

No. 675,872.

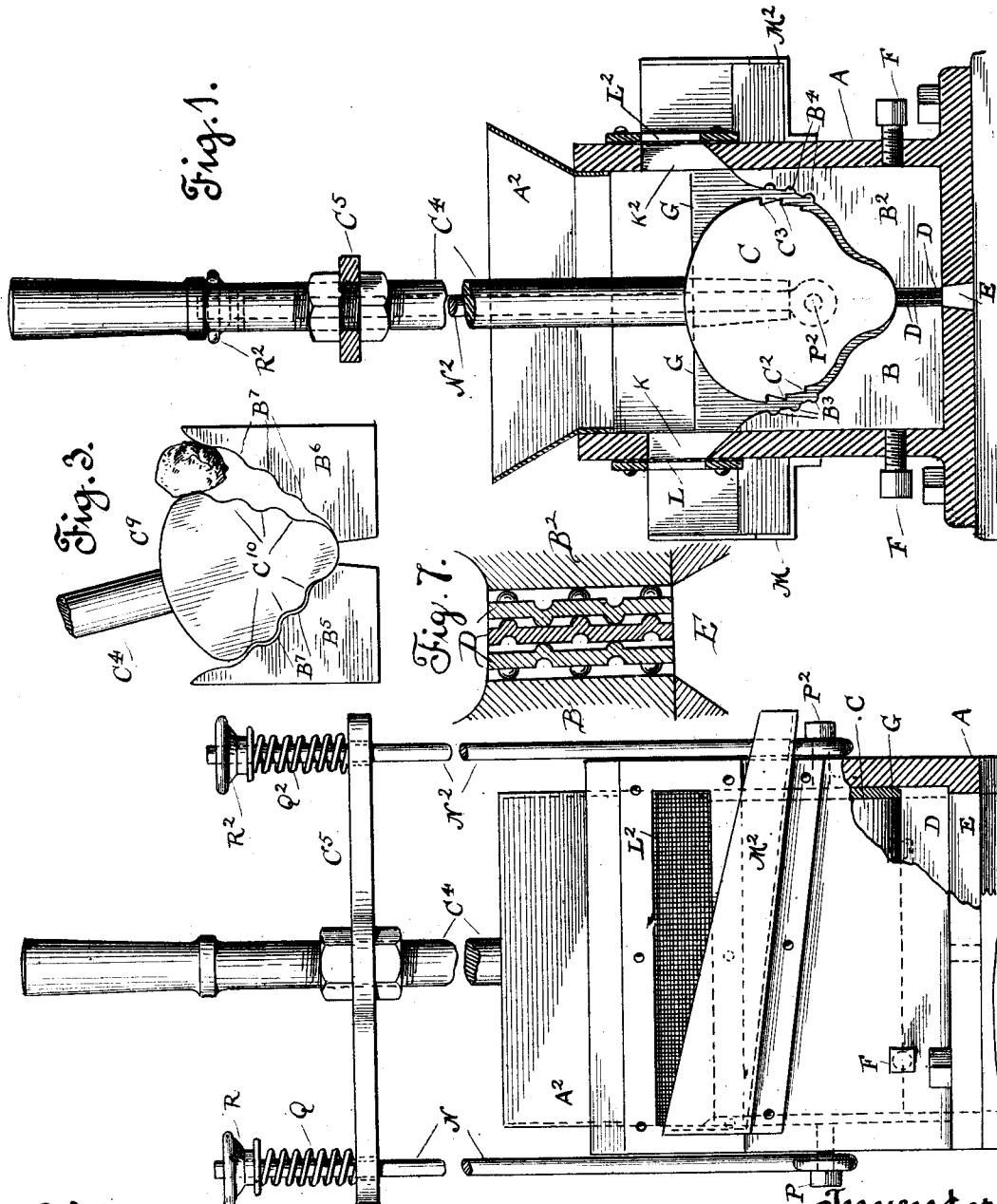
Patented June 4, 1901.

A. FORD.
QUARTZ MILL.

(Application filed Oct. 26, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.

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George A Proctor

Fig. 2.

Inventor.

