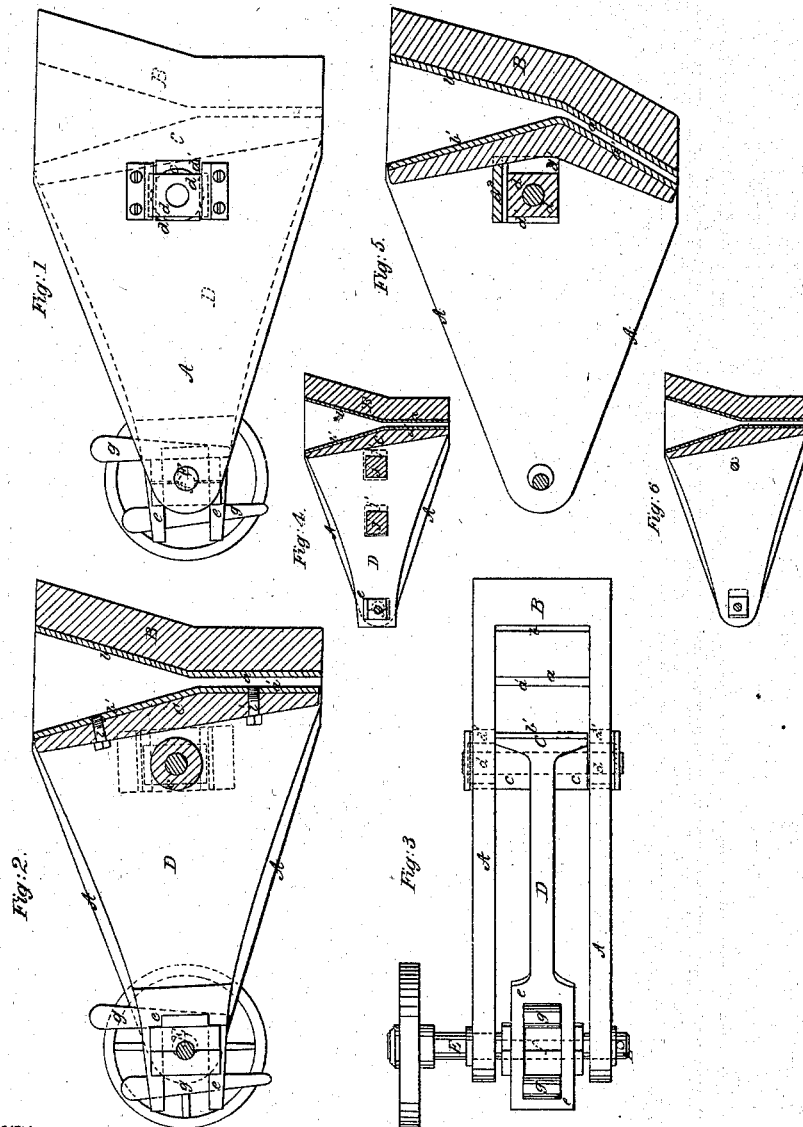


A. W. HALL.
MACHINE FOR CRUSHING ORE, &c.

No. 47,297.

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Witnesses:
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IMPROVEMENT IN MACHINES FOR CRUSHING ORE, &c.

Specification forming part of Letters Patent No. 47,297, dated April 18, 1865.

To all whom it may concern:

Be it known that I, ALEXANDER W. HALL, of the city, county, and State of New York, have invented a new and Improved Machine for Breaking or Crushing Ore, Rock, and other Hard Substances; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view of the machine. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a plan of the same. Fig. 4 is a longitudinal vertical section of a modification of the same.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to the employment, for breaking or crushing ore, rock, stone or other hard material, of a horizontally-moving direct-acting stamp and a stationary upright abutment, having the upper parts of their faces convergent and the lower parts parallel, or nearly so; and it consists in operating such stamp by means of an eccentric or crank at its rear end acting in concert with a sliding journal-box near the head, whereby I obtain a more effective crushing action than is obtained by placing the crank or eccentric near the head of the stamp with a guide at the rear end, as will be hereinafter fully explained.

A A B, Figs. 1, 2 and 3, is the frame of the machine, composed of a single casting, having upright parallel sides A A, connected at one end by the abutment B. This frame is to be placed on and secured to a suitable bed-piece or stand of wood or iron. The abutment B is made with the lower part, *a*, of its inner or working face of plane form and upright, and its upper part, *b*, of plane form and sloping outward in an upright direction.

