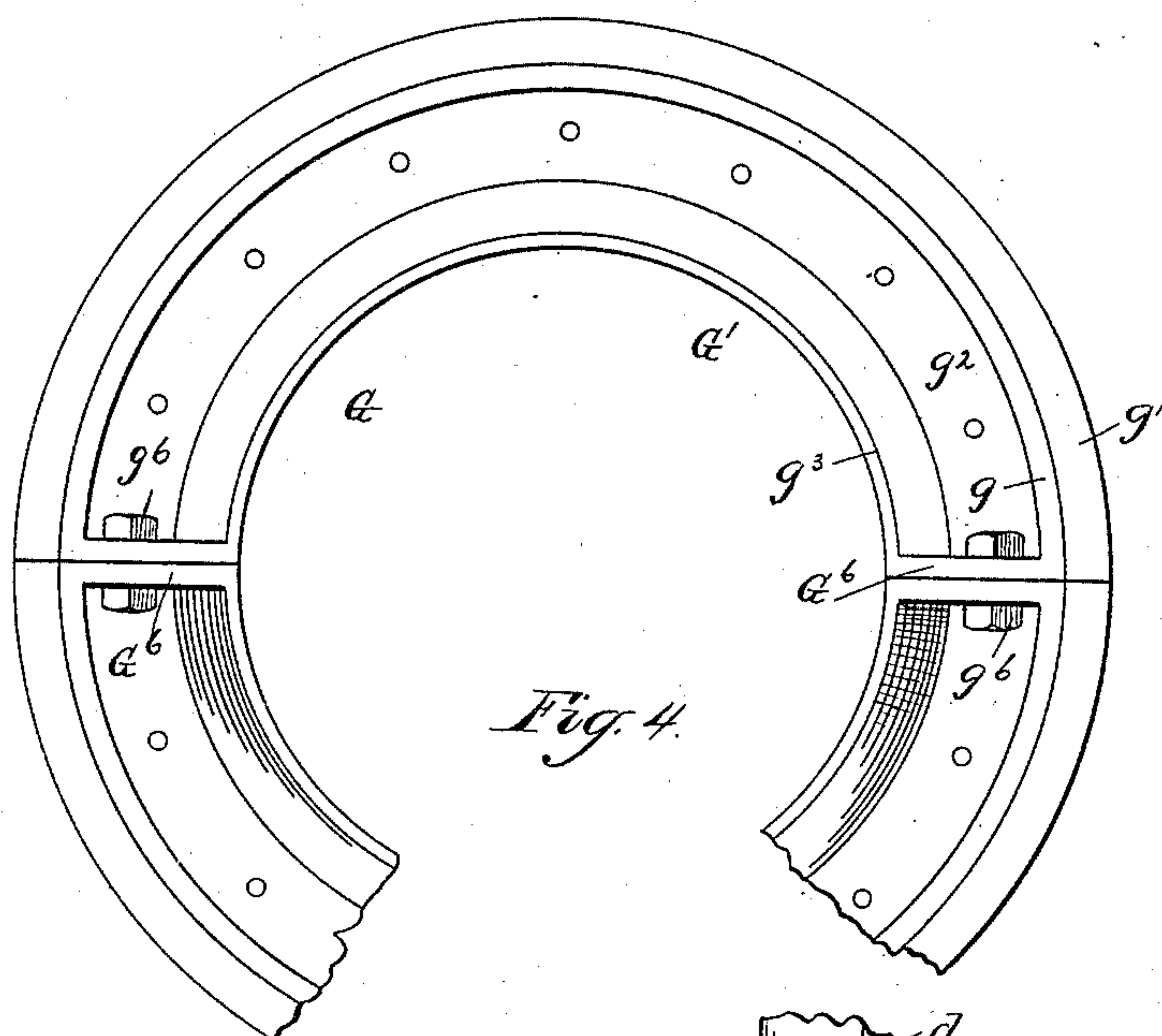


Fig. 4.

