M. F. ABBÉ.

PEBBLE MILL.

APPLICATION FILED MAR. 9, 1909.

944,996. Patented Dec. 28, 1909.

Fig. 1.

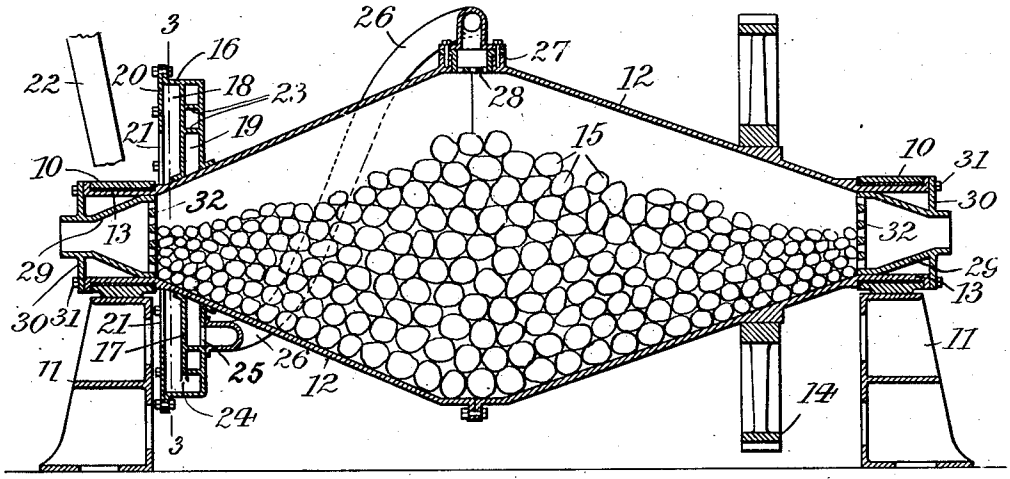


Fig. 4.

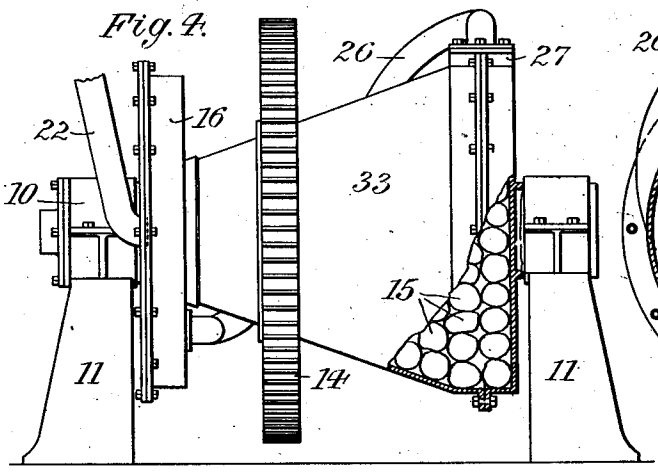


Fig. 3.

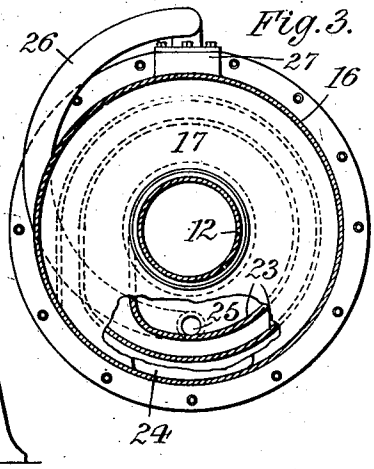
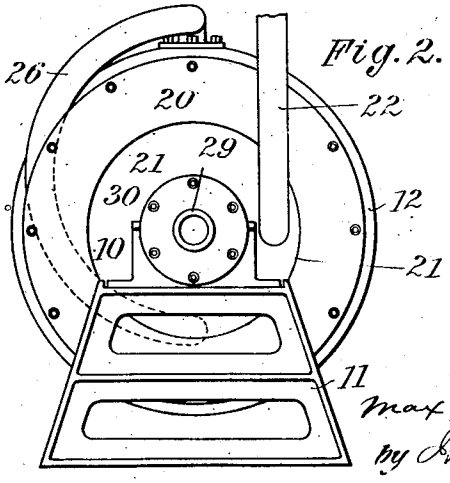


Fig. 2.



Witnesses:
Arthur E. Grumpe
Edward Schorr.

Inventor:
Max F. Abbé
by Dewey Brien & Mfg.

UNITED STATES PATENT OFFICE.

MAX F. ABBÉ, OF NEW YORK, N. Y.

PEBBLE-MILL.

944,996. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed March 9, 1909. Serial No. 482,242.

To all whom it may concern:

Be it known that I, MAX F. ABBÉ, a citizen of the United States, residing at New York city, Manhattan, county and State of New York, have invented new and useful Improvements in Pebble-Mills, of which the following is a specification.

This invention relates to a pebble mill provided with a tapering barrel or shell, and means for feeding the material to be ground to the widest part of the shell where the grinding efficiency is greatest so that the output of the mill is considerably increased.

