(No Model.) 2 Sheets—Sheet 1.

# W. H. THOMPSON.

## PULVERIZING MACHINE.

No. 249,489. Patented Nov. 15, 1881.

Fig. 1.

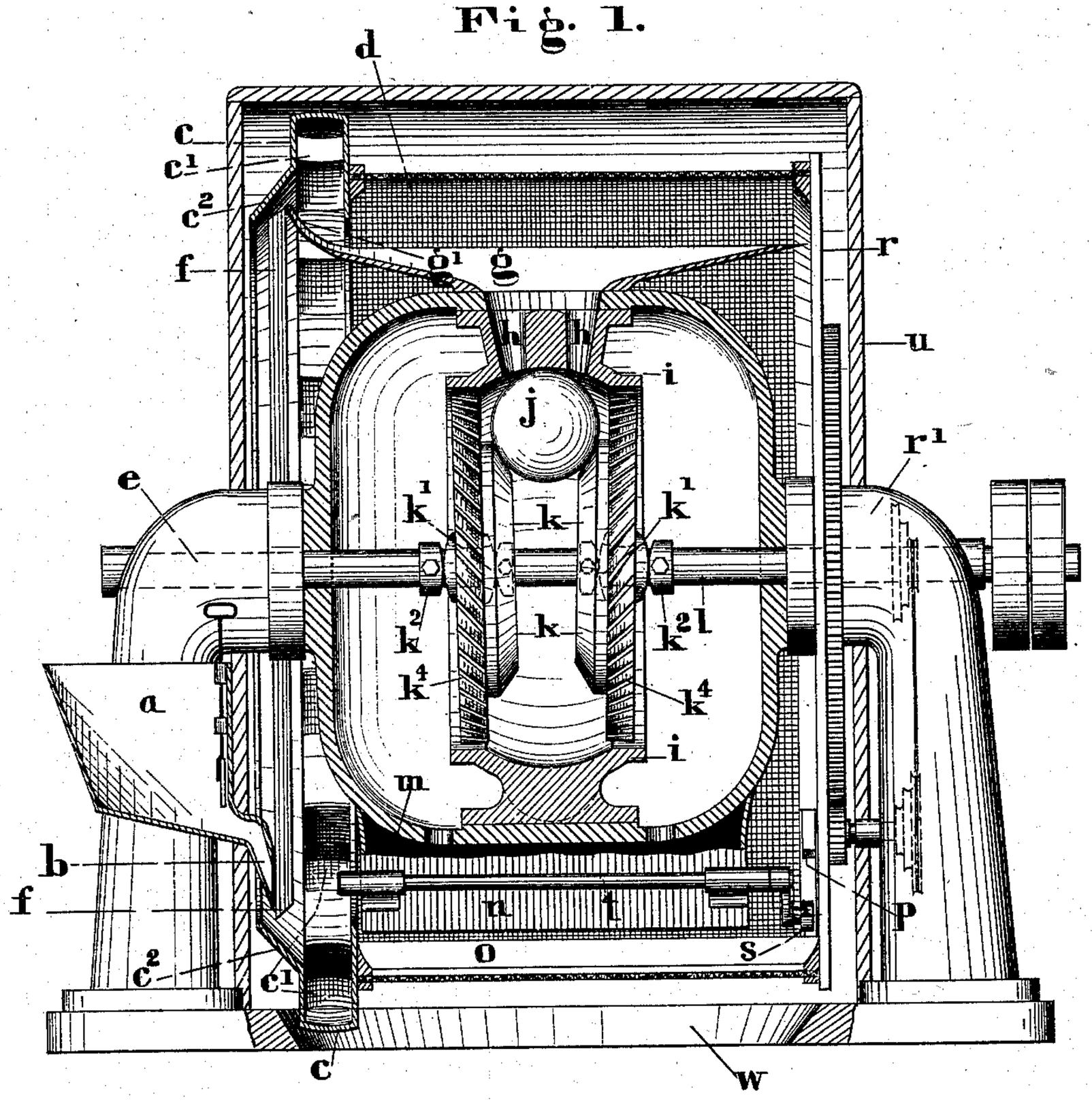
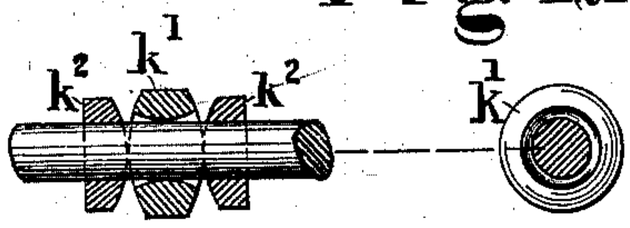



Fig. 1a.

