No. 624,139. Patented May 2, 1899.

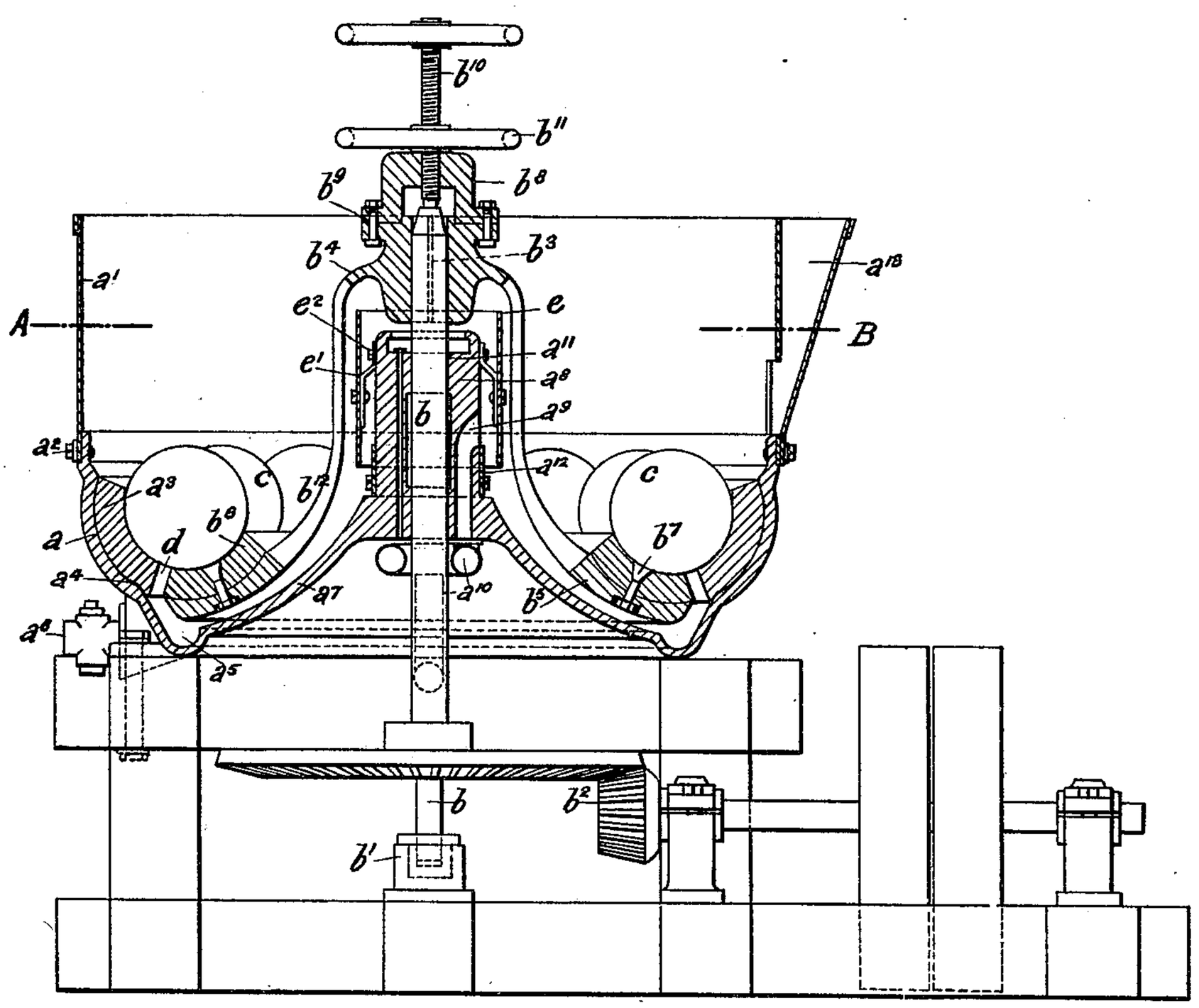
A. G. WELLS.

GRINDING MILL.

(Application filed May 21, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.



