Sheet 1- 2 Sheets

C. W. Stafford.

Ore-Crusher.

No. 59676

Patented Nov. 13, 1866

Fig. 1.

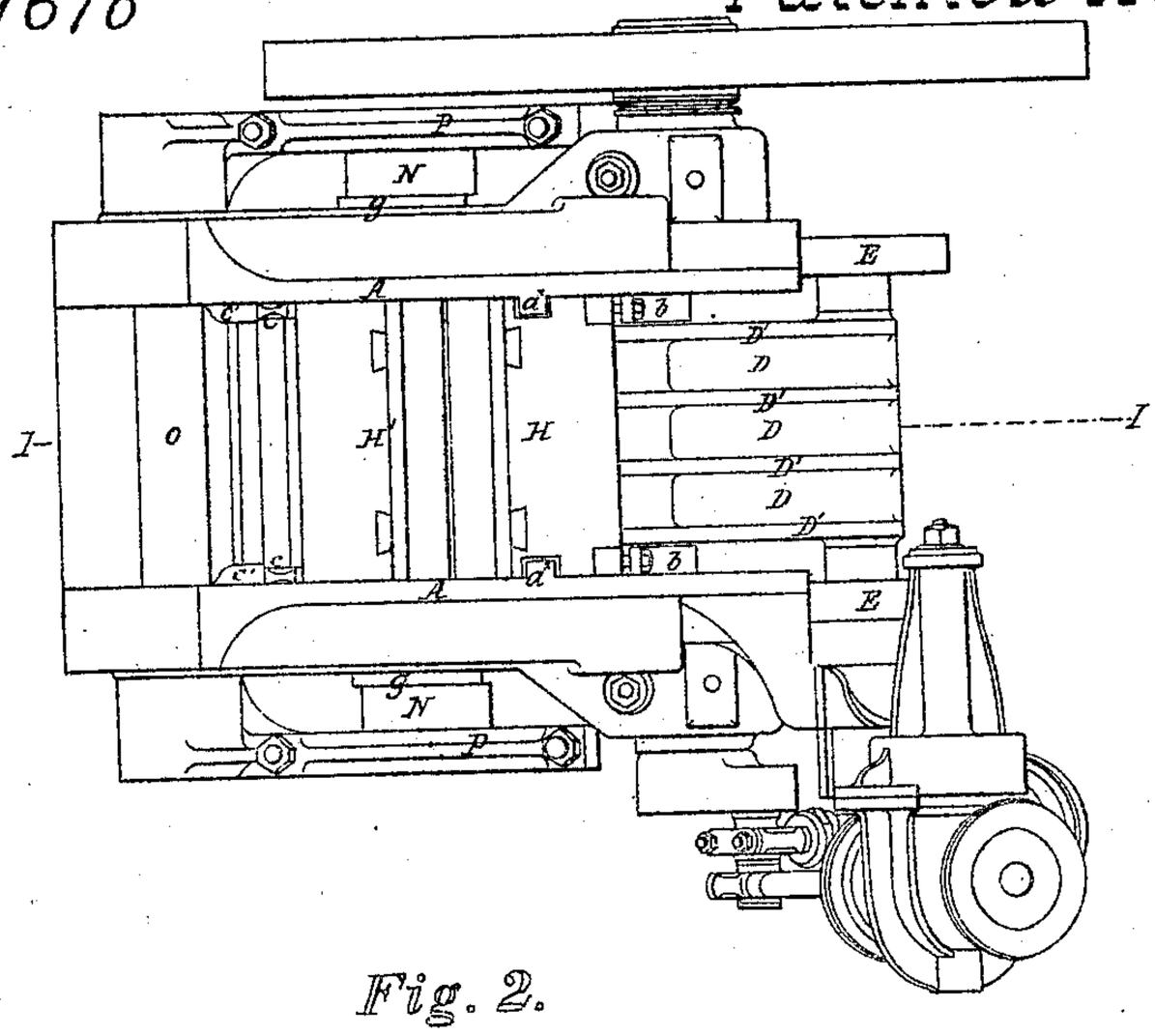
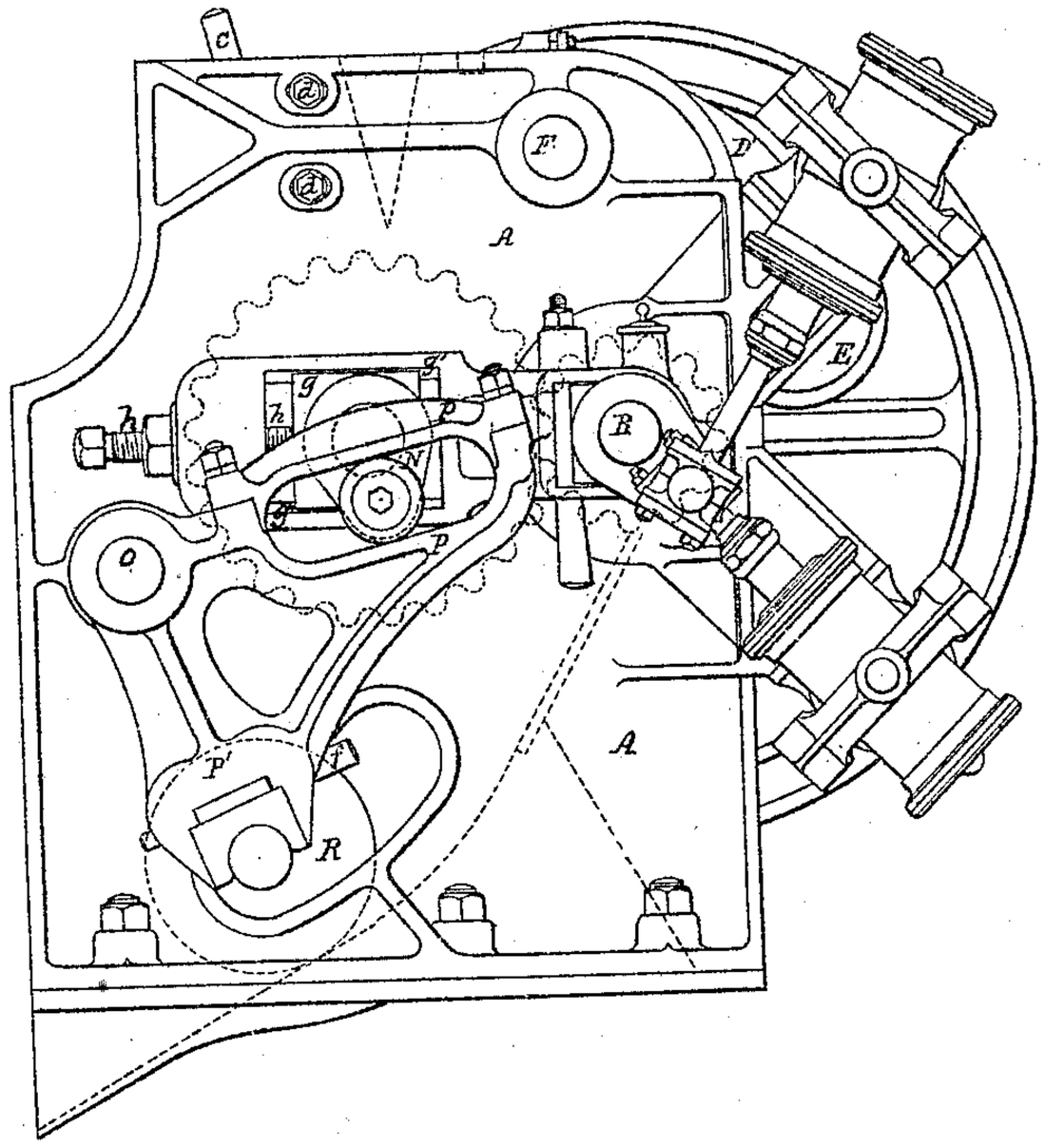


Fig. 2.



Witnesses

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Sheet 2-2 Sheets

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Fig. 4.