C D, Figs. 1, 2, 3, is the horizontal direct-acting stamp made of cast-iron, and having its head C fitted to slide freely between the parallel sides A A of the frame toward and from the abutment B. This head has its working-face *a' b'*, which is opposite the working-face *a b* of the abutment, of a form corresponding with that of the said face *a b*, except that the upper part, *a'*, slopes in an opposite direction to that of the part *a* of the said face

a b, so that the said parts *a a'* combine with the sides A A of the frame to form a hopper-shaped apartment, having a wide mouth for the reception of the ore or other material to be broken or crushed. The stamp C D has formed on each side in line with each other, and at a short distance in rear of its head C, two gudgeons, *c c*, the journals of which are fitted to boxes *d d*, which are arranged to slide horizontally in guide-slots *d' d'*, provided in the sides A A of the frame, and the rear portion D of the stamp has its extremity constructed and fitted up to form a journal-box, *e*, to receive an eccentric wrist, *f*, of short throw, constructed or provided upon the horizontal rotary shaft E of the machine, which is fitted to work in fixed journal-boxes in the sides A A of the frame. The journal-box *e* is fitted with wedges *g g* in front of and behind its lining-pieces for the purpose of adjusting its bearing toward or from the head C of the stamp, and thereby regulating the distance to which the face *a' b'* of the stamp shall approach the face *a b* of the abutment in the horizontal reciprocating movement of the stamp toward and from the abutment, which is produced by the revolution of the wrist *f* of the shaft E, thereby regulating the smallness of fineness of the particles into which the material is broken or crushed.

The operation of the machine is as follows: The lumps of ore or other material are fed into the hopper-like apartment formed between the upper portions, *a a'*, of the working-faces of the stamp and stationary abutment, while the stamp has a rapid horizontal reciprocating movement directly or bodily toward and from the abutment imparted to it by the rapid revolution of the eccentric wrist *f*, and the lumps descending in the widening space formed between the portions *a a'* of the working-faces, every time the stamp retires from the abutment with the movement of the said eccentric wrist, are broken smaller by every approach of the stamp toward the abutment, until they drop into the space between the lower portions, *b b'*, of the working-faces, where they are caught by the said faces, approaching each other in parallel positions in the next revolution of the eccentric wrist, and so further broken or crushed to the required size or degree of fineness, after which the material drops from

between the abutment and stamp the next time the latter retires from the former, and is received in a suitable receptable.

The vertical length or height of the lower portions, $b b'$, of the faces of the abutment and stamp which come nearly together in vertical positions, must be proportioned to the velocity of the revolution of the shaft E , according to the natural law of falling bodies, that the material may not fall between the said portions of the faces without being crushed. By making the height of the said faces not less than seven inches, when the shaft makes three hundred revolutions per minute, the material cannot fail to be caught and broken or crushed at least once between the said portions of the faces.

The parallel working-faces, which need not have more than one-quarter of an inch motion, can be adjusted to come so nearly together that fragments of ore or stone which have been previously reduced sufficiently by the convergent faces of the stamp and abutment may be crushed to flour, which is the great advantage of these faces, in combination with and placed below the convergent faces of the stamp and abutment, as explained.

By the arrangement of the eccentric or crank at the rear end of the stamp and the sliding journal-box near the head, I avoid the too great vertical movement, which is occasioned by the arrangement of the eccentric near the head of the stamp, and which wears out the faces of the stamp and abutment, and at the same time I obtain a more effective crushing operation by the powerful lever-like action of the stamp produced by the eccentric, such action, with the crank rotating in the direction of the arrow shown in Figs. 1 and 2, causing the space between the parallel faces $a a'$ of the stamp and abutment to commence closing at the bottom and close gradually upward as the stamp approaches the abutment, and thereby causing the crushing action to be extended through a greater portion of the revolution of the eccentric than if the stamp had a strictly rectilinear motion. The same movement may be obtained by substituting a cranked rock-shaft for the gudgeons $e e$ and sliding boxes $d d$, the journals of the said rock-shaft working in fixed boxes in the

sides of the frame and its crank-wrist fitting a box or bearing provided in the stamp.

The working-faces $a b$ and $a' b'$ of the abutment and stamp should preferably be composed, as represented, of independent plates of franklinite iron, which from its hard character renders it especially suitable for operating on hard materials. These plates are bolted to the abutment and stamp in such manner by screw-bolts $i i$ that when worn out they may be removed and replaced by new ones.

Fig. 4 exhibits a longitudinal view of a modification of the invention, the parallel portions $b b'$ of the faces $a b$ and $a' b'$ being arranged obliquely to the direction of the reciprocating motion of the stamp instead of perpendicular thereto. The object of this arrangement is to obtain a grinding action between the said portions of the faces as well as a crushing action. When this oblique arrangement is adopted, it is desirable to use in the guide-slots d' india-rubber packing-pieces d^2 , the said pieces being arranged above or below the box d , according to the direction of the obliquity of $b b'$. The object of these packing-pieces is to enable the surface b' to slide to some extent after it has come close against b . This partial sliding or grinding of the two parallel faces, if desired, can be more effectually accomplished by another modification of my invention, as shown in Fig. 6, when the eccentric wrist f is arranged near the head of the stamp and the sliding journal-box at the back end thereof.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination of a horizontally-moving direct-action stamp and a stationary abutment having the upper parts of their working-faces convergent and the lower parts thereof parallel, when the movement of such stamp is produced by an eccentric at the rear end of the stamp acting in concert with a sliding journal-box near the head of the stamp, substantially as and for the purpose herein specified.

A. W. HALL.

Witnesses:

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