E. COLEMAN.
Rock-Crusher.

No. 222,670. Patented Dec. 16, 1879.

Fig. 1.

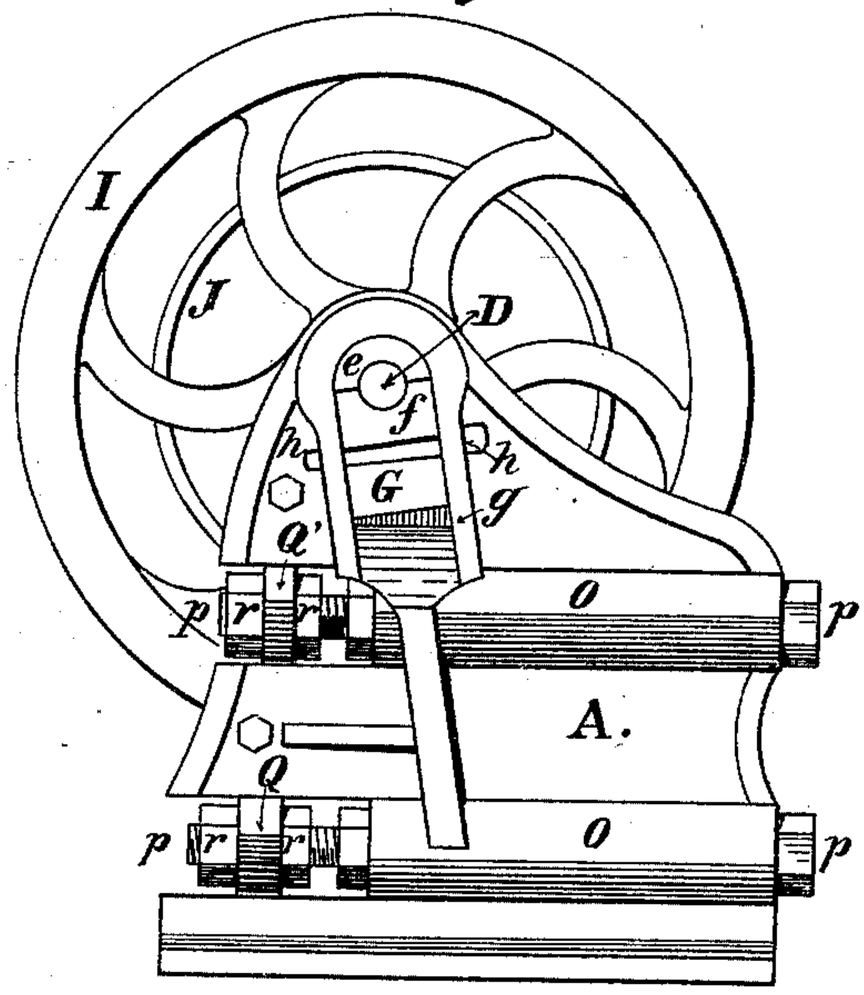


Fig. 2

