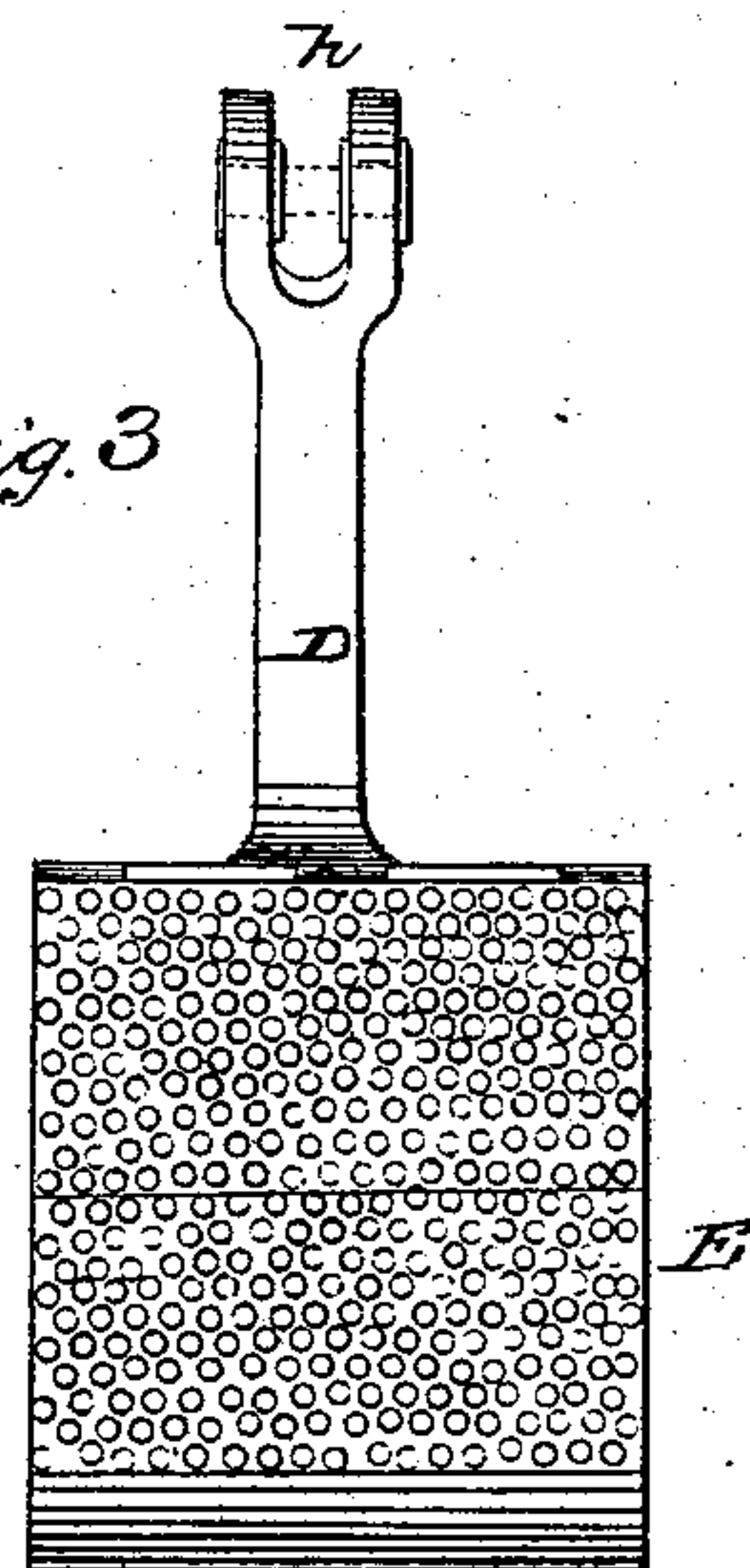
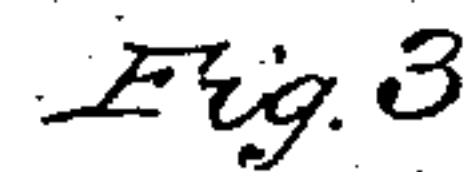
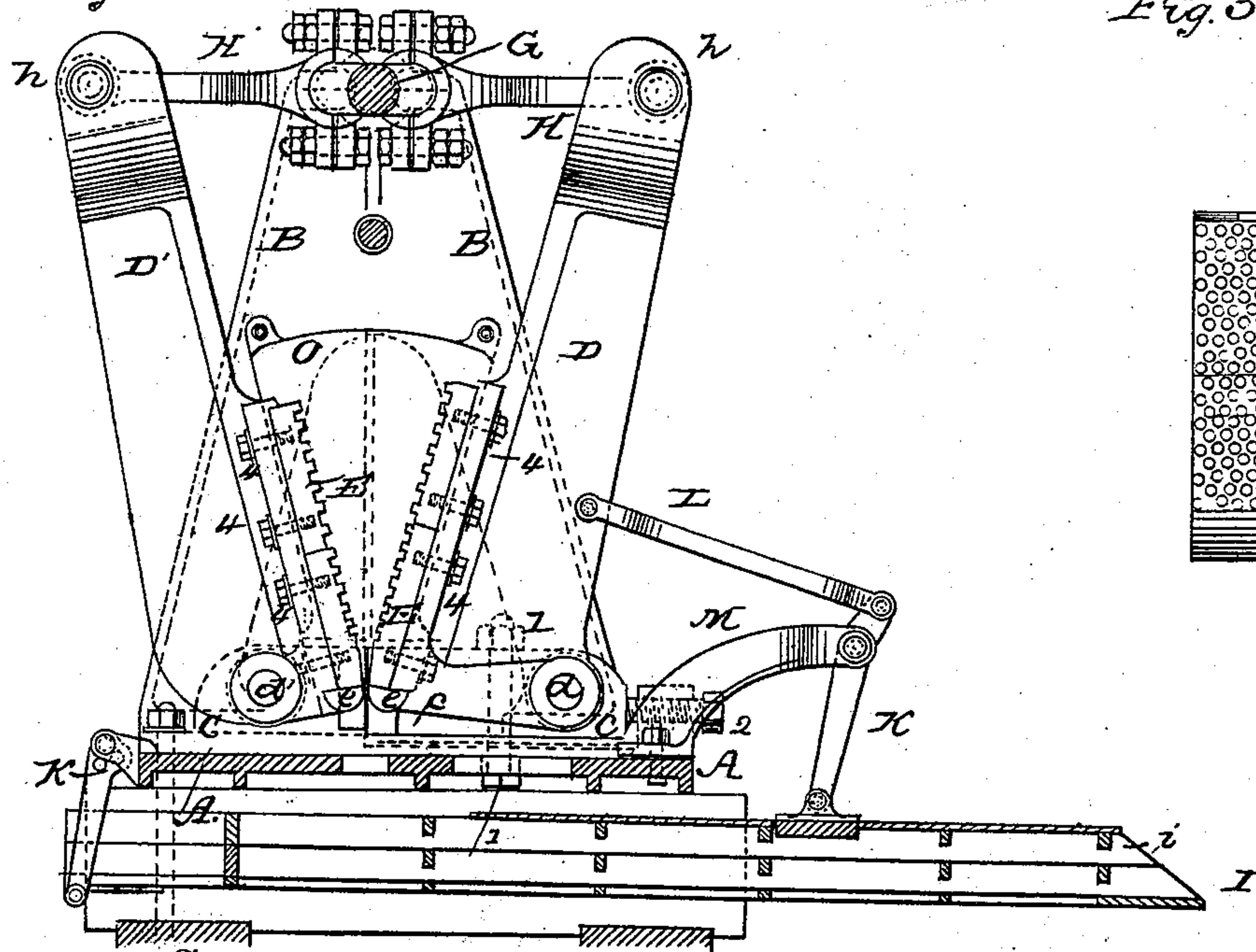