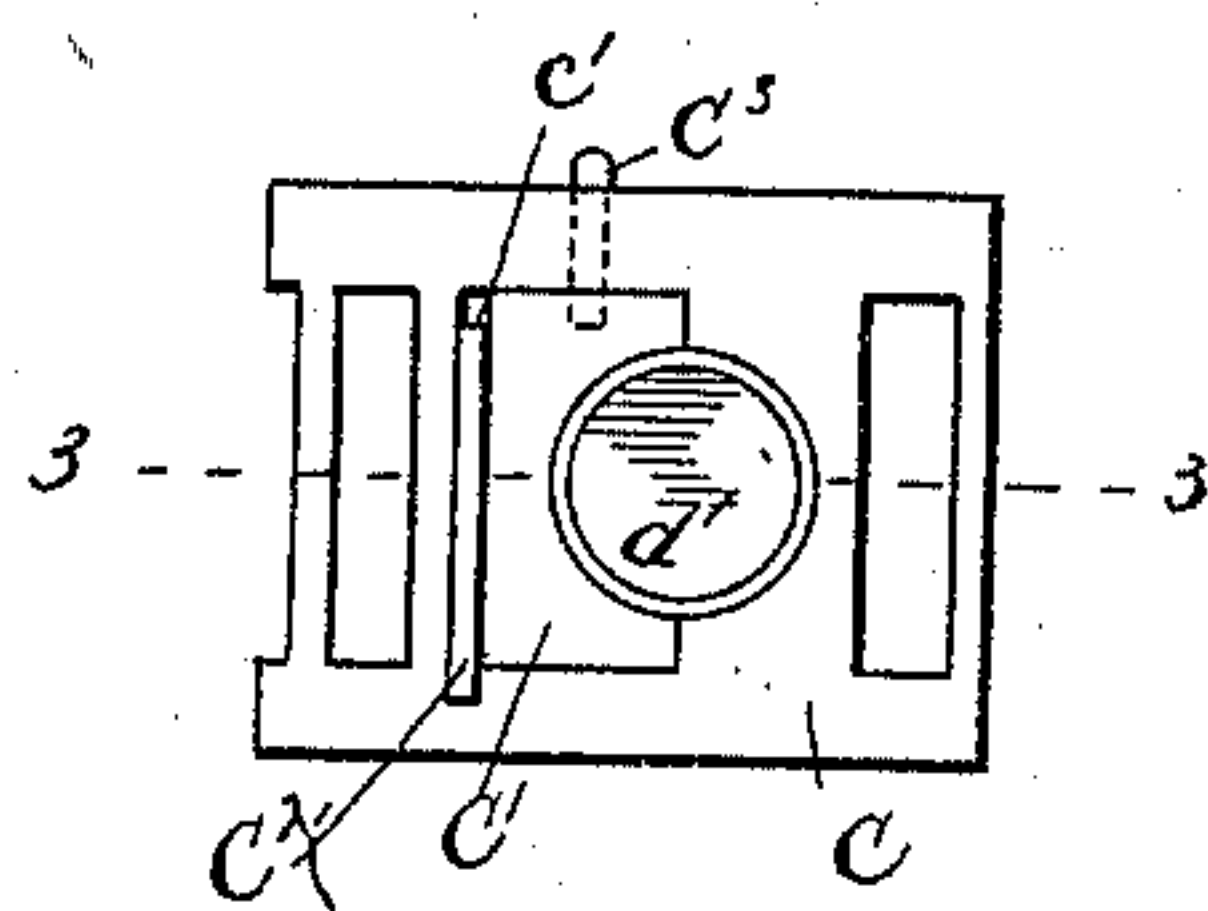


Fig. 5.