Witnesses:
C. Holloway
W. C. Pinckney

Inventor:
Alfrid George Wells,
By F. S. Allborn
Attorney

No. 624,139. Patented May 2, 1899.

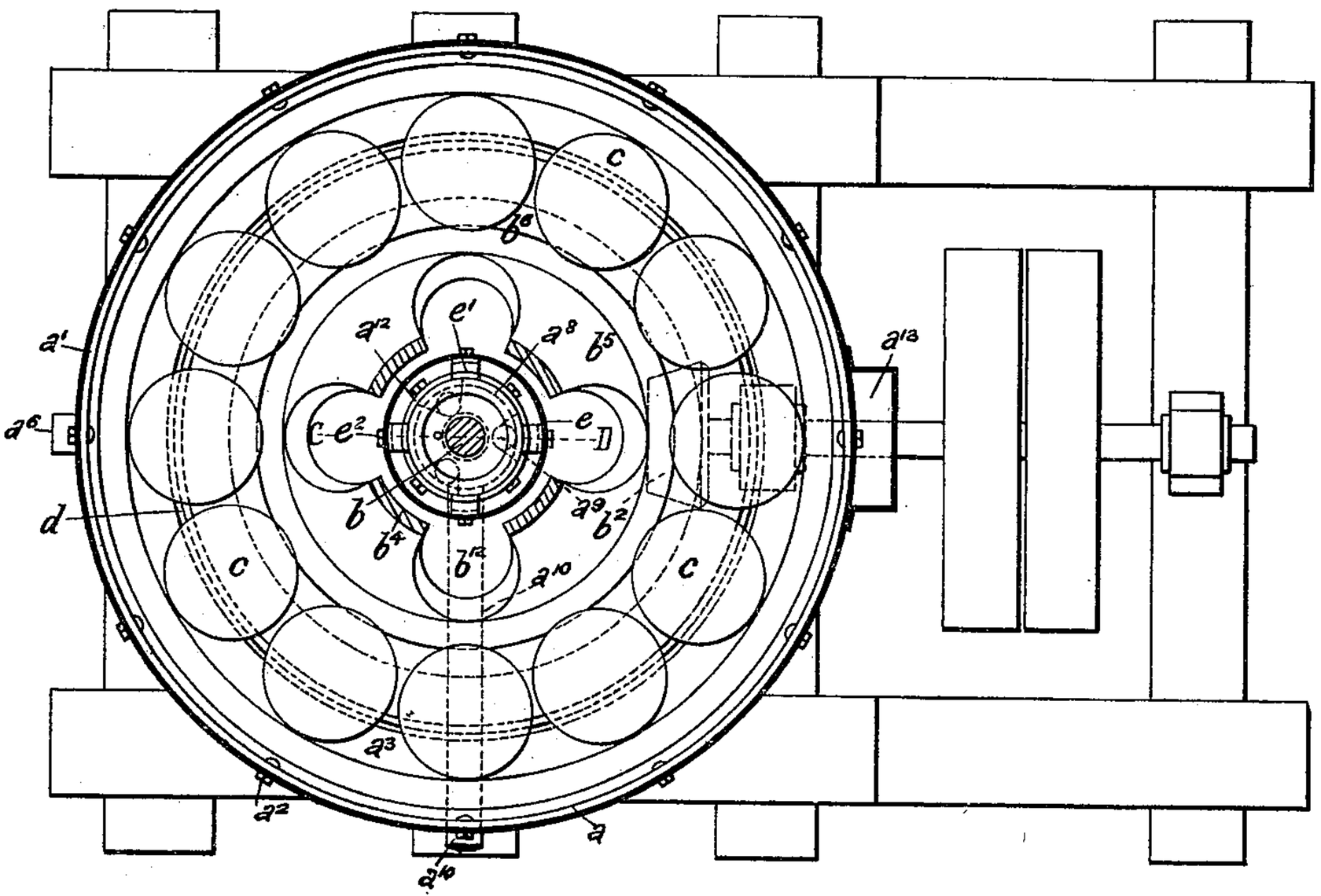
A. G. WELLS.

GRINDING MILL.

(Application filed May 21, 1898.)