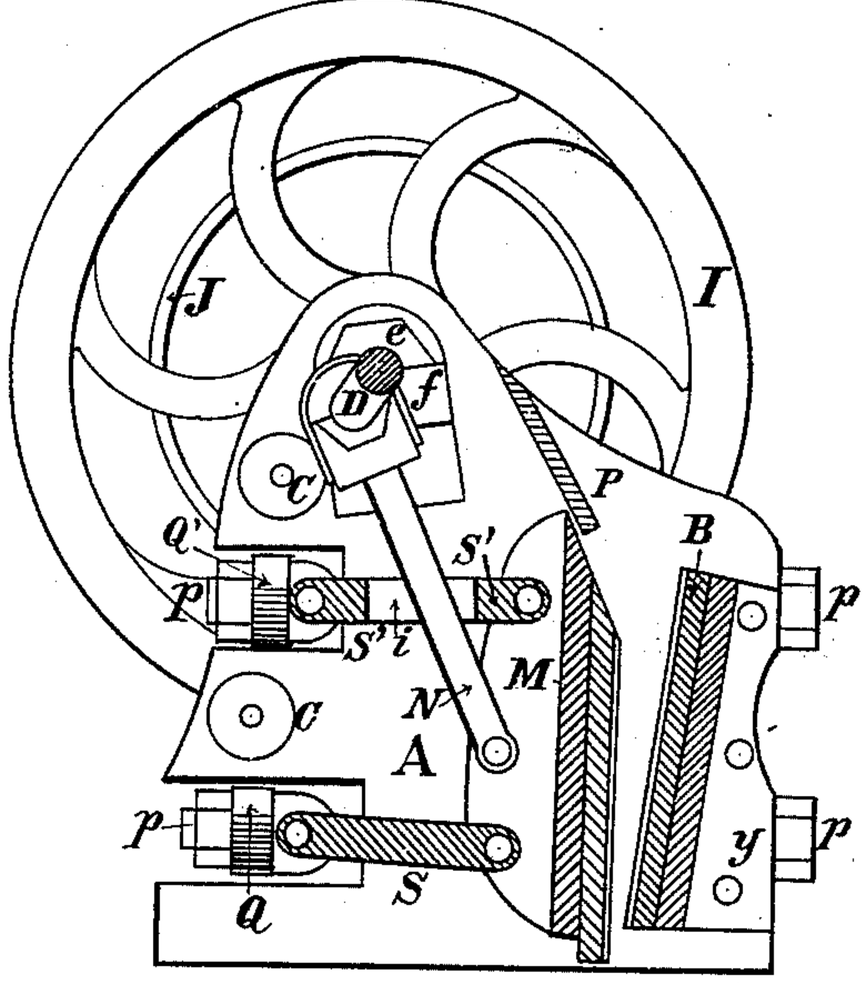


Fig. 3

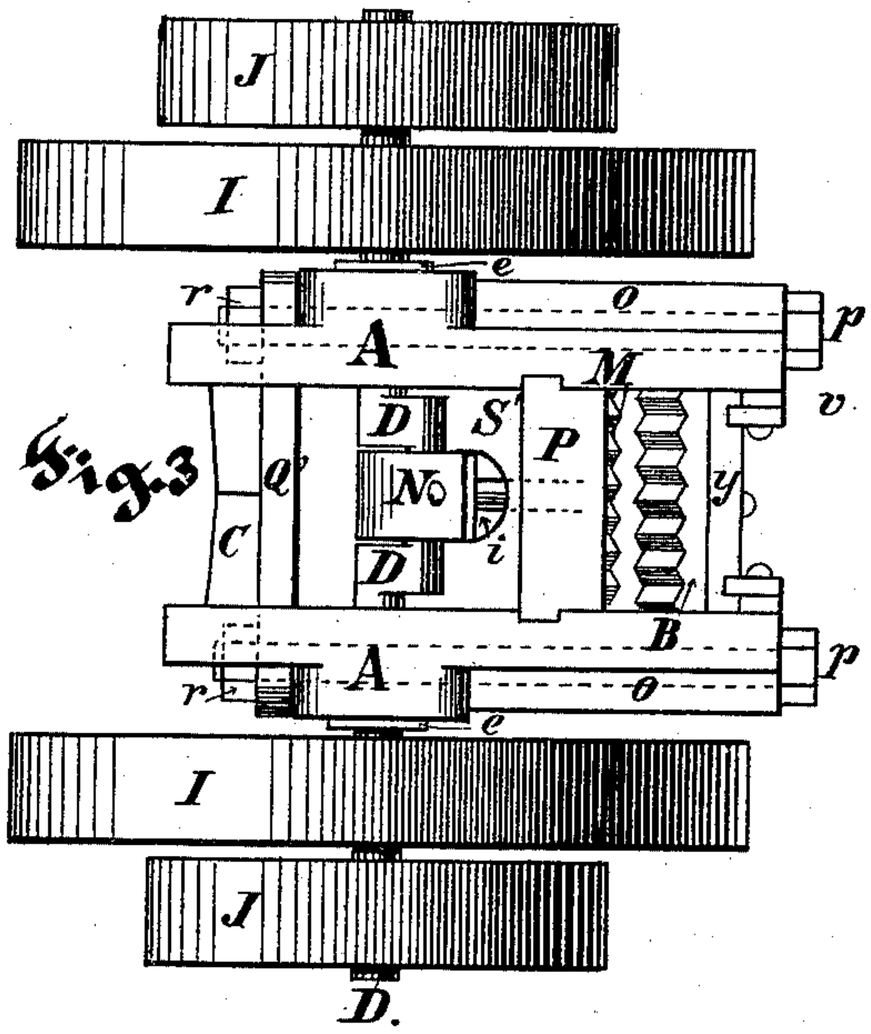
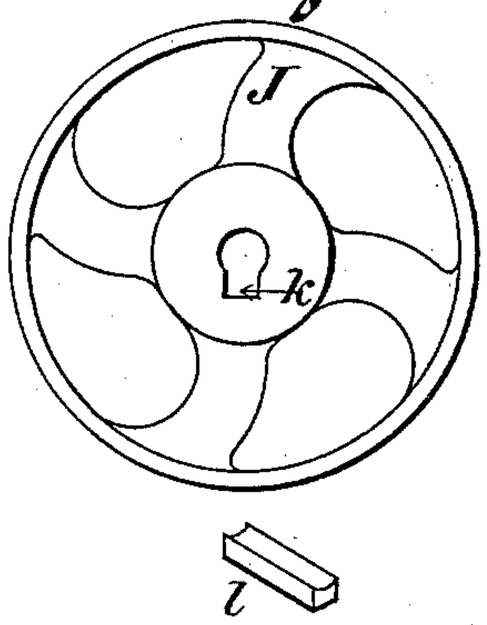