Archibald Ford

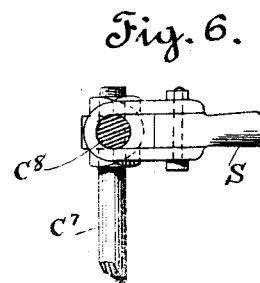
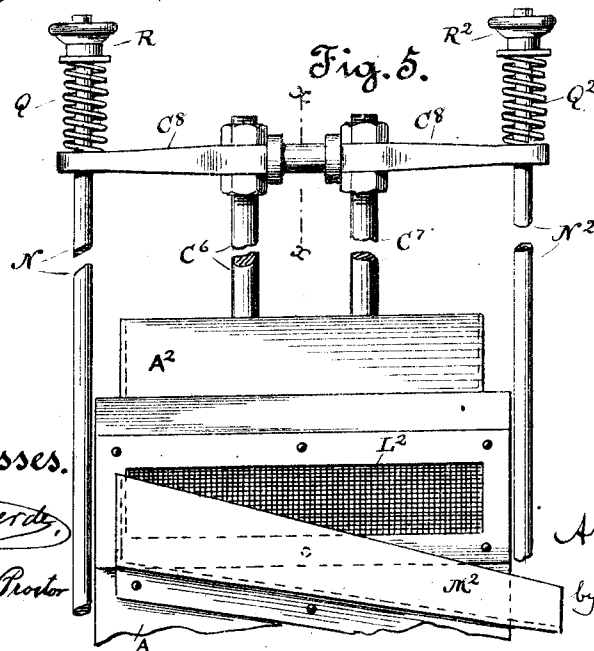
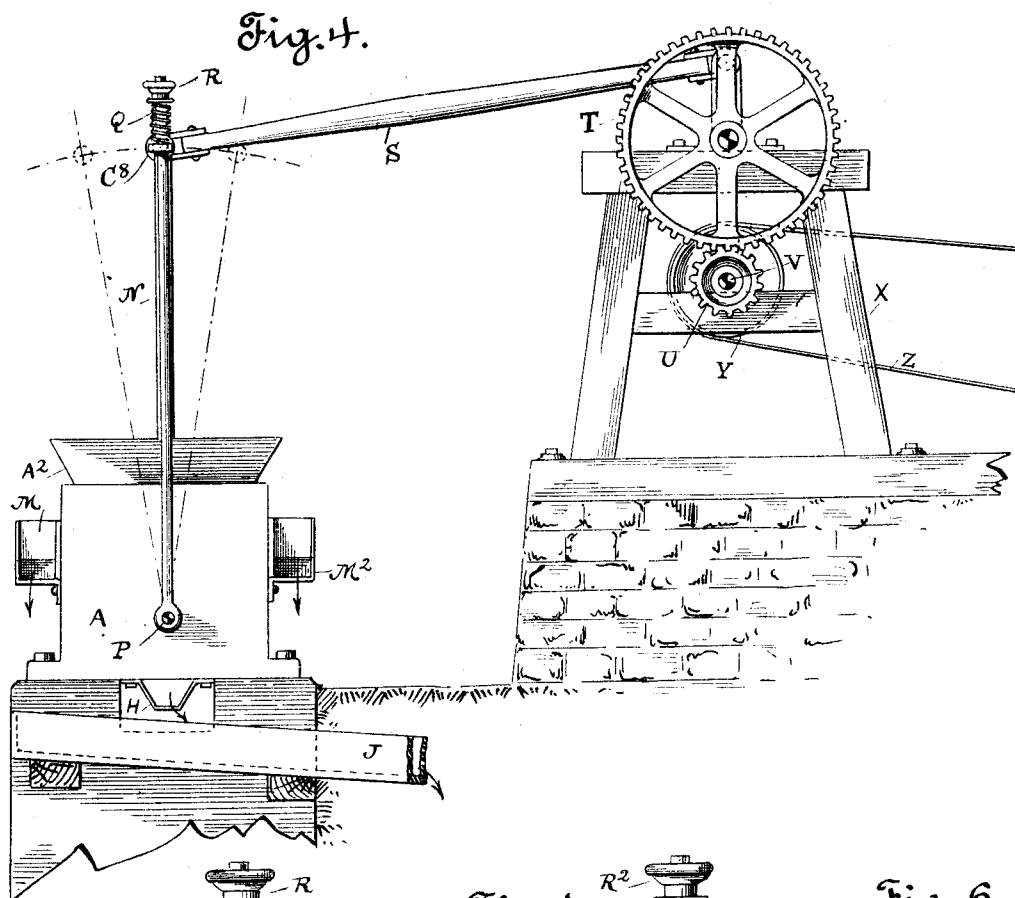
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(Application filed Oct. 26, 1899.)