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(No Model.) 2 Sheets—Sheet 2.

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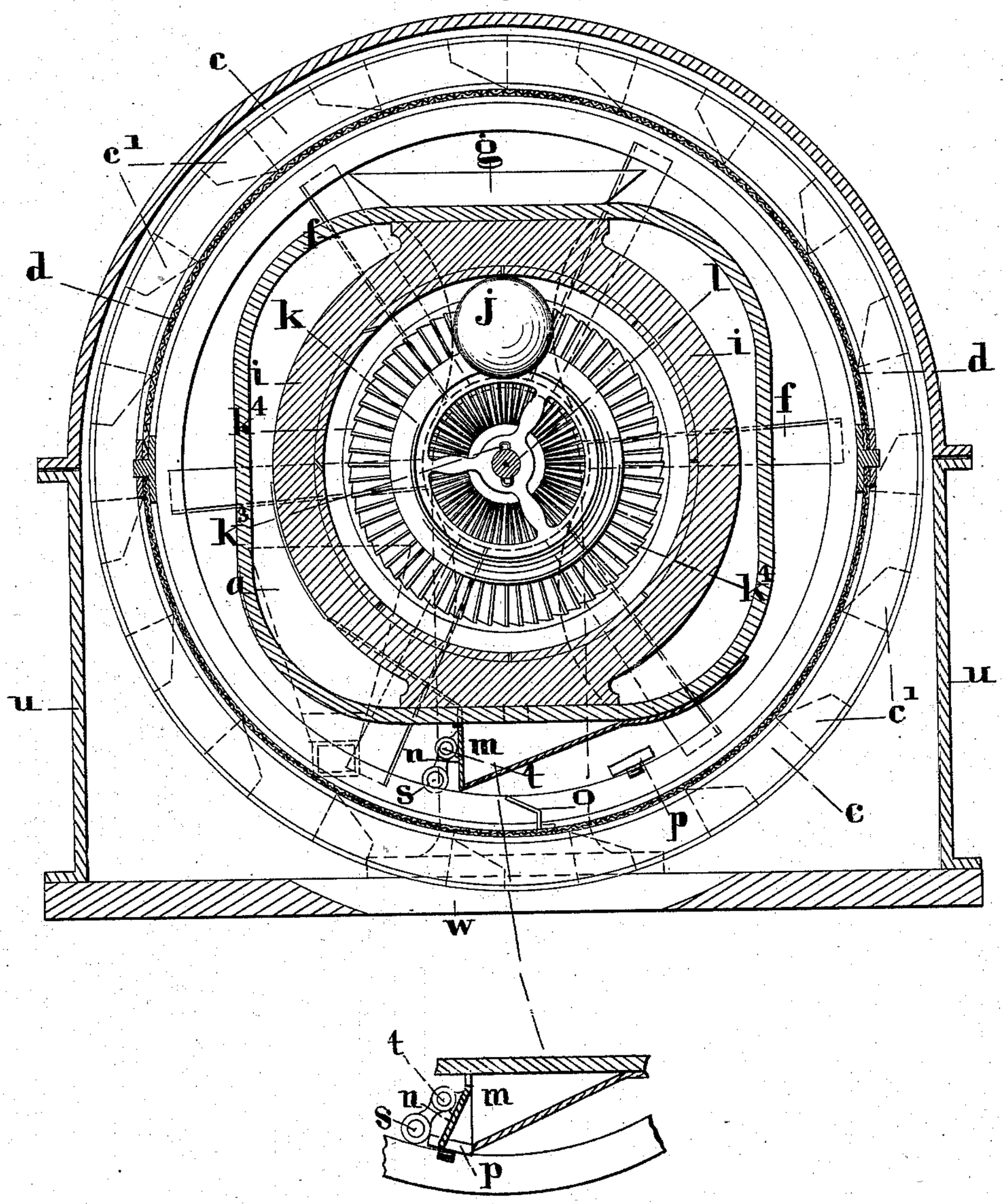
## PULVERIZING MACHINE.