Fig. 4



Witnesses:
W. Floyd Duckett
D. B. Lawler

Inventor
Ezra Coleman
per J. L. Boone
Attorney.

UNITED STATES PATENT OFFICE

EZRA COLEMAN, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN ROCK-CRUSHERS.

Specification forming part of Letters Patent No. **222,670**, dated December 16, 1879; application filed August 11, 1879.

To all whom it may concern:

Be it known that I, EZRA COLEMAN, of the city and county of San Francisco, in the State of California, have invented an Improved Rock-Crusher; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to an improved rock-crusher in which all the elements of strength, simplicity, economy of construction, and compactness are combined.

The nature of my invention consists of slotted sides, between which is a fixed jaw and a movable jaw whose toggle-levers are connected to cross-heads adjusted in the slots of the aforesaid sides and upon adjusting-rods supported in barrels or tubes cast or made with the sides; and, further, in certain details of construction, substantially as hereinafter more fully set forth.

Referring to the accompanying drawings, Figure 1 represents a side elevation, Fig. 2 a vertical section, Fig. 3 a plan view, of my improved rock-crusher; and Fig. 4 represents a detached view of a driving-pulley, showing the manner in which it is secured to the crank-shaft.

Let A A represent the two upright sides of the crusher, between which the crushing-jaws are placed and operated.

The stationary jaw B forms the forward end of the machine, being firmly secured between the sides A A, as hereinafter described. The rear ends of the sides are kept apart by short tubes C C, which are placed between them, and a bolt passes through each tube and through both sides, so that a nut on the end of the bolt will draw the sides together against the ends of the tubes, thus leaving an open rear end except where the tubes pass across.

The crank-shaft D, which drives the moving jaw, is mounted in bearings in the sides A A, at the top of the machine, near its rear end.

The boxes in which the bearings of the shaft are supported are made in two parts or halves, *e f*, which are secured in slots G in the sides A A. These slots are made large enough to allow the enlargement formed by the crank on the shaft D to pass through them after the box has been removed.

In casting the sides A A, I cast a rib or flange, *g*, around the outside of each slot, which serves not only to strengthen the sides, but also to provide a wide seat and bearing for the box. They also serve to furnish a convenient means of fastening the boxes in the slots. In the present instance the two parts of the box are secured in the upper part of the slot by a wedge-shaped pin or bar, *h*, which passes through holes in the flanges *g* and through a keyway on the under side of the lower part of the box. This enables me to remove the crank-shaft readily, as I simply have to knock out the keys or bars *h*, which allows the lower parts of the box to drop down. The crank-shaft can then be drawn through the slots after the wheels on its ends have been removed. This arrangement also enables me to take up the wear on the boxes by driving the key or bar in a little tighter, so as to force the parts of the boxes closer together.

The fly-wheels I and drive-pulleys J, I secure to the ends of the crank-shaft by friction-tight devices, so that in case any unusual strain should come upon the jaws the wheels will slip. To do this I simply make a keyway, *k*, in the hub of the wheel, and after the wheel has been adjusted I drive in a key, *l*, so that its pressure against the face of the shaft will hold the wheel in place against an ordinary strain.

I am aware that the fly-wheel of a rock-crusher has been fastened to the drive-shaft by a friction device that will give way when an unusual strain is brought to bear on the crushing-jaws; but it has never before been applied to both the fly-wheels and drive-wheels. This arrangement insures the machine against breakage, because one of the friction-bearings is sure to give way in case of unusual strain.