(No Model.)

2 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

ARCHIBALD FORD, OF GOLDENGATE, CALIFORNIA.

QUARTZ-MILL.

SPECIFICATION forming part of Letters Patent No. 675,872, dated June 4, 1901.

Application filed October 26, 1899. Serial No. 734,850. (No model.)

To all whom it may concern:

Be it known that I, ARCHIBALD FORD, a citizen of the United States of America, and a resident of Goldengate, in the county of Alameda and State of California, have invented certain new and useful Improvements in Quartz-Mills, of which the following is a specification.

This invention relates to machines for breaking, crushing, and grinding ores.

One object of the invention is to provide a machine of this class which is of simple and easy construction and will do its work quickly and thoroughly whatever may be the nature of the ore operated on.

A further object is to have a mill that can advantageously be made of any size, from the smallest to the largest, so the same will be available for prospecting and assaying, as well as for working a fully-developed mine.

Reference is had to the drawings hereto annexed for a detailed description of the invention.

In the said drawings, Figure 1 is a sectional end view of a small portable hand-mill embodying my improvements which is particularly adapted for prospectors' and assayers' use and is designed to work on ore previously broken up or existing in small pieces. Fig. 2 is a partly-broken front elevation of the same. Fig. 3 is a diagrammatic view showing the crushing parts of the mill used for breaking the larger pieces of ore preparatory to grinding. Fig. 4 is a miniature representation of a mill of the same type as the one represented in Figs. 1 and 2, but made in practice of much larger dimensions and run by power instead of by hand. Fig. 5 is a broken front view, also on a small scale, of the upper part of a power-driven mill such as is shown in end elevation in the preceding figure. Fig. 6 is a detailed view of part of the power connections in the latter-named mill. Fig. 7 is a detail showing the construction of the screening-plates.

Like reference-signs indicate like parts throughout the specification and drawings.

The letter A represents an iron box which may be bolted to any suitable base or foundation, as shown in Figs. 1, 2, and 4. In the bottom of this box are placed two chilled-iron shoes B B², shaped so as to receive between

them a "compound" rocker C and under it a set of plates D directly over a bottom discharge E. These few parts are the principal parts of my improved mill.

A² is one form of hopper which may be used to let down the ore to be ground into the box A. This hopper is furnished, when desired, with an automatic feed apparatus, particularly in the large-sized mills.

As shown in Fig. 1, the shoes B B² aforesaid are inclined downwardly from the sides to the middle of the box A and have a wavy surface, on which the ore fed from the hopper A is gradually crushed and pulverized as it runs down on them under the rocker C. They are furthermore provided each with three or four half-round or semicylindrical corrugations B³ B⁴. The rocker C is substantially pear-shaped in cross-section and set with its point down on the plates D and the lower edge of either of the shoes B B². It is made to fit and engage the hollows and swells of the shoes' upper faces when inclined on either side, and it is also provided with laterally and downwardly projecting teeth C² C³ opposite the corrugations B³ B⁴ in said shoes. The peculiar shapes thus given to the shoes and rocker are believed to be the best that can be devised to render the mill effective, the same affording gradually-decreasing spaces for the ore to be ground in, suitable inclines for the mineral-matter to slide down on, recesses that prevent the comminuted mineral water from flying up, but rather keep it working or forcing its way downward, and a continuous grinding on manifold or compound surfaces until the ore is all reduced to pulp and leaves the mill.

By preference the lower or grinding part of the rocker C is made of chilled iron, up to a point above the teeth C² C³. The upper part, in which is socketed the hand-lever or rocker-rod C⁴, is made of soft iron.

The shoes B B² are pushed inward toward the rocker C and adjusted with relation to it, as they wear out, by means of set-screws F passing through the sides of the box A.

