(No Model.)

T. W. WATSON & T. DENNY.

GRINDING AND AMALGAMATING MACHINE.

No. 423,502. Patented Mar. 18, 1890.

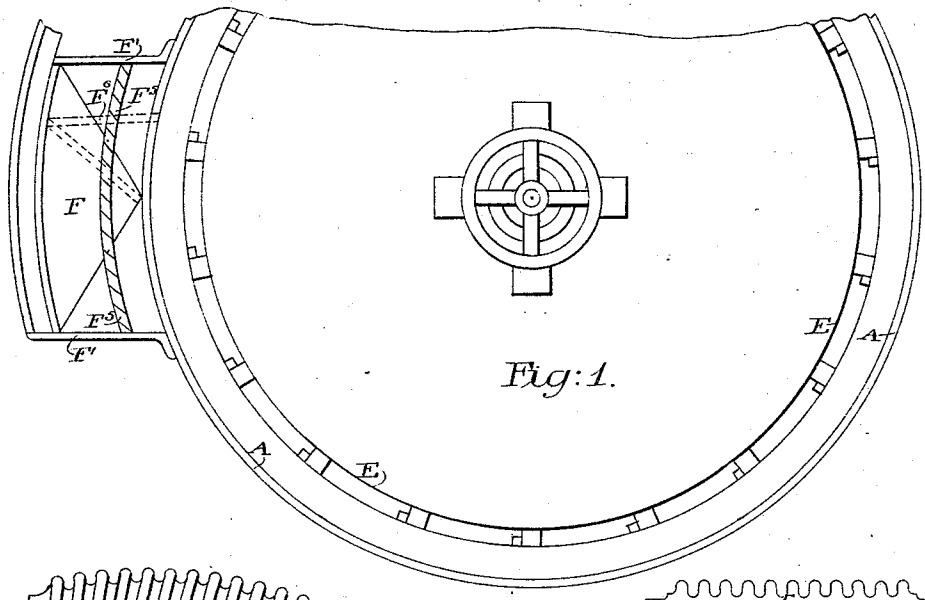


Fig: 1.

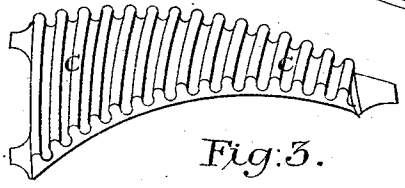


Fig: 3.

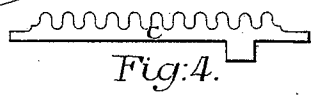


Fig: 4.

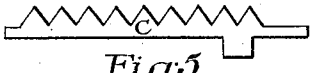


Fig: 5.

Fig: 2.

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UNITED STATES PATENT OFFICE.

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GRINDING AND AMALGAMATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 423,502, dated March 18, 1890.

Application filed July 18, 1888. Serial No. 280,333. (No model.) Patented in Victoria October 19, 1885, No. 4,285; in New South Wales July 29, 1886; in Queensland November 17, 1886, No. 136; in South Australia March 28, 1887, No. 786; in Tasmania October 6, 1887, No. 496/9, and in New Zealand October 18, 1887, No. 2,588.

To all whom it may concern:

Be It known that we, THOMAS WILLIAM WATSON and THOMAS DENNY, subjects of the Queen of Great Britain, residing, respectively, at St. Arnaud, in the British colony of Victoria, and at 93 Chapel street, South Yarra, in the said colony, have invented new and useful Improvements in Grinding and Amalgamating Machines, (for which we have obtained patents in the following British colonies: Victoria, dated October 19, 1885, No. 4,285; New South Wales, July 29, 1886, but unnumbered; Queensland, November 17, 1886, No. 136; South Australia, March 28, 1887, No. 786; Tasmania, October 6, 1887, No. 496/9, and New Zealand, October 18, 1887, No. 2,588,) of which the following is a specification.

This invention relates to improvements in combined grinding, classifying, and amalgamating machines, and is designed to produce a machine which will reduce to an almost impalpable powder all descriptions of ores, but especially those containing gold and silver; and the improvements consist, first, in forming the working-surfaces of the upper and lower grinding-segments of a corrugated section, so as to have a larger surface through which the material under treatment has to pass; second, in arranging the bottom of the pan and the lower segments in such a manner as that there is a clear space between them in which to place mercury for amalgamating purposes, and, third, in the peculiar construction of the overflow-classifier, which reduces to a minimum the possibility of losing any of the precious metals.

These improvements may be applied to any description of pan which works on the millstone principle; but the grinding-pans to which our first and second improvements are specially applicable are those which have a central vertical revolving spindle, which carries a circular plate, to the under side of which the upper segments are affixed. The lower corrugated surfaces of these segments grind and work upon the lower segments of a similar section placed at the bottom of the pan, which is itself circular. By forming the grinding-surfaces of a corrugated section, as described in the first improvement, it is nearly impossible for the material under treatment to pass through them without being very finely ground. The upper and lower segments may have either curved or straight joints, or they may be made in the form of a disk. To carry out the second improvement, the bottom of the pan is made flat for a certain distance from its periphery, and then it gradually ascends in a straight or curved line to the center, where it reaches the level of the bottom of the lower segments, whose inner ends are supported upon it. Thus the vertical section of the space between the pan and lower segment assumes that of an elongated wedge, and the outer ends of the lower segments are held up to their horizontal position either by forming a ring at the bottom of the pan or on the bottom of the segments themselves.