The moving jaw M is placed between the sides A A in rear of the stationary jaw, and is driven by a pitman, N, from the crank of the crank-shaft D, as hereinafter described.

In casting the sides A A, I cast a barrel, O, horizontally on the outside near the top, and another near the bottom, and through each barrel I run a long metal bolt, *p*, so that the head of the bolt will be against the front end of the barrel. The threaded end of the bolt

will then project from the rear end of the barrel, on which is a nut screwed up tightly to hold the bolt firmly in place.

The projecting ends of each two opposite bolts pass through holes in the opposite ends of a horizontal cross-head, Q, which extends across the rear end of the crusher-frame, and as there are two pairs of bolts, one near the bottom and another higher up, there will be two cross-heads, as represented. Nuts *r* are then turned on each threaded end, so as to hold the cross-heads in place. These cross-heads are connected with the moving jaw and fit in slots in the rear ends of the sides A, and serve to receive the strain as follows: A strong plate, S, has one end hinged to lugs on the rear side of the moving jaw near its lower end, while its opposite end is hinged to lugs on the lower stationary cross-head, Q. Another similar plate, S′, is hinged to the rear side of the moving jaw near its upper end, while its opposite end is hinged to the upper cross-head, Q′. An opening, *i*, is made in the upper plate, S′, through which the pitman N, which connects the crank of the crank-shaft with the lower plate, passes. These plates, arranged in this way, serve as toggles, because their rear ends work from a fixed or stationary center, while their forward ends move up and down when the crank-shaft is rotated, and as the lower end of the pitman N is attached to the moving jaw just above the point where the lower plate is hinged to it, the up-and-down motion of the pitman causes the moving jaw to rise and lower, while the relation of plates and jaw forms a complete toggle. The motion which this arrangement imparts to the moving jaw is a compound motion. The direct motion is up and down, but the concentric action of the plate gives a back-and-forth motion to and from the stationary jaw. The up-and-down motion produces a rubbing action on the rock to be crushed, while the back-and-forth motion gives the crushing effect, so that less power is required to crush the rock than when a direct back-and-forth motion is used.

The lower end of the stationary jaw could be bent at a slight angle and extended downward, so that a long rubbing contact would be obtained at the lower end of the jaws for pulverizing the rock to a very fine condition.

It will be noticed that the strain on the moving jaw is thrown back upon the cross-heads Q Q′ by the hinged plates, and as these heads are secured to the longitudinal bolts *p*, the greatest possible strength is obtained.

The moving jaw is set to or from the stationary jaw by turning the nuts *r* so as to move the cross-heads in or out in the slots at the rear ends of the sides A A, as required.

In order to secure the stationary jaw between the front ends of the sides A A, I form a ledge or projection, *v*, on the inside edge of each side A. The jaw is cast with a rib or flange, *y*, on it near each end, so as to form an angular channel at each end of the jaw, that will fit the projections *v* when it is placed inside the projections and fitted to them, as shown at Fig. 3.

The upper end of the moving jaw is cut off at an angle, as shown, and a plate, P, is arranged to slide down at an angle in grooves in the sides A A in front of it, so as to form the hopper-opening for directing the ore between the jaws, and to prevent the particles of ore from getting in between the edge of the moving jaw and the sides of the crusher. I thus provide a simple, strong, and compact rock-crusher.

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

1. In a machine for crushing hard substances, the combination of the cross-heads Q Q′ and adjusting-rods *p*, supported in the sides A, with the movable jaw M, having its toggle-levers S S′ connected to the cross-heads Q Q′, substantially as and for the purpose set forth.

2. In a crushing-machine, the combination of the toggle-levers S S′, the lever S′ having a slot, *i*, with the movable jaw M, cross-heads Q Q′, sides A, pitman N, passing through the slotted lever S′, and driving-shaft D, substantially as and for the purpose specified.

3. In a crushing-machine, the combination of the cross-heads Q Q′, adjusting-rods *p*, toggle-levers S S′, the lever S′ having slot *i*, pitman N, extending through the slot of said slotted lever S′, with the slotted tubular sides A, jaws M B, and driving-shaft D, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand and seal.

EZRA COLEMAN. [L. S.]

Witnesses:

W. FLOYD DUCKETT,

W. F. CLARK.