G indicates loose plates, one of which is provided at each end of the rocker C, to prevent the ore from reaching the ends of the box A and getting packed there. These plates are adjustable and rest edgewise on the bottom

of the box. They are suitably cut in their middle lower portion to allow the plates D to pass through.

The main discharge for the ground ore and water with which it is usually worked is the bottom discharge E, hereinbefore referred to. The ground ore, however, is not let directly into the opening E. It has first to pass between the plates D, which are set on edge and supported above the said opening between the lower inner sides of the shoes B B². Three or four plates D are provided, not less than two being used in any case. These plates are rough-surfaced and set quite close together—that is, about one one-hundredth of an inch apart one from another—or so as to leave interstices that will have the same effect on the ground ore as is secured from a forty to a sixty mesh screen. They act like a screen on the pulp, their rough surfaces or indentations and close setting having the same action on it as a fine screen. In practice these plates are center-punched on one of their vertically-disposed faces, thereby forming projections on the opposite sides which keep them just sufficiently apart to exclude the passage of any but very finely pulverized matter. The projections on any plate are made so as to be more or less alternate with the corresponding depressions on its contiguous plate in order to keep the plates asunder to the extent of the projections only. Rough surfaces would have the same effect. Hence my use of "rough-surfaced" and "indented," as above. From the bottom opening E the pulp falls into an under chute H, Fig. 4, down which it runs into another chute, J, suitably supported on the side of the foundation that the mill rests on. The chute H is open at both ends, so that it may be easily washed out and all the pulp therein secured after a given quantity of ore has been passed through the mill.

There are two side discharges for the mill besides the bottom discharge at E. These consist of the two lateral openings K K², covered by the screens L L² and discharging into the chutes M M², which are bolted to the sides of the box A. The side discharges, it will be understood, carry away the water and ground ore that splash up upon the rocker C being swung over the shoes B B². The lower edges of the openings K K² and upper edges of the shoes B B² are suitably beveled, as shown in Fig. 1, to let the splashing water and ore find their way readily into the side chutes M M². The chutes M M² drop their contents into the chute J the same as chute H. (See Fig. 4.)

Several means may be employed to work the rocker C—that is to say, to swing it back and forth on the ore dropped between it and the shoes B B²—though for the prospector's and assayer's mill it is thought nothing simpler or better could be used than the plain hand-lever or rocker-rod C⁴ hereinbefore mentioned, which is inserted in a socket formed in the top of the rocker, about the center thereof. This is all that is necessary

to run the mill; but to render its action more positive and regular I provide in addition two outside rods N N², which are yieldingly or flexibly connected to the rocker-rod C⁴ by a flat spring or else a cross-bar C⁵ and pivotally connected to the ends of the box A by means of bolts or collar-studs P P², passed through eyes in the lower ends of said rods. (See Figs. 1 and 2.) These rods are attached to the box a little below or above, but preferably below, the center of the rocker therein and have spiral springs Q Q² coiled around their upper ends and confided between hand-wheels R R² thereon and the ends of the bar C⁵ below the same. The upper ends of the rods N N² pass and slide through holes in the ends of the bar C⁵, which is fastened to the rocker-rod C⁴. It will be seen that these springs assist in grinding by bearing down on the rocker, and at the same time the rocker is able to adjust itself on the ore that is being ground. The hand-wheels allow the springs to be compressed or relaxed at the will of the operator to suit the grade of ore operated on. When the rocker is swung over to one side or the other by reason of its fulcruming on the shoe, its point is lifted off said shoe and the springs compressed by reason of the change of the fulcrum of rods N N², which is off the center of oscillation of the rocker, and the springs acting to expand to their normal force the point of the rocker onto the other shoe. The pulp therefore runs down easily to the bottom discharge.

In the power-driven mill, Figs. 4 and 5, I make use of two rocker-rods C⁶ C⁷ to swing the rocker, the same being assisted also by end rods N N², with a cross-bar C⁸, springs Q Q², and hand-wheels R R², as in the hand-mill. To a central rounded portion of the bar C⁸ is attached one end of a pitman S. (See Fig. 6 in addition to Figs. 4 and 5.) The other end of the pitman S is connected with a crank-gear T, which is turned by a pinion U, secured to a shaft V, journaled in suitable bearings on the frame X, and driven by a pulley Y and belt Z.