No. 249,489. Patented Nov. 15, 1881.

Fig. 2.







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# UNITED STATES PATENT OFFICE.

WILLIAM H. THOMPSON, OF ISLINGTON, COUNTY OF MIDDLESEX, ENGLAND.

## PULVERIZING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 249,489, dated November 15, 1881.

Application filed May 11, 1881. (No model.) Patented in England November 8, 1876.

*To all whom it may concern:*

Be it known that I, WILLIAM HENRY THOMPSON, of Islington, county of Middlesex, and Kingdom of Great Britain, have invented new and useful Improvements in Pulverizing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention consists, mainly, in the combination, with a suitable inclosing-case and an independent sphere or ball, of certain means, hereinafter fully described, for giving the ball a movement about the inner periphery of the casing, and also at the same time a rotation upon its own axis.

It further consists in the combination, with the features above named, of other features hereinafter named, and also in certain details of construction, all of which will be fully described hereinafter.

In the drawings, Figure 1 represents a longitudinal sectional elevation of my improved machine, and Fig. 2 a transverse sectional elevation of the same.

To enable others skilled in the art to make my improved machine and properly use the same, I will proceed to describe fully its construction and the manner of its operation.

*a*, Fig. 1, represents a hopper, located at one end of the machine, into which the material to be pulverized is placed, which is provided with an inclined bottom, as shown, for permitting the ready discharge of its contents, and with a discharge-spout, *b*, as shown. The delivery of the contents of the hopper is controlled by a gate of any suitable construction, as shown.

*c* represents a wheel having radial arms *f*, and a proper hub or collar held by the standard *e*, by means of which it is properly supported in such manner as to be capable of free revolution.

*c'* represents one of a series of elevating-buckets located about the inner periphery of the wheel, and $c^2$ an annular inclined guiding-plate, by means of which the material discharged by the spout is properly directed to the buckets.

*d* represents a cylindrical sieve, inclosing the central portions of the mill, which is held at one end by the wheel *c* and at the other by the wheel *r*, as shown. The wheel *r* is supported by a proper standard, *r'*, as shown, and receives revolution from the main shaft through an intermediate system of pulleys and gear-wheels, which serve to give to the sieve a revolution less rapid than that of the main shaft.

*i* represents a circular ring or casing, strongly supported by the standards in any proper manner; and *h h*, openings through the same at the top, which communicate with the hopper *g*, as shown.

*g'*, Fig. 1, represents an extension of the hopper at one end, by means of which it is adapted to catch the contents of the elevating-buckets when the same are discharged by the revolution of the wheel.

*l* represents the main shaft, which receives movement in any proper manner from the main source of power.

*k k* represent disks, each of which is located on the main shaft at a proper point upon one side of the center, and each is provided with a peripheral beveled bearing-surface, as shown.

*k' k'*, Figs. 1 and 1ª, represent curved bearing-surfaces at the eye of the disk, by means of which the latter is adapted to rock upon the shaft and permit, consequently, a lateral vibration of its extremities.

$k^2$ $k^2$ represent collars, having curved bearing-faces, by means of which the disks are held against lateral movement at their centers without interfering with the freedom of their rocking movements.

$k^3$, Fig. 2, represents a key, by means of which the disks are united to the shaft *l* in such manner as to revolve with the same.

$k^4$ represents one of a series of blades secured to the disks, which blades are adapted by means of their location, inclination, and proximity to each other to prevent the escape of the material under treatment until it has become sufficiently pulverized.

*j* represents a sphere or ball, which in diameter slightly exceeds the distance between the beveled faces of the disks when the latter are held exactly at right angles to the shaft.