Ore Crusher.

Patented Feb. 21, 1865.



WITNESSES

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ELI P. GARDINER, OF NEW YORK, N. Y.

IMPROVEMENT IN MACHINERY FOR BREAKING QUARTZ, &c.

Specification forming part of Letters Patent No. 46,461, dated February 21, 1865.

To all whom it may concern:

Be it known that I, ELI P. GARDINER, of the city, county, and State of New York, have invented certain new and useful Improvements in Machinery for Breaking, Reducing, and Pulverizing Quartz and other Ores; and I do hereby declare that the following is a full and exact description of my said improvements and machinery, reference being had to the drawings accompanying and making part of this specification.

In the accompanying drawings, Figure I represents an end elevation of the working parts of the machinery. Fig. II represents a top view. Fig. III represents, in elevation, the face and pins or teeth and operating-arm of one of the face-plates for breaking or pulverizing.

The nature of my invention consists in subjecting the ores or material to be acted upon to a compound force composed of reciprocal pressure, and its release or reaction and of simultaneous abrading or grinding action, this compound force being produced by two surfaces having the combined motions required to produce such results by means of rapidly-reciprocating machinery, as hereinafter described, whereby the ores or material to be acted upon are not only reduced in size but are to a very considerable degree pulverized rapidly and sifted.

Upon the strong rectangular iron platform or bed-plate A are erected two upright frames, B, one of which is shown in the drawings, the near one being left out in order to show the interior parts beyond it. These are opposite each other, and parallel and in the form of what is usually called a "gallows-frame." Upon the bed-plates are placed opposite each other the four pillow-blocks *c c*, firmly bolted and secured to the bed-plate; but nevertheless two of them are made adjustable, so as to be moved nearer or farther from the two corresponding opposite ones, as hereinafter described. Upon these pillow-blocks are hung the two upright arms D D' by gudgeons or axles *d d'* running through from pillow-block to pillow-block, and fitting into corresponding openings in the pillow-blocks fitted to receive them, and so as to allow the two arms D D' to vibrate freely upon them. These arms are constructed and hung so that at the base they

approach each other, and the bases form the radii of circles of which the gudgeon or axle *d d'* are the centers. The radius of the circle of one of the bases of the arms is greater than that of the other. In the present machine the radius of the circle formed by D is just twice that of D'—that is to say, the distance from the center of motion of D at *d* to the end of the radius at *e* is twice that from the center of motion of D' at *d'* to *e'*. The object of this arrangement is to give a different and greater motion to D than to the opposite arm D', so as to produce the grinding and abrading or rubbing motion, as hereinafter described.