In the accompanying drawing: Figure 1 is a vertical longitudinal section of my improved pebble mill; Fig. 2 a left hand end view thereof; Fig. 3 a cross section, partly broken away, on line 3—3, Fig. 1, and Fig. 4 a side elevation, partly in section, of a modification of the mill.

Within bearings 10 of standards 11 is rotatably supported the shell or barrel 12 of the mill. This shell is composed of two frusto-conical sections which are reduced toward the ends of the mill, and are joined at their base which thus forms the center of the mill. In this way shell 12 tapers from the center toward both ends, where it terminates in hollow trunnions 13 which engage bearings 10. The axis of shell 12 is arranged in a substantially horizontal direction and the shell is rotated by means of a driving wheel 14 and a suitable power shaft (not shown). Within shell 12 are contained the usual grinding balls or pebbles 15 which, owing to the tapering form of the mill, will, during operation, have the tendency to move inward along the inclined sides of the mill toward the center thereof, *i. e.*, toward that portion of the mill which has the largest diameter. Thus, by the lateral pressure exercised upon the central pebbles, the latter will be crowded upward to form a central bulge, as shown. Furthermore, as the balls are usually of various sizes, the larger balls will gather at the center, the balls gradually decreasing in size toward trunnions 13. It is evident that, owing to the conditions described, the grinding power of the mill is greatest at its maximum diameter and gradually decreases toward its reduced diameters.

Means are provided for feeding the material to be ground to the mill at that portion thereof which has the greatest grinding capacity, that is to say, at its greatest diameter, so that the largest particles to be ground are subjected to the most forceful grinding action, such action gradually decreasing with the gradual reduction of the particles. In this way the power of the mill is utilized to great advantage. The means for effecting the feed of the particles to be ground are as follows: Upon one of the reduced ends of shell 12 is fitted a cylindrical casing 16 divided by partition 17 into a pair of chambers 18, 19. The outer wall 20 of chamber 18 has an annular opening 21 for admitting the feed pipe 22, which is shown broken away in Fig. 1. Within inner chamber 19 is contained a feed spiral 23, the outer convolute of which communicates with chamber 18 by an opening 24 of partition 17. The inner convolute of spiral 23 communicates, through opening 25 of casing 16, with the inlet end of a spiral conveyer 26 adapted to convey the material to be ground to a peripheral inlet opening formed at the center or greatest diameter of the mill. Conveyer 26 is coiled partly around shell 12 and its flanged outlet end is bolted to a boss 27 formed on the center of such shell. Within this boss may be contained a grate 28 which prevents pebbles 15 from dropping into the conveyer. By fitting casing 16 upon the reduced end of the mill, space will be economized and the diameter of the latter will not be unduly increased, while the material to be ground will be nevertheless fed to its widest portion.

Within each of the hollow trunnions 13 is removably fitted a tapering discharge nozzle 29, the outer plate 30 of which is bolted at 31 to a flange of the trunnion. At its inner end, nozzle 29 is provided with a grate 32 which permits the discharge of the ground material, while confining the balls within shell 12.

In use, the material to be ground will, from tube 22 and chamber 18, be fed to spiral 23 which delivers it through conveyer 26 to the center of the mill, *i. e.*, to that part of the mill which has the greatest diameter. Here the coarser particles are attacked by the accumulated larger grinding balls, while the reduced particles will be subjected to a further reduction as they are forced toward the discharge nozzles 29.

In Fig. 4, the shell 33 of the mill is of single frusto-conical form, so that it is widest, not at the center, but at one of its ends. Here too, the material to be ground is

fed into the widest portion of the shell through conveyer 26, to pass toward the reduced discharge end thereof.

I claim:

1. A pebble mill comprising a coniform shell having a peripheral inlet opening at the widest portion thereof, a pair of supporting bearings, means for axially rotating the shell, grinding bodies inclosed within the shell, a casing encompassing the shell, a spiral conveyer within the casing, and means for connecting the casing with the inlet opening.

2. A pebble mill comprising a coniform shell having a peripheral inlet opening at the widest portion thereof, a pair of supporting bearings, means for axially rotating the shell, grinding bodies inclosed within the shell, a casing encompassing a reduced section of the shell, a spiral conveyer within the casing, and a feed spiral connecting the casing with the inlet opening.

3. A pebble mill comprising a coniform shell having a peripheral inlet opening at the widest portion thereof, a pair of trunnions, one of which is hollow, means for axially rotating the shell, grinding bodies inclosed within the shell, a casing encompassing the shell, a spiral conveyer within the casing, and means for connecting the casing with the inlet opening.

4. A pebble mill comprising an axially rotatable shell provided with a peripheral inlet opening at a point intermediate its ends, said shell having discharge openings on opposite sides of the inlet opening, grinding means inclosed within the shell, and means for feeding the material to the peripheral inlet opening; whereby the ground material will be free to flow without obstruction in opposite directions to the discharge openings.

5. A pebble mill comprising a coniform shell having a peripheral inlet opening in its widest portion, means for axially rotating the same, grinding means inclosed within the shell, and means for feeding the material into the peripheral inlet opening.

Signed by me at New York city, (Manhattan,) N. Y., this 8th day of March, 1909.

MAX F. ABBÉ.

Witnesses:

FRANK V. BRIESEN,

EDWARD SCHORR.