Fig. 3 shows the form of rocker and shoes employed for breaking the ore that is in large pieces previously to passing it through the mill represented in the other figures. The rocker C⁹ and shoes B⁵ B⁶ in this view are respectively made with large corrugations C¹⁰ and B⁷ and are well adapted to receive and crush the coarser or heavier ore between them. These corrugations may be provided only on one side of the rocker and on only one of the shoes, if desired. The shoes B⁵ B⁶ and rocker C⁹ are placed in a machine similar to the one hereinabove described and operated substantially in the same way, and in practice I couple the two machines, so that the same form one continuous mill.

Having now described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A quartz-mill comprising shoes separated

to provide a discharge-opening and having inclined undulating surfaces, plates closely set on edge between said shoes and acting to screen the material passing through the discharge, and a rocker placed between the shoes above said plates, and having inclined undulating surfaces complementary to the shoe-surfaces, substantially as described.

2. In a quartz-mill, the combination of a box, shoes therein having oppositely-disposed crushing-faces and separated at their lower ends, means for adjusting said shoes toward and from each other, said box having an opening in its bottom beneath the space between said shoes, and a plurality of plates loosely resting upon the bottom of said box over the opening therein and between the lower ends of said shoes close together and acting to screen the material passing to the discharge-opening in the bottom of the box, substantially as described.

3. In a quartz-mill, the combination with oppositely-disposed shoes having inclined crushing-surfaces, of a rocker between said shoes and adapted to fulcrum at its upper part on said shoes, means acting positively to move the lower end of the rocker from one shoe to the other, when the end of the rocker is lifted by reason of its upper part fulcruming on one of the shoes, substantially as described.

4. In a quartz-mill, the combination with oppositely-disposed shoes having generally-inclined undulating crushing-faces, of a rocker between said shoes having complementary undulating crushing-faces, means for rocking said rocker, a rod fulcrumed to said rocker off the center of oscillation of the same, and a yielding connection between the rocking means and said rod, substantially as described.

5. A quartz-mill comprising inclined shoes, a rocker between the same, a rocker-rod secured to said rocker, another rod fulcrumed at a suitable place off the rocker's center of oscillation, and a flexible or yielding connection between the rocker-rod and the said other rod, substantially as set forth.

6. A quartz-mill comprising inclined shoes, a rocker between the same, a rocker-rod secured to said rocker, other rods fulcrumed at suitable places opposite the ends of the rocker, off the center of oscillation thereof, and a spring connection between said other

rods and the rocker-rod, substantially as set forth.

7. A quartz-mill comprising a box, wavy-surfaced inclined shoes therein, a correspondingly-shaped rocker placed between said shoes, a rocker-rod secured to said rocker, a cross-bar fastened to said rocker-rod, other rods pivotally connected with the ends of said box beyond or off the center of the rocker and passing freely through holes in the ends of said bar, springs bearing on the bar, and hand-wheels to regulate the tension of said springs, substantially as set forth.

8. A quartz-mill comprising shoes separated to provide a discharge-opening and having inclined surfaces, rough-surfaced or indented plates closely set on edge between said shoes and acting to screen the material passing through the discharge, and a rocker also placed between the shoes above the said plates, substantially as described.

9. A quartz-mill comprising shoes separated to provide a discharge-opening, rough-surfaced plates set on edge close together between said shoes and acting to screen the material passing through the discharge, and a rocker also placed between the shoes above said plates, substantially as described.

10. A quartz-mill comprising shoes separated to provide a discharge-opening, rough-surfaced plates set on edge close together between said shoes and acting to screen the material passing through the discharge, and a pear-shaped rocker between the shoes and resting at its point on the plates, the crushing-surfaces of the shoes substantially conforming to the rocker-surfaces, substantially as described.

11. A quartz-mill comprising shoes separated to provide a discharge-opening, rough-surfaced plates set on edge close together between said shoes and acting to screen the material passing through the discharge, a rocker also placed between the shoes above said plates, and means, as set-screws, for adjusting the shoes against the plates, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARCHIBALD FORD. [L. S.]

Witnesses:

GEO. A. YOUNG,
A. H. STE. MARIE.