*m*, Fig. 2, represents a receptacle in which is received the pulverized material which is

discharged from the casing *i* through the openings between the blades $k^4$, the same being provided with an inclined bottom, as shown.

*n* represents a door to the receptacle, which is pivoted upon the shaft *t*, and is provided with an arm having a friction-roller, *s*, as shown.

*p*, Fig. 1, represents a cam or projection upon the wheel *r*, by means of which, at the proper time in the revolution of the sieve, the roller *s* is struck and moved to open the gate *n*, in order that the contents of the receptacle *m* may be discharged upon the sieve. By increasing or decreasing the length of the projection the door may be caused to remain open a greater or less time, as may be desired.

*o* represents a collector or bucket upon the sieve, by means of which any particles too large to pass the meshes of the sieve are returned by the revolution of the sieve to the hopper *g*. The position of the cam *p* is such that the gate *n* is opened only after the collector *o* has passed by the same.

*u* represents a casing, by means of which the escape of dust is prevented. *w w* represent openings through which the material passing through the meshes of the sieve is delivered to any desired point.

The operation of the described construction of pulverizer is substantially as follows: Rapid revolution having been communicated to the main shaft *l* from the main source of power, and the hopper *a* having been supplied with the material to be pulverized, the latter, when discharged from the spout *b* of the hopper *a*, will be delivered into the buckets of the wheel *c* and be lifted thereby into the hopper *g*. From the hopper the material will fall through the passages *h h* into the casing or ring *i*, and be there acted upon by the sphere *j* until sufficiently fine to pass through the openings between the blades $k^4$ into the receptacle *m*. The pulverized material then will accumulate in the receptacle while the slowly-moving sieve makes one revolution, and then, the door *n* of the receptacle being opened, the contents of the same will be discharged into the sieve below. By means of the collector *o* any particles too large to pass through the meshes of the sieve will be returned to the hopper *g* for further treatment. The main shaft and the disks have a rapid revolution, but the wheel *c* and sieve *d* have a slow revolution.

The operation of the disks and ball is substantially as follows: When the disks are revolved their tendency is to assume a position exactly at right angles to the shaft *l;* but as they cannot do this, for the reason that the diameter of the ball at the point of contact exceeds the distance between the adjacent bearing-faces, it follows that they bear or press upon the ball in their effort to assume this position and crowd the latter against the casing with greater or less force, according to the rapidity of the revolution. The disks, also, by the friction of the contact, carry the ball with them in their revolution about the casing, and thus communicate to it a centrifugal action. The disks, also, by the friction of this contact, communicate to the ball also an axial rotation. The ball then, it will be understood, is caused to act upon the material to be pulverized with a resultant force, which is obtained from three distinct sources, as follows: first, the direct radial thrust which is received from the efforts of the disks to assume a position at right angles to the shaft, the bearing-faces of the same acting as inclined planes to crowd the ball against the inner surface of the casing; second, the centrifugal action which results from the rapid revolution of the ball around the casing; and, third, the grinding action which results from the rotation of the ball upon its axis. By adapting the disks to rock upon the shaft the ball is permitted to move on radial lines to and from the shaft, according to the amount of material in the casing, without being free at any time from the action of the disks.

Some of the advantages of the described construction are as follows: The machine is automatic in its action; when in motion and kept supplied with material it will properly perform its work without the services of an attendant; by means of the threefold source of power most effective work is performed with great rapidity.

I do not limit myself to the precise construction shown.

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

1. In combination with an inclosing casing or ring and an independent ball, means, substantially as described, for giving the ball revolution around the casing and an axial rotation, substantially as described.

2. In combination, the ball, casing, main shaft, and disks, substantially as described, adapted to rock upon the shaft, as and for the purpose set forth.

3. The receptacle *m*, having the door *n*, with crank-arm, in combination with the projection *p* of wheel *r*, as described.

4. In combination with the rapidly-moving disks and ball, the more slowly-moving sieve and the intermediate driving mechanism for imparting the varying movements to said parts, substantially as described.

WM. H. THOMPSON.

Witnesses:
OWEN JONES,
C. W. HITTS.