D. H. ANDERSON.
Quartz-Mill.

No. 212,829. Patented Mar. 4, 1879.

Fig. 1

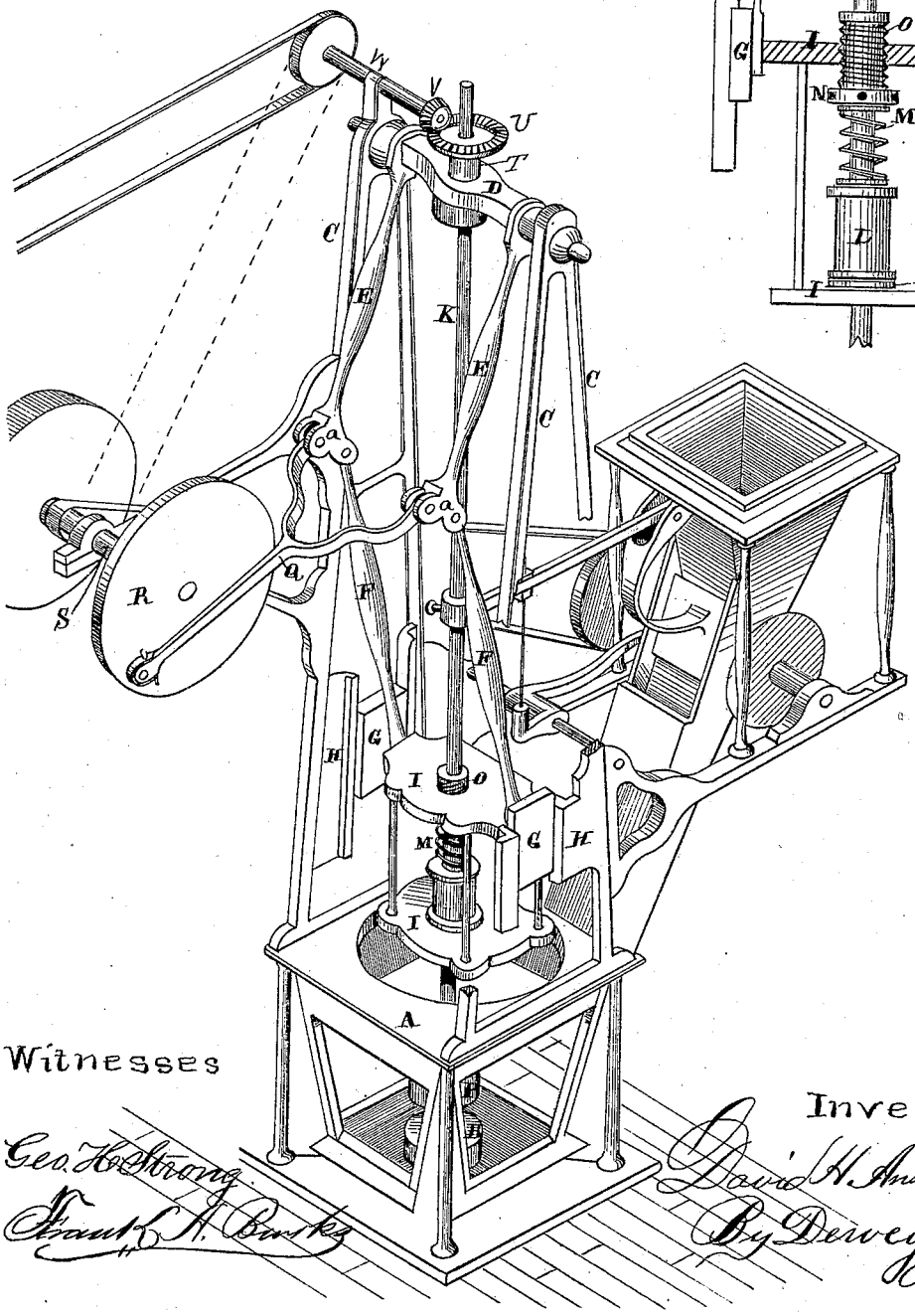
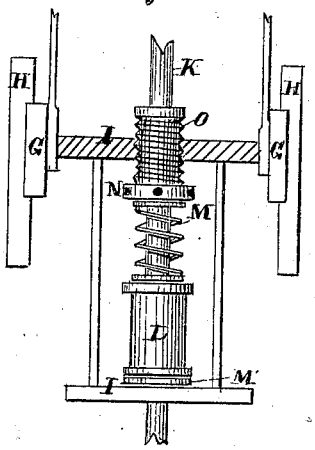