The third improvement, relating to the overflow-classifier, is applicable to any description of grinder-pan or amalgamating-machine, and consists in forming at the outside of the machine, around the overflow-opening, a box or cistern whose three sides taper toward its bottom at an angle of about fifty to sixty-five degrees, and such bottom has an opening in it which leads to the pan slightly above or in a line with the corrugated grinding-surfaces. By this means the outflowing material from the pan has to pass through the still water in the classifier, which thus enables the heavier particles of ores or precious metals to fall by gravity to the bottom, whence they are led back to the pan through the lower opening, while the waste material passes away from the classifier through the overflow at its top. It is evident that by this means much precious material is saved that would otherwise be lost.

Although there may be a degree of similarity between the general appearance of our machine and those in common use, still we claim to have produced a useful and meri-

torious invention, with which the millions of tons of auriferous tailings now lying idle on the surface of all gold-fields may be worked economically and expeditiously, at the same time yielding large profits, whereas with all known appliances the gold contained in such auriferous tailings could only be extracted at a cost considerably in excess of their value.

The drawings hereto attached illustrate at Figure 1 a part plan, and at Fig. 2 a central section, of a machine having our improvements embodied in it. Fig. 3 is a plan of the lower corrugated segment; and Fig. 4, a longitudinal section of it, showing a circular corrugation, while Fig. 5 is a longitudinal section showing an angular corrugation.

In the drawings, A is the pan, and A′ its bottom; B, the space forming the mercury-well; C, the lower segmental grinding-plate; D, the upper segmental grinding-plate attached to the rotary carrying-plate E, which is supported by the tubular carrier E′, secured upon the central vertical spindle E^2, to which motion is imparted by bevel-gearing E^3, the pinion of which is on the lay-shaft E^4. The segments forming the upper grinding-plate D are secured to the carrying-plate E in any approved manner, while the bottom segments C have at their bottom the rib C′ to raise them to a horizontal position and allow space for the mercury-well.

The inner wall of the classifier F is formed, preferably, by the side of the pan, while its outer walls are formed by the box F′, which tapers at an angle of from fifty to sixty-five degrees nearly to a point at its bottom end, and leads to the hole F^2 between it and the pan.

F^3 is the inlet-hole to classifier, and F^4 the waste discharge or overflow from it, and F^5 is the divergent plate at top of classifier.

The operation of our machine is as follows: The material to be treated is fed into the pan with the necessary quantity of water, and by the currents therein carried to between the corrugated segmental grinding-plates D and C, while the liberated metal falls and is brought into contact with the mercury in the well B. The ground material escapes through the opening F^3 near top of pan to the classifier, and owing to the agitation at this point a large percentage of coarse grains are carried into the classifier and in the ordinary way would flow away to the waste-heap; but the material passing from the agitated water in the pan to the still water of the classifier causes the heavy and not sufficiently-ground particles to fall to the bottom of the classifier, when, by the influence of the currents, they re-enter the pan through the opening F^2 and thence between the corrugated grinding-surfaces D and C until each particle is sufficiently fine to float with the current over the still water of the classifier-discharge F, and thence to the waste-heap. The adjusting-board F^6, fitted into the classifier near its one end, is designed to regulate the discharge of the material under treatment to any desired degree of fineness, and the diverting-board F^5 is to divert the current passing from F^3 to F^4, causing it to pass under the lower edge of the diverting-board F^5, by which means the very finest particles of metal, as well as coarse particles of ore, are made to sink.

Having thus described the nature of our invention and the manner of performing same, we would have it understood that what we believe to be new, and therefore claim as our improvements in combined grinding, classifying, and amalgamating machines, is—

1. The combination, in an ore crusher and amalgamator, of a pan having a portion of its bottom from the axis toward the periphery inclined and thence to the periphery horizontal, a stationary crushing-disk provided with feet C′ near its periphery, resting on said bottom to form an amalgamating-chamber below said disk, and a revoluble crushing-disk co-operating with the stationary disk, substantially as and for the purpose specified.

2. The combination, in an ore crusher and amalgamator, of a pan provided with an axial tubular vertical bearing and a bottom extending on an inclined plane from the bearing toward the periphery and thence on a horizontal plane to said periphery, a revoluble shaft extending through said bearing and carrying a tubular support encompassing the tubular bearing, a grinding-disk connected with the tubular support, and a stationary grinding-disk provided with feet C′ near its periphery, said stationary grinding-disk resting on the bottom of the pan and being adapted to co-operate with the revoluble grinding-disk, substantially as for the purpose specified.

3. The combination, in an ore crusher and amalgamator, of a pan, revoluble crushing devices arranged therein and near the bottom thereof, and a classifying or settling chamber on the outside of the pan and in communication therewith by a port near the upper edge of the pan and a port at or near the bottom of said pan, said chamber having inclined walls to direct the subsiding material to the lower part, and a diverting-board projecting from above into said chamber in front of the upper port, substantially as and for the purposes specified.

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