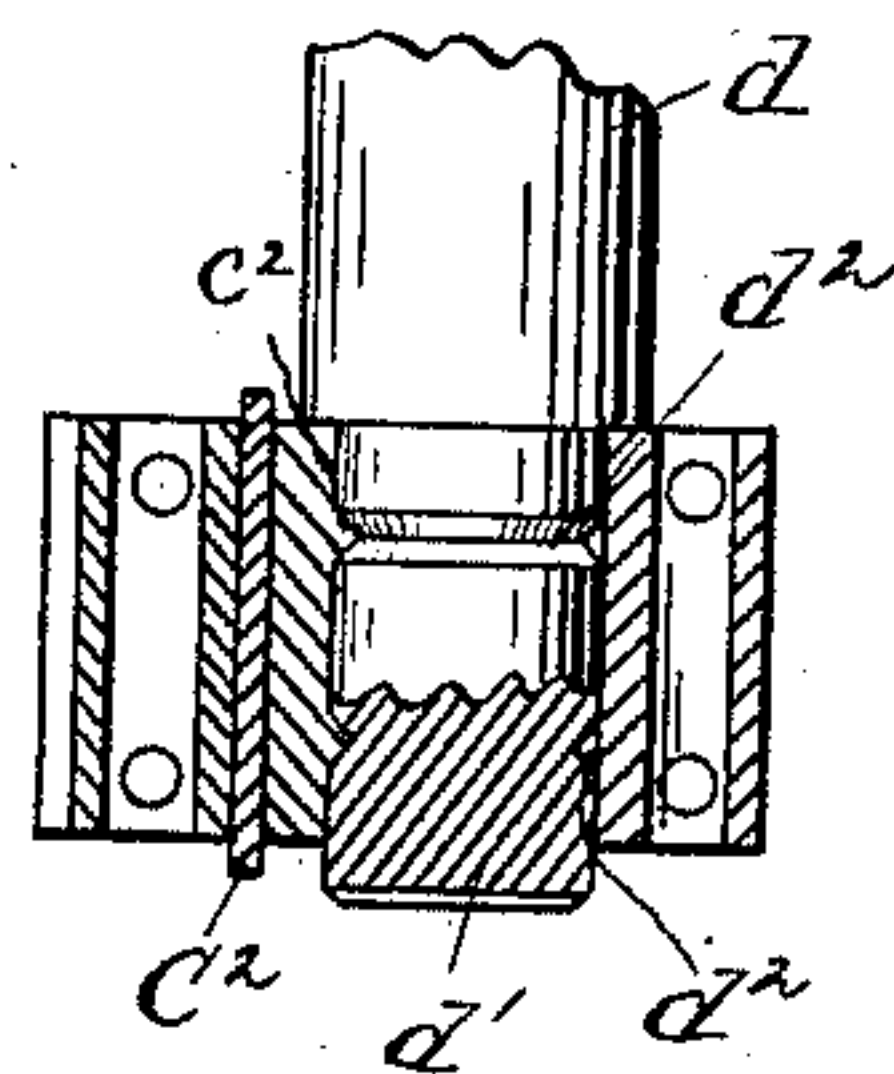


Fig. 6.

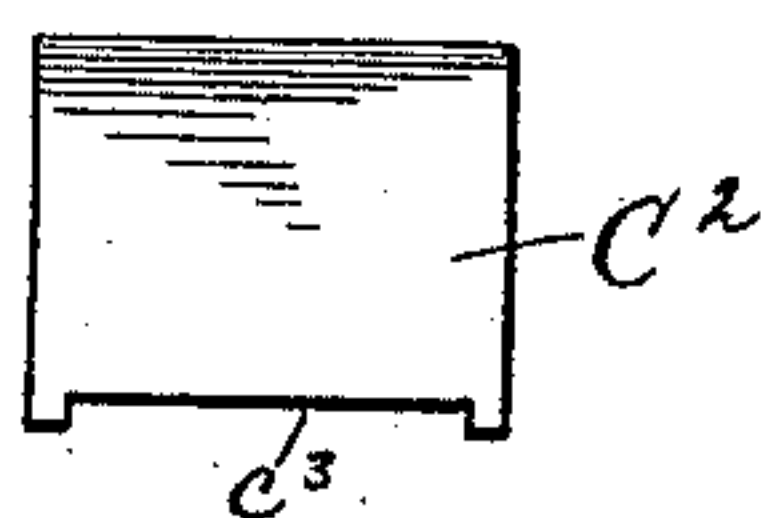


Fig. 7.