Fig. 2



Witnesses

Geo. H. Strong.

Frank L. H. Burbeck

Inventor

David H. Anderson

By Dewey & Co.

Attys

UNITED STATES PATENT OFFICE.

DAVID H. ANDERSON, OF SAN FRANCISCO, CAL., ASSIGNOR OF ONE-HALF HIS RIGHT TO SAMUEL K. GOLDTRAP, OF CENTERVILLE, IDAHO TERRITORY.

IMPROVEMENT IN QUARTZ-MILLS.

Specification forming part of Letters Patent No. **212,829**, dated March 4, 1879; application filed December 2, 1878.

To all whom it may concern:

Be it known that I, DAVID HENRY ANDERSON, of the city and county of San Francisco, and State of California, have invented an Improved Quartz-Mill; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved mill for crushing ores or rock; and my improvements consist in operating the stamp by a pitman or rod connected with the knee or elbow of a toggle-joint, one end of said toggle being connected with the girt-timber of the mill, and the other by suitable means with the stamp, so that the stamp is raised and lowered twice for every revolution of the crank-shaft.

It also consists in a means of connecting the stamp-stem with the toggle-joint, so as to relieve the operating mechanism of any jar, and to give a certain impetus to the downward-moving stamp, to render its force more effectual. Suitable provisions are made for regulating the drop of the stamp, for rotating it, and for regulating the cushion or spring which aids its downward force.

It further consists in certain details of construction, which are more fully described in the drawings.

Figure 1 is a perspective view, and Fig. 2 is a sectional view.

The arrangement which I have devised is designed to do away entirely with the cam and tappet without necessarily changing the form of stem, shoe, die, or mortar, while at the same time the stamps may be operated very rapidly and no undue strain brought on any of the parts. In this arrangement the principles of crushing rock by stamps are not changed; but the mechanism by which it is accomplished will render each stamp very much more effective, by reason of the rapidity with which the stamp may be operated.

The mortar A, in which my stamp operates, is of suitable size to contain a single die, B, and has a discharge-opening on each of the four sides, as shown, a screen being placed at each opening in the usual manner. On each side of the mortar, and extending upward, is the frame-work C, connected at the top by the girt-timber D, as shown. The top of the mortar is covered, but has a central opening, through which the stamp-stem passes.

On the girt-timbers at each side, inside the frame-timbers, are journaled the parts E of a toggle-joint, these being jointed, as shown at *a*, to the lower parts, F, so as to form the toggle. The lower ends of the lower joints of the toggles are journaled to the slides G, which move in the guides H, attached to the inner sides of the frame-work, as shown. These slides G are attached to or form part of the cage or frame I, so that as the slides move up and down, as hereinafter described, the cage or frame moves with them. This cage I has a top and bottom, which are joined by bolts at the corners, so as to leave an open space between them; and both top and bottom have central openings, through which the stamp-stem K passes.