The pillow-blocks of D are secured to the bed-plate by the vertical screw and nut 1, and it passes through a slot in the the pillow-block by which the block may be slid backward or forward when the screw-bolt is loosened. This movement is produced by means of the horizontal screw 2 passing through the fixed block 3 into the end of the pillow-block, by means of which the pillow-block may be adjusted so as to bring the face of D nearer to or farther from the opposite, D'. The lower part of the arms D D' are widened so as to nearly occupy the space between the upright frame-pieces B B, and are seen in shape in detail in Fig. III. Upon this part of the face of the arms I place the face-plate E, and it is firmly secured to the back by means of the screw-bolts 4, passing through the back of the arm into the face-plate. These face-plates E are fitted with teeth or pins over their whole surface of a peculiar shape, and arranged in a peculiar manner; thus they are cylindrical with flat ends, and they are so constructed and arranged that from about half the distance from the top of the plate they diminish in size and length of projection gradually to the lower line of pins or teeth, which are the smallest and shortest. These teeth or pins are seen in front or end view in Fig. III, and in side view or elevation in Fig. I, and in an oblique top view in Fig. II. They should be made of the best steel or the hardest iron and very tough, so as not to break or chip off. Across the upper extremities of the gallows-frame, from side to side, is placed the driving-shaft G, Fig. II, which turns in journal-boxes resting on pillow-blocks at the top of the gallows frame, and it is provided with balance-wheel P.

The shaft G is constructed with a double crank, *g g*, Fig. II. Upon these cranks are keyed at one end the shackle-bars H H, Fig. II, and at the other end the shackle-bars are connected with the upright arms D D' by a fork in the head of the arm *h*, Figs. III and II, and a pin passing through the fork and the end of H, so as to form a journal.

The arms H are not placed directly in the middle of the face-plates, but a little one side, and the shackle-bars H are bent laterally for the purpose of bringing them in line with the cranks, and so as not to interfere in the working.

Under the bed-plate of the machine, which is raised upon four heavy timbers, crossed at right angles, two above and two below, (the ends of the two lower ones being shown at *a* in Fig. I,) is suspended the receiving and emptying or discharging trough I, in which are placed wire sieves, in a series of two, three, or more, one above the other, and having a sufficient space between them.

The trough I extends under the opening between the face-plates E E, and outward beyond the bed-plate. The sieves should be graduated as to the size of the meshes, the coarse being on the top, and so on to the finest. A part of the upper sieve is shown in surface in Fig. II at *i*. The trough in which the sieves are hung is suspended by the two upright vibrating frames K K', the lower end of K working in bearings upon the trough, and its upper extremity or cross-head forming a joint or spindle, upon which works the shackle-bar L, which at its other end works in a bearing fixed to D. A pair of parallel brackets, M, are fast at the lower ends to the bed-plate and at their upper ends to K, by which a fulcrum is obtained for K for the purpose of vibrating or reciprocating the trough and sieves in connection with the operation of the face-plates and machinery, as hereinafter described.

O, Fig. I, represents one of the side pieces which closes the operating-chamber, so that the ore and dust will not fall out at the sides.

Having thus described the construction of my machinery and improvements, the manner

of operating is as follows: The driving-shaft G being put in motion, the two face-plates, by their connection with the arms D D' and the shackle-bars and cranks, are drawn toward each other at their upper parts, and at the same time a downward motion of the faces is produced by the turning of the arms on their centers *d d'*, but with different velocities and distances of motion. The length of the radius from *d* being twice the length of the radius from *d'*, the face of D will move twice as fast and double the distance of that of D'. The quartz, ores, or other material being fed into the chamber or space between the faces the ores and material are cracked and crushed by pressure, and simultaneously rubbed, ground, and abraded by the rapid vertical movement of the face of D across the face of D', and thus the ores are to a considerable extent pulverized, and are also carried and driven down through the opening between the face-plates. The reciprocating motion of the arm D causes the troughs and sieves connected therewith to be rapidly drawn back and forth, and at each change of the reciprocating motion the broken and pulverized material is shaken and agitated and passes through the sieves and screened and separated, the finer from the coarser parts.

Having thus described the construction of my machinery and improvements and the manner of operating the same, what I claim as my invention, and for which I desire Letters Patent, is—

1. The combination and arrangement of the arms D D', hung upon centers at unequal distances from the faces, with the operating-shaft G and cranks and shackle-bars H H, the whole operating together in the manner and for the purposes described.

2. The combining and arranging and operating the sieves and trough with the reciprocating arms in the manner and for the purposes described.

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Witnesses:

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