

Quartz Mill.

Patented Jan'y 30, 1866.



Inventor  
C. H. Wagner



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN QUARTZ-MILLS.

Specification forming part of Letters Patent No. 52,347, dated January 30, 1866.

*To all whom it may concern:*

Be it known that I, CONRAD PH. WAGNER, of the city, county, and State of New York, have invented new and useful machinery for crushing and pulverizing quartz and other ores containing metals and other substance and I do hereby declare that the following is a full and exact description of my said machinery and the manner of operating the same, reference being had to the drawing accompanying and making part of this my specification.

The drawing, consisting of Figure 1, is a double drawing in one, presenting two views, one side presenting an exterior elevation of one half of the machine, the other presenting a vertical cross-section through the center of the machine, the exterior being removed from the other half, the operating parts of the machine being circular and on all sides alike.

The nature of my invention consists in the manner of subjecting the ores or materials to be acted upon to a combined and simultaneous crushing, triturating, and pulverizing operation between two vertical revolving toothed surfaces, the interior conical and the exterior partly a hollow cone and partly cylindrical, the speed of the interior cone being accelerated many times beyond that of the exterior, but revolving in the same direction, and the chamber or space formed by the two cones in which the ore is placed diminishing in width and in the size of the teeth gradually toward the bottom, where it becomes extremely minute, so as to discharge the reduced ores finely pulverized, provision being made for graduating the size of this opening or vent to any degree of minuteness by adjustment of the interior cone.

The machinery is placed between two strong iron galleys-frames, A A, opposite and parallel to each other, and standing vertically upon an iron bed-plate, C, to which they are firmly bolted. A cross-head, B, unites the two sides of the frame at the top and furnishes in part a support and bearings for the machinery of the interior cone. In the center is placed the strong vertical revolving shaft D, having its bearings in a journal-box in the cross-head B at *d*, where it rests upon an adjustable collar, *d'*. The lower part of the shaft has a bearing also, at *d''*, upon the center of cross-bars or radii fixed to the bed-plate, the whole of the bed-plate underneath the revolving parts of

the machine being left open in the casting, excepting the bars which form the lower bearing of the shaft, this opening being circular to correspond with the shape and interior diameter of the revolving parts above. The lower part of the shaft D is furnished with a screw-thread to receive two nuts, *d<sup>4</sup>* and *d<sup>5</sup>*, one above the bars, the other underneath, by the turning and adjustment of which two nuts the shaft and its cone attached may be raised or lowered and held in place when adjusted. Around shaft D is the crushing and pulverizing irregular cone E, flanging or widening toward the lower part and hollow like a funnel for about one-half its length, so as not to touch the shaft at the hollow part. The hollow interior portion is shown at *e*. That part of the cone E which is above the hollow funnel-shaped portion is firmly fixed to the shaft by keys or bolts, or may be cast in one piece with the shaft. All around the exterior surface of E it is provided with teeth, which are largest at the upper part of E and gradually diminish in size to near the bottom or place of discharge, where they cease. They are to be made of tough chilled iron, cast solid with the cone itself, or may be made separately, so as to be replaced. The upper end of shaft D is provided with a drum, G, with a tip or flange at the bottom, *g*, to carry a belt for communicating rotation. At the head of the shaft is the balance-wheel H.

Around E, I place the corresponding operating part I, which on the interior surface is partly cylindrical and partly conical, so as to create a chamber or space between the two which shall be wide enough at the top to receive the broken pieces of the ore, and shall gradually narrow down to the lower edge or place of discharge, at which point the lower edge of I nearly touches the lower edge of E. This part I is cast in segments and is provided with teeth of chilled iron corresponding to those opposite on E. These segments are bolted fast to the outer hollow cylindrical and cone-shaped part, K, which surrounds the part I and holds the segments firmly by the bolts *k k* and supports and carries the operating part I, as next described. The part K is provided on its outer periphery with supporting and friction wheels L L, running on axles *l l*. These wheels are supported by and travel upon a circular hori-



zontal track, M, placed upon the raised rim or flange N, which is a part of the bed-plate and surrounds the edge of the circular open space in the bed-plate above described. The lower edge of K is provided with a lip or flange,  $k''$ , which, extending outward and under a lip or flange on M, prevents its being lifted out of place by the pressure upon the ore when the machinery is in operation. Around the periphery of K is placed the large drum O, having a lip, o, at the lower edge for carrying a belt, by which it and its connections K and I are put in rotation.

Having thus described the construction of my machinery, I proceed to describe its operation, as follows: A rapid rotation is given to drum G and to its connections D E. At the same time a much slower motion—say as about one to six, though I do not confine myself to any exact proportion—is given to the drum O in the same direction. The ore having been prepared and reduced to a suitable size is thrown into the chamber or space between E and I, so as to be kept full. The unequal speed of rotation of the crushing and pulverizing parts E I causes the ores to pass rapidly across each other between the opposite sides, and this, combined with the pressure of the descending mass and the gradually contracting space and the tendency to descend by gravity and the centrifugal force, crushes and pulverizes the ore, which, as it becomes fine enough to pass out through the opening between E and I at the bottom, falls in a continuous stream of almost impalpable dust. The fineness of the dust is regulated and adjusted by means of the nuts  $d^4$   $d^5$  and the screw on the shaft above described, for by screwing down nut  $d^5$  the shaft is raised and

the lower interior surfaces of E and I are brought down together, while by turning the nut in an opposite direction the shaft descends and the space is enlarged. The rotation of the two parts E I, if at the same speed, will not produce any crushing or pulverizing effect upon the ore, and if the rotation of the two is in opposite directions the effect is very slight, and does not answer a useful purpose; or if one is stationary and the other in rotation this will not produce the desired effect, inasmuch as the operating faces or surfaces of the parts next the ore and which are in contact with them will be cut or worn away rapidly, for the ores will grind or wear across the teeth and faces instead of being reduced by attrition upon the ores themselves; but by giving a motion of unequal rotation in the same direction, there is produced not merely a granulation, but a very minute, smooth pulverization or flouing by the attrition of the particles upon each other, and at the same time there is a great saving of wear of the surfaces and teeth.

Having thus described my machinery and the manner of operating the same, what I claim therein as my invention, and for which I desire Letters Patent, is—

The combination of the two crushing and pulverizing cylinders E I, arranged and constructed as described, with rotation of the two cylinders in the same direction, but one with a greatly accelerated speed over that of the other, for the purpose and operating in the manner described.

C. PH. WAGNER.

Witnesses:

W. H. BLACKLER,  
J. B. STAPLES.