On the stamp-stem, inside of the cage and near the bottom, is keyed in the ordinary manner a lug or tappet, L, having a small elastic washer or cushion, M′, under it. Above this lug or tappet is secured a spring or elastic cushion, M, the upper end of which presses against a collar, N, on a bushing, O, through which the stamp-stem passes. This bushing O has screw-threads formed on its outer surface, and the central opening in the top of the cage has threads formed on its edges, so that the bushing may be screwed up or down to increase or decrease the tension of the spring M. The stamp-stem passes freely through this bushing, so as to have a certain amount of vertical play; but when forced down, as hereinafter described, when there is anything under the shoe on the stamp P, the spring M is compressed by the tappet or lug pushing it up against the flange, so that the cage or frame is relieved of any jar. When the cage is lifted the weight of the stem and stamp is held by the tappet resting on the bottom of the cage, a suitable cushion being placed under the tappet to prevent any sudden jar injuring the cage.

At the point *a* of the knee of the toggle the head of one of the parts is enlarged, so that a bifurcated pitman, Q, may be journaled to the knee-levers, as shown, the other end of the

pitman being journaled to the crank-wheel R on the driving-shaft S. The amount of drop to the stamp can therefore be regulated by the position of the wrist-pin in this crank-shaft, and a sliding adjustable wrist-pin can be used for the purpose, which may be brought nearer to or farther from the center, to regulate the length of stroke and consequent drop of stamp.

The operation of my device is as follows: The ore is fed into the battery in the ordinary manner by mechanism or by hand, and power is applied to the driving-shaft S. The pitman is thus given an oscillating motion, drawing and pushing the central or knee joint of the toggle to and fro. As the upper end of the toggle is journaled to the girt-timber, this action of the toggle lifts and depresses alternately the slides G, thus lifting and lowering the cage and stamps. As the cage is lifted the tappet on the stamp-stem rests on the bottom of the cage, the tappet sustaining the weight, as described. As the cage is lowered the stamp and stem fall by gravity, the same as an ordinary stamp, the spring in the cage, however, assisting its descent. When running at high speed the action of the spring on the stem is such as to give the stamp a downward throw.

The stamp may be rotated slightly at each revolution by a ratchet-and-pawl connection, if desired. To rotate it continuously, so as to be more effectual in crushing, I place a collar, T, in the girt-timber D, a flange being placed on the lower end of this collar, and a gear-wheel, U, on its upper end. A feather in the inside of this collar engages with a groove on the stamp-stem, so that when the gear is rotated it will rotate the stamp-stem, while at the same time the stem may have a vertical motion. A gear, V, on a counter-shaft, W, on the frame engages with the gear-wheel U, and this counter-shaft may be rotated by belt and pulley connected with the driving-shaft, as shown.

As many of these stamps as may be desired may be placed in line, each having a separate mortar, and each stamp running independently.

When it is desired to run the pans and settlers with the same power that drives the stamps, I can connect the piston-rod of a small engine direct to the knee *a* of the toggle-joint, and thus operate the stamp. In that case I place the engine on standards on the frame on the opposite side from the crank-wheel R, and the pitman Q will then drive the crank-wheel, which will revolve pulleys, which may be belted to the pans and settlers.

The motion of the engine or driving-shaft may be reversed, if desired, without affecting the vertical motion of the stamp, so that hoisting and lowering may be done with the engine which drives the stamp. This has been impossible with the stamps driven by cam and tappet. For small mines this is a great advantage, as the hoisting-works and mill may be operated from the same engine.

In the drawings I have shown as connected with the battery an improved ore-feeder, for which I have applied for Letters Patent, and which is specially adapted for this style of stamp when rapid motion is accomplished.

I am aware that springs or elastic cushions have heretofore been used for increasing the downward blow of stamps for crushing ore. Several patents may be cited which show a cushion or spring connected with the stamp for relieving jar or utilizing downward force of the spring. My construction is different from any of these, and the operation is not exactly the same.

The stamp-stem is not connected to the spring in any way, nor is it attached in any place to to the cage. It is, as heretofore described, free to move vertically within certain limits in the cage. It drops by gravitation the same as a stamp operated by cam and tappet; but the spring which I use is necessary, in order to operate my stamp as rapidly as is designed.