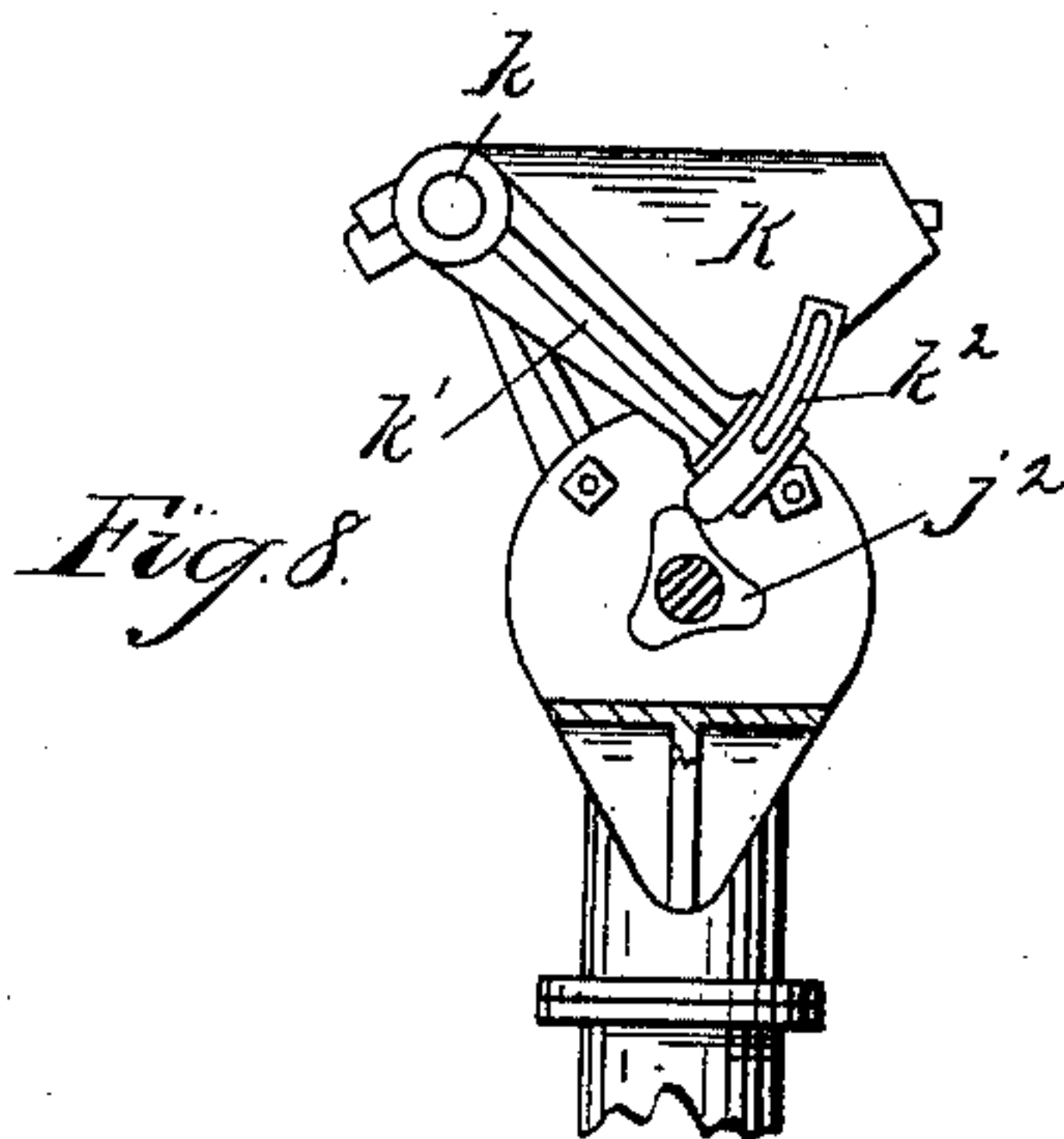


Fig. 8.

