H. GARDINER.

Ore Mill.

No. 10,685. Patented March 21, 1854.

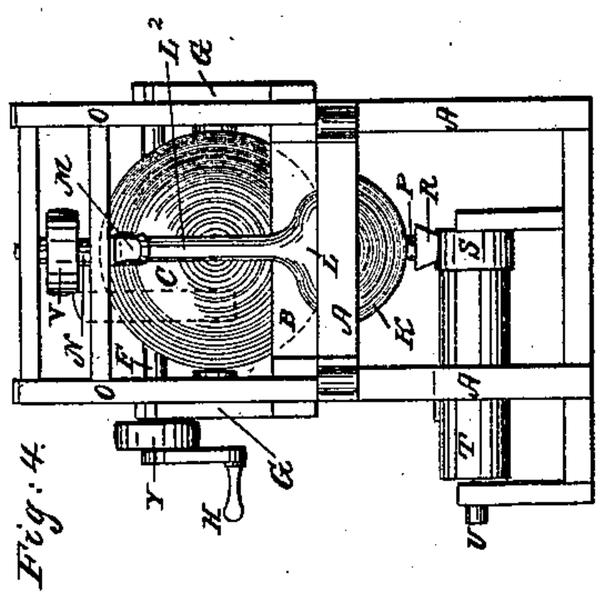

Fig: 4.

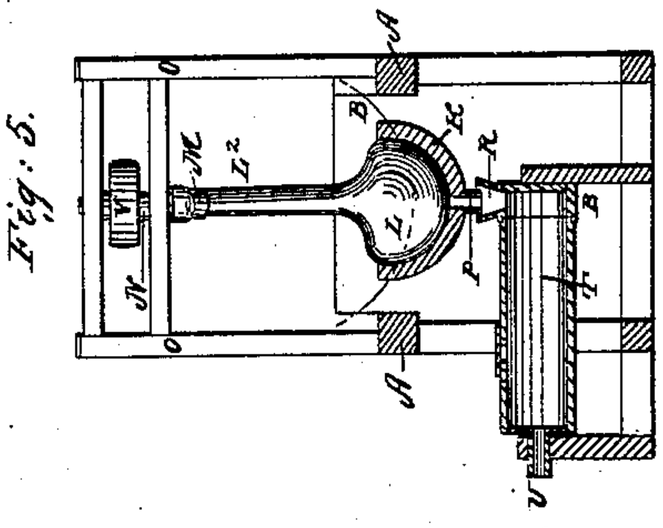

Fig: 5.

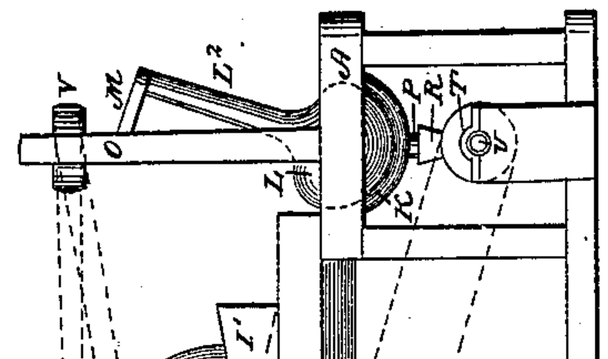

Fig: 1.

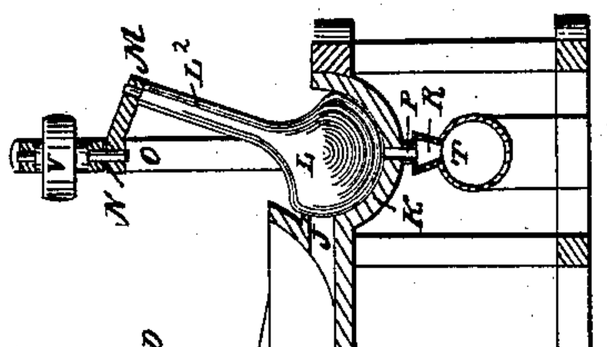

Fig: 2.

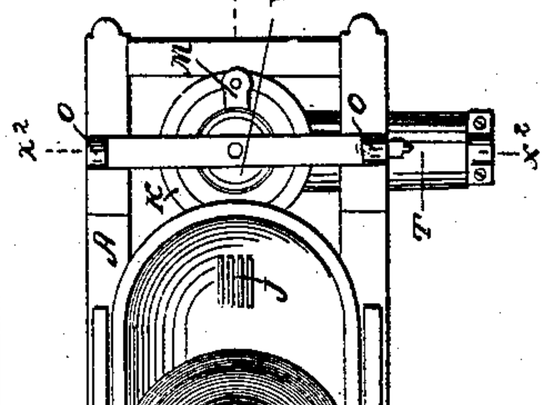

Fig: 3.

UNITED STATES PATENT OFFICE.

HEMAN GARDINER, OF NEW YORK, N. Y.

IMPROVEMENT IN QUARTZ-CRUSHERS.

Specification forming part of Letters Patent No. **10,685**, dated March 21, 1854.

To all whom it may concern:

Be it known that I, HEMAN GARDINER, of the city, county, and State of New York, have invented a new and Improved Quartz Crushing, Pulverizing, and Amalgamating Machine; and I do hereby declare that the following is a full and clear description of the same.

The nature of my invention consists in making and using an oblong chilled cast-iron trough arranged in a suitable frame and having on the side rails of the trough-frame reversed inclined planes, so as to give a winding rolling motion to a heavy cast-iron ball in the trough as it is made to roll backward and forward by means of a connecting-rod attached to a crank and driven by any suitable power for the purpose of making a machine for crushing and pulverizing earths, quartz-rock, or other substance containing any of the precious or baser metals.