(No Model.) 3 Sheets—Sheet 2.

FIG. 2



Witnesses:
C. Holloway
W. C. Pinckney

Inventor:
Alfred George Wells,
By F. A. Wilcox
Attorney

No. 624,139. Patented May 2, 1899.

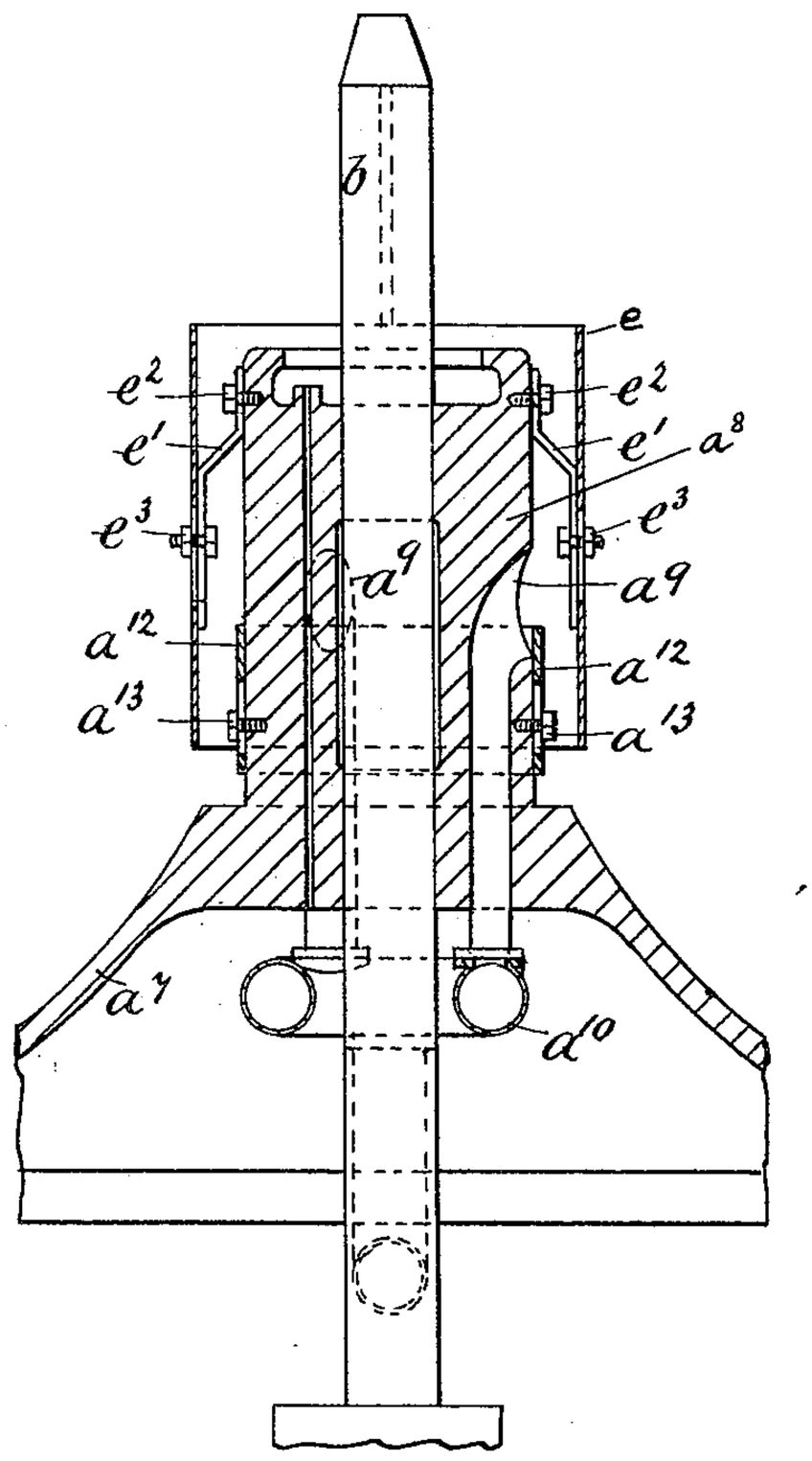
A. G. WELLS.