Witnesses

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A. M. Best

Inventor:
Ryerson D. Gates

By Edwin Whacker
Attys.

UNITED STATES PATENT OFFICE.

RYERSON D. GATES, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GATES IRON WORKS, OF SAME PLACE.

PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 436,349, dated September 16, 1890.

Application filed March 24, 1888. Serial No. 268,396. (No model.)

To all whom it may concern:

Be it known that I, RYERSON D. GATES, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pulverizing-Machines, which is fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a machine embodying my invention; Fig. 2, a rear elevation of the same, one-half thereof being shown in section upon the line 1 1 of Fig. 1; Fig. 3, a sectional view taken on the line 2 2 of Fig. 2; Fig. 4, a side elevation of the screen-frame; Fig. 5, an end elevation of one of the roller-shaft bearings detached; Fig. 6, a sectional view of the same, taken on the line 3 3 of Fig. 5; Fig. 7, a detail view of one of the gibs or keys detached; and Fig. 8, a detail sectional view taken on the line 4 4 of Fig. 2.

Like letters refer to like parts in all the figures of the drawings.

My invention relates to pulverizing-machines, and more particularly to that class in which cylindrical pulverizing-rolls are employed in conjunction with a cylindrical revolving screen surrounding the same, and within which said rolls operate.

My present invention is in the nature of an improvement upon the pulverizing-machine for which Letters Patent have been granted to me as follows—to wit: No. 260,092, dated June 27, 1882; No. 269,404, dated December 19, 1882, and No. 286,290, dated October 9, 1883, and also Letters Patent No. 319,479, granted June 9, 1885, to myself and Charles Kaestner.

The object of my present invention is to produce a machine of improved construction and of increased efficiency in operation; and to these ends my invention consists in certain novel features which I will now proceed to describe, and will then particularly point out in the claims.

In the drawings, A represents the base of the frame, upon which is mounted the lower half B of the casing, which is secured thereto in any suitable manner. This casing is made in two sections, the upper half B' being

mounted in the lower half B and secured thereon in any suitable manner, so as to be removable therefrom. The lower half B of the casing is provided on each side with a supporting-ledge *b*, and upon these ledges are mounted the bearing-boxes C of the roller-shafts *d*.

The bearing-boxes C of one of the roller-shafts *d* are bolted to the ledges by means of bolts *c*, while the bearing-boxes of the other roller-shaft are free to move upon said ledges. Upon each side of the machine there is provided a yoke E, which embraces both bearing-boxes on each side of the machine, and which is provided with a follower E', adjusted by means of a screw E², and having springs E³, which bear against the stationary bearing-box C, said yoke operating to draw the movable bearing-boxes toward the stationary bearing-boxes, substantially as in my Letters Patent hereinbefore referred to. The construction of the yoke, however, is somewhat different. It consists of end blocks *e*, which are notched at the top and bottom, as shown at *e'*, to receive the ends of straps *e*², which connect the said end blocks. The projecting ends of the straps are threaded and provided with nuts *e*³, by means of which the parts of the yoke are held together. It will be seen that by reason of this construction it is only necessary to loosen the screw E² sufficiently to remove the tension and then loosen the nuts *e*³ in order to enable me to lift up the entire strap and remove the same, thus giving free access to the bearing-boxes without the necessity of removing the entire yoke.