But to describe my invention more particularly I will refer to the accompanying drawings, forming a part of this schedule, the same letters of reference wherever they occur referring to the same parts.

Figure 1 is a side elevation of the machine. Fig. 2 is a longitudinal cut section of the machine through line *x x*, Fig. 3. Fig. 3 is a plan view of the machine. Fig. 4 is a vertical end view of the machine. Fig. 5 is a view of a vertical cut section of the machine through the line x^2 x^2, Fig. 3.

Letter A is the frame of the machine, which may be made of any suitable material for the purposes required and shape to suit the position and place it is to be used in.

B is a chilled cast-iron trough placed longitudinally between the side rails of the machine. The length, width, and depth of the trough may be varied as circumstances and the size of the machine may require, the curve of the trough, however, being rounded out, so as to fit the sides of a crusher-ball C. This ball is some three to six feet (more or less) in diameter, having a hole bored through its axis for a cylindrical rod or bar D to pass as an axle-tree, on which the ball rotates.

To the ends of the axis D is attached the forked end of a connecting-rod E, having its back end attached to a crank-shaft F, arranged transversely of the frame of the machine on arms G G and operated by steam, manual, or horse power, as represented, by the crank-handle H on the end of the crank-shaft.

On each side rail of the machine frame or trough is secured an inclined plane I′ I^2. These inclined planes have reversed inclinations, the object of which is to give the ball C as it is propelled backward and forward in the crusher-trough by the connecting-rod a twisting or spiral motion at the same time of the rolling motion, and thereby cause it to touch and grind the quartz against the sides of the trough more perfectly than could be done if but one uniform motion had been communicated to the ball—that is, an alternating rolling motion. The importance, therefore, of this double motion given to the ball in the crusher-trough will be obvious, and is claimed by me as an entirely new principle of operation for the motion of a crusher-ball for quartz-crushing machinery.

Letters J J, &c., are several apertures in the front end of the crusher-trough, leading to a pulverizer pot or basin K. The object of these apertures is for the purpose of allowing the granulated wash and quartz from under the crusher-ball to escape into the pulverizer trough or basin and underneath the pulverizer-pestle L.

The pulverizer-basin is made of cast-iron, of about three feet in diameter, more or less, as may be desired, and is either cast as a part of the same casting with the crusher-trough or separate and joined to the crusher-trough by suitable connections for securing them firmly together, so as to allow of the passage-ways J J, leading from the crusher-trough to the pulverizer-basin.

In the pulverizer-basin is a pestle L, made of cast-iron and spherical, so as to fit the inside of the pulverizer-basin, and having a handle L^2, the upper end of which is fitted in the end of a crank-lever M, so that as it is rotated by means of a vertical shaft N, secured in the standards O O, erected on the frame of the crusher-machine, a gyrating and rolling motion is communicated to the pestle round the inner sides of the pulverizer-basin to reduce the granulated ore received from the crusher-trough to an impalpable mass.

When the ore has been pulverized, it is discharged through an orifice P in the bottom of

the pulverizer-basin into a hopper R, secured to a stationary head S of the amalgamator-cylinder T. This cylinder is made of iron and of any suitable diameter and length desired. The end of it where the hopper is attached is made stationary, and through the other is a hollow axis U, through which the lighter and earthy matters are discharged from the amalgamator. The arrangement of the hopper may be dispensed with, and the amalgamator-cylinder be placed by the side of the machine and hollow axles at both ends of the cylinder be used, the point of ingress having a bent tube communicating with the funnel from the lower side of the pulverizer-basin, so as to have the discharge from the amalgamator always lower than the point of ingress.

In the interior of the amalgamator-cylinder may be arranged a series of cleats or agitators for mixing and agitating the quicksilver with the pulverized ore as the amalgamator-cylinder is rotated.

Letter V is a pulley on the vertical shaft N, and W is another pulley on the main crank-shaft F, around which a belt X passes for communicating to the pulverizer-pestle the gyrating and rolling motion.

Letter Y is a driving-pulley on the main shaft F for communicating a rotating motion to the amalgamating-cylinder by means of a belt Z passing around them.

The operation of my machine is that when set in motion broken pieces of rock quartz are thrown into the crusher-trough, over which the crusher-ball is made to roll by means of the connecting-rod. In doing so the opposite ends of the axis on which the ball runs are alternately elevated and depressed in running up and down the inclined ways on the side rails of the machine, and thereby giving to the ball a twisting and grinding motion simultaneously with the forward and backward rolling motion to reduce the rock quartz to a coarse grit. When thus reduced or small enough to pass through the apertures in the trough, it is worked through the passage-ways to the pulverizer-basin, and there by the rolling and gyrating motion of the pestle is ground to an impalpable mass. It is then discharged through the funnel in the bottom of the pulverizer-basin into the amalgamator-cylinder, which, being charged with quicksilver and kept constantly agitated by its revolving motion, intimately mixes the ore and quicksilver together, so as to allow the quicksilver to take up all the particles of gold, while the earthy and lighter sedimentary matter is discharged from the hollow axis at the end of the amalgamator. When the quicksilver has become charged with gold, a man-hole in the side of the amalgamator-cylinder is opened, and the quicksilver or amalgam is removed for the separating process.

Having now described my invention and its operation, I will proceed to state what I claim and desire to secure by Letters Patent of the United States.

What I claim is—

The crusher-trough having on each side rail reversed inclined planes I' and I^2 for the purpose of giving the ball as it is propelled backward and forward in the trough a twisting motion, substantially as hereinbefore set forth.

HEMAN GARDINER.

Witnesses:

ROBT. S. ROWLEY,

CHARLES L. BARRITT.