GRINDING MILL.

(Application filed May 21, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig: 3.



Witnesses:
C. Holloway
W. C. Pinckney

Inventor:
Alfred George Wells,
By F. W. Bowen
Attorneys

UNITED STATES PATENT OFFICE.

ALFRED GEORGE WELLS, OF LONDON, ENGLAND.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 624,139, dated May 2, 1899.

Application filed May 21, 1898. Serial No. 681,382. (No model.)

To all whom it may concern:

Be it known that I, ALFRED GEORGE WELLS, engineer, a subject of the Queen of Great Britain and Ireland, residing at London, England, have invented certain new and useful Improvements in Grinding-Mills, (for which I have filed an application for British Patent No. 28,893, dated December 7, 1897,) of which the following is a specification.

This invention relates to improvements in mills for grinding auriferous and argentiferous ores and the like and extracting the metal particles by mercury, one of the main objects of the invention being to enable the discharge of the ore-pulp to be regulated according to its specific gravity, whereby the efficiency of action of the mill will be considerably increased and there will be less liability of the loss of the finer metal particles desired to be extracted.

To this end the invention is characterized by so constructing the mill as to cause the ore-pulp to be discharged centrally of the pan through outlets around which a comparatively still body of the fluid ore-pulp may be kept to any desired depth and the overflow-level of which outlets may be regulated according or as best suitable to the specific gravity of the ore-pulp, so that the overflow will tend only to carry away the particles desired to be removed without liability of carrying away the metal particles desired to be extracted.

On the accompanying drawings, Figure 1 represents a vertical section of the improved mill. Fig. 2 represents a sectional plan thereof through A B, Fig. 1; and Fig. 3 represents a vertical section on C D in part and on an enlarged scale, showing the means of regulating the discharge of the pulp at the central outlets in different positions to those indicated in Fig. 1.

a is a stationary pan which at its outer periphery is adapted to support a water-tight casing a', bolted thereto, as at a^2, and a concaved grinding-ring a^3, seated therein, as at a^4, and at its lower portion is formed with an annular trough a^5, serving to contain mercury, and is fitted with a tap a^6 for discharging the contents of the trough, and within the circumference of the trough is formed with an upwardly-inclined bottom a^7, which at its central part a^8 rises to above the level of the liquid contents of the pan and below such level is formed with central outlets a^9, which communicate with a discharge-pipe a^{10}. The upraised central part a^8 of the pan a is also adapted, as at a^{11}, to serve as a bearing to the upper part of a vertical shaft b, which is mounted in a foot-step b' and can be driven by gearing b^2 from any convenient source of motive power, and above the bearing a^{11} is keyed, as at b^3, to an overhanging yoke b^4, which descends around the upraised central part a^8 of the pan, approximately conforming at its bottom part b^5 to the shape of the inclined bottom a^7 of the pan, and at its lower part is adapted to support a grinding-ring b^6, bolted thereto, as at b^7.

The grinding-faces of the rings a^3 b^6 are so shaped as to form a channel adapted to support a series of crushing-balls c, made of steel, iron, or other suitable material, and which can freely rotate in such channel, and the edges of such rings are spaced apart to form a continuous annular opening d below the crushing-balls and serving to deliver the crushed material directly to the subposed mercury-trough a^5. The distance between the bottoms a^7 b^5 of the pan a and yoke b^4 may be regulated and adjusted by means of a yoke top b^8, bolted, as at b^9, to the yoke b^4, and an adjusting-screw b^{10}, taking its bearing on the end of the shaft b and a set-nut b^{11}.