The bearing-boxes themselves are constructed in detail in the manner shown in Figs. 5, 6, and 7 of the drawings. Each bearing-box is formed in a single piece, and one half of the bearing therein is formed by means of a suitable semi-cylindrical recess in the said box. The other half is formed by means of a block C' of Babbitt metal or other suitable material arranged in a recess *c'* in the box C. The journal *d'* of the roller-shaft *d* is provided with grooves *d*², extending around the same, and the block C' is provided with corresponding projections *c*², which fit and enter said grooves. The recess *c'* is of a width from front to rear greater than the width of the

block C' by an extent slightly greater than the height of the projections c^3 , and the block is held in position by means of a gib or key C², equal in thickness to this excess of width of the recess, and notched at the bottom, as shown at c^3 , to catch over the bottom of the recess and be held firmly in position when in place. A pin C³ serves to prevent lateral displacement of the block C'. By reason of this construction end motion of the roll-shafts is prevented, thereby avoiding binding and friction and consequently heating at the shoulders of the journals thereof.

The block C' of each bearing-box may be readily removed by first removing the pin C³, then raising the gib C² to disengage its lower edge, and then removing the same, when the block C' may be moved away from the journal sufficiently to clear the projections c^2 thereof from the grooves d^2 of the journal d' . The block may then be moved laterally outward and thus removed from the recess. By reversing these operations the block may be reinserted.

The rolls D, which are mounted on the shafts d , may be of any suitable construction for their purpose, and are driven by suitable pulleys D', mounted on their respective shafts and actuated by means of a belt from a suitable counter-shaft or line of shafting. Between the said rolls and above the same there is mounted a hopper F, consisting of a transverse plate f , arranged above the front roll and inclined toward the junction of the two rolls, and of the side plates f' , extending toward and over the rear roll, the whole being supported by means of arms F', extending downward and bolted to the lower half B of the casing.

G indicates the revolving cylindrical screen, which consists of two parallel annular side plates G'. Each of these plates consists of a cylindrical body portion g , provided with an outwardly-projecting flange g' near its inner edge, and with a flange g^2 projecting radially inward in the opposite direction from the inner side of said body portion.

The flange g^2 is provided with an inclined extension g^3 , which extends laterally outward, as shown, to a level with the outer edge of the body g . Upon the outer face of the body g , and between the flange g' and the inner edge of the body, there is mounted a sectional rim G² of wood, secured in position by wedge-shaped cross-bars G³, extending across from plate to plate and secured by bolts g^4 . These wooden pieces provide a means of attachment for the wire gauze or netting G⁴, of which the main portion of the periphery of the revolving screen is composed. This wire gauze or netting is constructed in comparatively small sections, corresponding in length to the sections G² of the wooden rim, so that in case any portion of the said gauze or netting is injured it will not be necessary to remove the whole thereof, but only that section which has been injured.

The entire screen G is divided diametrically into two separable halves, the two halves of said screen being connected by means of bolts g^6 passing through flanges G⁶ at the ends of the halves, or in any other suitable manner. The object of this construction is to enable me to remove and replace the screen without removing the rollers contained therein, and this may be obviously effected by removing the bolts g^6 , when the upper half of the screen may be first removed bodily and the lower half then brought uppermost and removed in a similar manner. This enables me also to employ rolls, the combined diameters of which are sufficient to occupy nearly the full space within the screen. Moreover, I am enabled to provide the screen with the flanges g^2 and g^3 , which contract the lateral openings of the screen to an extent just sufficient to clear the shafts of the rolls D. Semi-circular plates G⁷ may be employed to close the lower half of this lateral opening on each side.

The revolving screen G is supported upon friction-rollers H at the bottom thereof, the said rollers being arranged in pairs, both at the front and rear of the machine, and being mounted on shafts h , by means of which they are driven. The revolving screen G is provided with a series of transverse buckets G⁵, constructed and arranged substantially as in my Letters Patent hereinbefore referred to.

At the bottom of the casing B there is arranged a trough I, tightly connected to said casing at its ends, as shown in Fig. 3, and of a width slightly greater than the width of the wire-netting of the revolving screen G. Along its lateral edges, at the top thereof, this trough is provided with an upwardly-projecting flange i , which enters a corresponding groove g^5 , formed in the periphery of the revolving screen G between the flange g' and the wooden rim G² thereof. Within the trough I there is arranged a conveyer I', of spiral or other suitable form, extending longitudinally through said trough, and also through the tube or conduit I², which forms a continuation of said trough at the rear.