It will be seen that the cage in the rapid motion imparted to it by the peculiar mechanism described will go downward faster than the stamp would fall by gravity in so short a space or drop. As the cage starts downward rapidly it would reach its lowest position and begin to to rise before the shoe struck the die, and the lower surface of the tappet would strike the bottom of the cage before the blow was struck if the spring were not placed in the position shown. Instead of this taking place, as the cage begins its downward course it overtakes the tappet on the stamp-stem; and as the spring is attached to the lower side of the upper head of the cage, the spring is compressed by the tappet, the stamp-stem thus having its speed gradually accelerated, and the spring being gradually compressed until the stamp is moving as fast as the cage. When, therefore, the cage has reached its lowest position the compression of the spring has allowed the tappet to come nearer the top of the cage than the bottom, and the cage is in a momentary state of rest. The stamp continues its downward course, aided by the expansion of the spring, and strikes its blow before the cage commences to rise. As the cage commences to rise the tappet on the stamp-stem is then nearest the bottom of the cage and in a position to rest on said bottom and lift the stamp without any jar on the cage or operating mechanism. This spring is therefore an essential feature in the whole device, without which the cage would be apt to be broken, inasmuch as said cage moves faster by its toggle-connection than the stamp does by gravity, and the tappet without it would strike the top of the cage on its downward course and the bottom on its upward course without the blow being utilized on the rock. The spring therefore obviates the possibility of breakage of the cage by gradually accelerating the downward force of the stamp-stem, giving it a speed in unison with that of the cage as it is rapidly moved by the toggle. Without this spring in its peculiar position

the mill could not be operated as rapidly as it is intended to be.

In most of those devices heretofore patented where the spring is utilized to increase the downward force of the blow of the stamp the spring has to be compressed as the stamp is raised. In my device this is not the case, the spring being compressed as the stamp is falling, and presenting no resistance whatever to the raising of the stamp.

This mill may be run for prospecting purposes by hand-power, as the driving-shaft may be geared from a crank-wheel, so that very rapid blows may be struck. It is, however, adapted for all purposes in large or small mills.

The batteries may be set up in pairs, single, or in a line, suitable connection being made for driving the stamps.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The toggle or knee lever E F, with the horizontally-operating pitman Q and the crank-wheel R, in combination with the vertically-moving stamp-stem K and stamp P, whereby two blows of the stamp may be imparted by one stroke of the pitman, substantially as herein described.

2. The cage I, with its slides G moving in the guide H, in combination with the stamp-stem K, said stem passing through the cage and being provided with the tappet L, and having the elastic cushions or springs M M′, substantially as and for the purpose herein described.

3. The stamp-stem K, operated by the action of the knee or toggle levers E F and the horizontally-acting pitman Q, in combination with the gear U and pinion V, whereby a combined stamping and rotary motion is produced, substantially as herein described.

4. The cage I, operated by the knee or toggle levers E F and the pitman Q, as shown, in combination with the stamp-stem K, passing loosely through the cage and provided with the spring M, placed between the top of the case and the tappet, substantially as herein described.

5. In combination with a stamp and stamp-stem operating with a rapid vertical movement, the cage I, connected with the actuating mechanism and working independently of the stem K, the tappet or collar L, secured to the stem within the cage, and the spring M, acting between the top of the cage and the tappet to act upon the stamp at the end of the stroke without presenting any resistance to the raising of the stamp, substantially as herein described.

6. The stamp P and stem K, with its collar or tappet L and the spring M within the actuating-cage I, in combination with the adjustable collar or bushing O, whereby the tension of the spring and the relative position of the stamp and cage are regulated, substantially as herein described.

In witness whereof I have hereunto set my hand.

DAVID H. ANDERSON.

Witnesses:
CHAS. G. YALE,
FRANK A. BROOKS.