Between the upraised central part a^8 of the pan and the surrounding yoke b^4 is fitted a cylindrical shield e, which is adjustably secured to the part a^8 by brackets e' and bolts e^2 e^3, the bolts e^2 securing the brackets to the part a^8 and the shield being longitudinally slotted where the bolts e^3 pass through it to permit of its vertical adjustment in different elevations in relation to the pulp-outlets a^9. (*Vide* Fig. 3.) The shield e extends from below the water-level in the pan almost to the crown of the yoke and serves to prevent undue agitation of the ore-pulp in the vicinity of the outlets a^9 and to surround the latter with a comparatively still body of the ore-pulp to any desired depth. Evidently the form of the shield e may be varied; but the shield must extend over outlet or outlets a^9 at a distance in front thereof, so as not to close the same. Shutter a^{12} to be described may also be varied in form, but it must be

adapted to partially cover the outlet or outlets a^9 from the bottom, thereby raising the overflow edge of such outlet. The part a^8 is also fitted with an adjustable shutter a^{12}, which can be set at and secured by bolts a^{14} in different elevations in relation to the overflow-level of the pulp-outlets a^9, (*vide* Fig. 3,) so that such overflow-level can be adjusted, as required and as best suitable to the specific gravity of the ore-pulp under treatment, the shutter being longitudinally slotted where the bolts a^{14} pass through it to permit of its vertical adjustment in relation to the pulp-outlets.

In the operation of the mill the yoke b^4, with its grinding-ring b^6, is caused by the means described to rotate within the pan a and its grinding-ring a^3 and causes the balls c to roll around in the channel formed by the grinding-rings a^3 b^6 with a crushing action, which is peculiarly effective in pulverizing the ore, which, fed into a hopper a^{13}, attached to the casing a', falls into such channel and under the balls c. The pulp passes by the opening d and by other openings b^{12} in the yoke b^4 to the bottom of the pan in the trough a^4, of which the metal particles are extracted by the mercury, while the lighter particles of pulp float up the inclined surface of the pan-bottom until they pass away through the outlets a^9, the heavier particles circulating and undergoing further crushing treatment until sufficiently reduced. The mercury and extracted metal particles are drawn off from the trough a^4 by the tap a^6.

What I claim as my invention is—

1. In grinding and amalgamating mills for treating auriferous and argentiferous ores and the like; in combination; a stationary pan and a revoluble overhanging yoke fitted with annular concaved grinding-rings forming a channel adapted to support a series of crushing-balls and a continuous annular opening leading to the pan-bottom, the revoluble yoke being formed with openings for the circulation of the pulp and adjustably supported on a shaft rotated by gearing, and the pan being formed with an annular mercury-trough, an upwardly-inclined bottom and an upraised central part adapted to serve as a guide to the shaft supporting the revoluble yoke, and having an outlet a^9 for pulp leading to a discharging-pipe below the pan-bottom; a shutter adjustably applied to the upraised center part of the pan and serving to regulate the overflow-level of the inlets to the pulp-outlets; a cylindrical shield adjustably applied to the upraised central part of the pan around the pulp-outlets thereof, and a series of crushing-balls adapted to roll around within the channel formed by the grinding-rings and to be actuated by the rotation of one of such rings, as set forth.

2. In a mill of the character described, the combination of a stationary pan having an aunular trough a^5, and an upwardly-inclined bottom with a central part a^8, a revoluble yoke b^4 the lower part of which conforms approximately to the shape of the bottom of the pan, a grinding-ring b^8 secured to the yoke, a grinding-ring a^3 supported by the pan, balls c supported by the grinding-rings, means for turning said yoke, a central outlet a^9, and a shield extending over said outlet but not closing it.

3. In a mill of the character described, the combination of a stationary pan having an annular trough a^5, and an upwardly-inclined bottom with a central part a^8, a revoluble yoke b^4 the lower part of which conforms approximately to the shape of the bottom of the pan, a grinding-ring b^8 secured to the yoke, a grinding-ring a^3 supported by the pan, balls c supported by the grinding-rings, means for turning said yoke, a central outlet a^9, and an adjustable shutter a^{12}, which when raised raises the level at which pulp passes into outlet a^9.

4. In a mill of the character described, the combination with a pan having a bottom a^7 with a central part a^8 having an outlet a^9, of an adjustable shutter on part a^8, and an adjustable shield e around part a^8 and extending over said outlet a^9 but not closing it.

Signed at London, England, this 29th day of April, 1898.

ALFRED GEORGE WELLS.

Witnesses:

CHARLES AUBREY DAY,

ALFRED CHARLES DAY.