The tube I² ends in a suitable discharge-spout I³, which is open at its upper end to provide means for connecting thereto a suitable dust collector or discharge, by means of which the fine dust may be collected and discharged. At its forward end the conveyer I' is provided with a bevel-wheel i' , which meshes with a similar wheel i^2 on a shaft i^3 , driven from one of the shafts h .

At the top of the machine, above the casing, there is arranged a transverse trough or conduit J, from each end of which feeding-spouts J' extend downward and inward, terminating at a point above and between the rolls D.

Within the trough J there is arranged a right and left hand spiral conveyer J², extending in each direction from the center of said trough and mounted upon a shaft j , extending through said trough and provided

with a pulley j' , by means of which it is driven from a pulley D^2 on the shaft d of the front roll.

Above the center of the trough J is arranged a hopper K , provided with a V-shaped parting-ridge k^3 , extending from front to rear thereof and adapted to divide the material which falls into the hopper and discharge the same in two equal portions into the trough J , at each side of the center thereof.

In the hopper K there is arranged a vibrating plate K' , mounted on a rock-shaft k , the said rock-shaft being provided with an arm k' , which is actuated by a cam j^2 on the shaft j . The lower end of the arm k' is provided with a slotted toe k^2 , adjustably bolted thereto and bearing upon the cam j^2 , and serving by its adjustment to correspondingly adjust the position of the plate K' . The plate K' is provided with a central aperture K^2 to receive the end of the main feeding-spout L , which rests upon the said plate, as shown in Fig. 3.

M represents a screw-bolt passing through an arm m on the hopper K and adjustable therein, the said screw-bolt forming an adjustable stop or rest for the feeding-spout L to limit the downward motion thereof. The feeding-spout L is of course free to vibrate when actuated by the vibrating plate K' .

The front shaft h is provided with a pulley N , by means of which it is driven through the medium of a suitable belt from a pulley N' on the shaft d of one of the rolls D . The rear shaft h is provided with a pulley O , by means of which it is driven through the medium of a suitable belt connecting it to a pulley O' on the shaft d of the other roll D . The shaft i^3 is driven by means of a belt from a pulley P on the front shaft h .

The operation of the machine is as follows: The machine being in operation the vibrating plate K' imparts a vibrating motion to the feed-spout L , and each time the said feed-spout descends it strikes sharply upon the support M and a portion of the material contained therein is disengaged into the hopper K . The amount of the material thus discharged may be readily regulated by adjusting the support M and the toe k^2 . The material thus discharged into the hopper K is parted by the dividing-ridge k^3 and falls into the trough J , along which it is fed in each direction and in equal quantities by means of the right and left conveyer J^2 . It then enters the feeding-spouts J' and is by them discharged between the rolls, where it is pulverized and falls through upon the wire-netting of the screen G . That portion which is sufficiently fine to pass through the said screen falls through into the trough L , while the coarser particles are carried upward by the buckets G^5 and discharged again between the rolls to be repulverized. The hopper F serves to guide the material properly between the rolls and also to prevent the buckets from

discharging the material in front of the front roller instead of between the two rollers.

I have found that when the revolving screen is driven at a sufficient rate of speed to enable it to conform in its screening capacity to the crushing capacity of the rolls there is a tendency to discharge the contents of the buckets in the manner just described. By employing the hopper F , I am enabled to overcome this disadvantage and give an increased speed to the revolving screen, and thus materially increase the capacity of the machine. That portion of the pulverized material which falls into the trough I is fed positively and regularly along the said trough and discharged therefrom as fast as it accumulates. The flanges i of the said trough extend upward as far as the top of the lower half of the casing and serve to prevent the lateral escape of the pulverized material which has passed through the wire netting of the revolving screen and to conduct the same positively into the trough I . These flanges also serve to prevent any of the coarser material which may escape from the lateral openings of the screen from falling into the trough I and becoming mixed with the pulverized material therein. By dividing the cylindrical screen G diametrically, in the manner hereinbefore described, into two separable halves I am enabled not only to employ rolls of comparatively large diameter, but I am also enabled to provide the said cylindrical screen with the inwardly-projecting flanges g^2 g^3 , which to a large extent close the sides of the said screen and prevent the lateral escape of the material operated upon.

It is obvious that various modifications in the details of construction may be made without departing from the principle of my invention, and I therefore do not wish to be understood as limiting myself strictly to the precise details hereinbefore described, and shown in the drawings.

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

1. In a pulverizing-machine, the combination, with the trough J , having right and left conveyer J^2 , of the central hopper K , arranged above said trough and provided with parting-ridge k^3 , the pulverizing-rolls, and their inclosing cylindrical screen, and the feeding-spouts J' , arranged at each end of the trough J and extending downward through the lateral openings of the screen to conduct the material to the rolls, substantially as and for the purposes specified.

2. In a pulverizing-machine, the combination, with the hopper K , having vibrating plate K' , on which the main feeding-spout rests, and the main feeding-spout, of the rock-shaft k , on which said plate is mounted, the arm k' on said rock-shaft, the trough J , and the conveyer J^2 , arranged in said trough and provided with shaft j , having cam j^2 to oper-

ate the arm k' , substantially as and for the purposes specified.

3. In a pulverizing-machine, the combination, with the hopper K, vibrating plate K' arranged therein, main feeding-spout, rock-shaft k , and arm k' , of the adjustable toe k^2 , mounted on said arm, and a suitable cam with which said toe engages, substantially as and for the purposes specified.

4. In a pulverizing-machine, the combination, with the side-plates G', consisting of the cylindrical body portion g , provided with the outwardly-projecting flange g' and flange g^2 , having an inclined extension g^3 , of the sectional rim G², the wedge-shaped cross-bars G³, secured to the sectional rims G², the wiregauze netting G⁴, and the feed-spouts L, substantially as specified and shown.

5. In a pulverizing-machine, the combination of the side plates G', the sectional rims G², the wedge-shaped cross-bars G³, the wiregauze netting G⁴, the flanges G⁶, and bolts g^6 , substantially as and for the purposes specified.

6. In a pulverizing-machine, the combination, with the pulverizing-rolls and the revolving cylindrical screen surrounding the same, of a horizontal trough arranged at the bottom of the screen and provided with a suitable conveyer, substantially as and for the purposes specified.

7. In a pulverizing-machine, the combination, with the casing, the pulverizing-rolls, and the revolving cylindrical screen surrounding said rolls and inclosed within the

casing, of a trough arranged at the bottom of the casing provided with upwardly-extending flanges which close the lateral spaces between the screens and the casing, and having a longitudinal conveyer, substantially as and for the purposes specified.

8. In a pulverizing-machine, the combination, with the pulverizing-rolls and the revolving cylindrical screen surrounding the same and provided with grooves g^5 , of a trough I, arranged at the bottom of the machine, provided with the longitudinal conveyer and having flanges i on its upper margins to fit the grooves g^5 , substantially as and for the purposes specified.

9. In a pulverizing-machine, the combination, with the rolls D, their shafts d and bearings C, of the yokes E, each consisting of end blocks e , notched at e' , and straps e^2 , having threaded ends to receive the nuts e^3 , substantially as and for the purposes specified.

10. In a pulverizing-machine, the combination, with the central pulverizing-rolls and the revolving cylindrical screen surrounding the same and provided with central elevating-buckets, of the hopper F, arranged within the screen and above the rolls and consisting of the inclined transverse plate f above the front roll, and the side plates f' , extending over the rear roll, substantially as and for the purposes specified.

RYERSON D. GATES.

Witnesses:

CARRIE FEIGEL,
IRVINE MILLER.