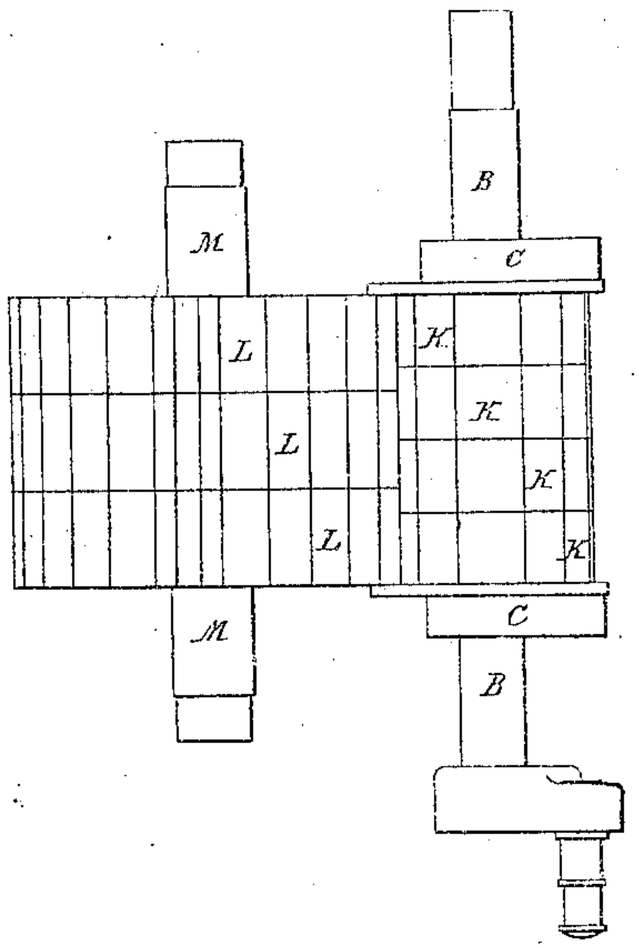

Fig. 3.

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UNITED STATES PATENT OFFICE.

CHARLES W. STAFFORD, OF SAYBROOK, CONNECTICUT.

IMPROVEMENT IN ORE-CRUSHERS.

Specification forming part of Letters Patent No. **59,676,** dated November 13, 1866.

To all whom it may concern:

Be it known that I, CHARLES W. STAFFORD, of Saybrook, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Machines for Crushing and Pulverizing Ores; and I do hereby declare the following to be a full, clear, and exact description thereof, to enable any one skilled in the art to which my invention appertains to make and use the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a plan or top view of my machine. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical section in the plane indicated by the line I I, Fig. 1; and Fig. 4 shows parts in detail.

In all the figures like parts are indicated by the same letters of reference.

The principal object of my invention is to avoid the danger of clogging, which results from the excessive motion imparted to the upper in comparison with the lower part of the reciprocating jaw in quartz-crushing machines. For this purpose I avoid the use of a fixed pivot or fulcrum for the moving jaw, but mount it upon guides, and impart to it a reciprocating rectilinear motion by means of eccentrics, as hereinafter explained.

A A are the standards or supporting-plates, in which are the bearings of the working parts. On one of the plates A are brackets supporting two oscillating steam-engines, set so as to have their piston-rods in direct connection with a crank on the end of the shaft B, and working at right angles with each other in a manner common to oscillating engines when coupled in pairs to the same crank-pin. A fly-wheel on the other end of the shaft B gives uniformity of motion.

Firmly secured on each end of the shaft B, so as to revolve with it, and between the plates A A, is a cam, C C, (shown in dotted lines in Fig. 3 and in full lines in Fig. 4,) which may be an eccentric or of any other form that may be deemed expedient. A lever made of a plate, D, and deep stiffening ribs or flanges D′, (see Figs. 1 and 3,) carries at its lower end two friction-rollers, E, one of which is in contact with each of the cams C C, and kept against its surface by the weight of the lever D D′. The lever D D′ has its fulcrum on the shaft F, which has its bearings in the plates A A, and terminates in an eccentric cam, G, vibrating on the shaft F, (see Fig. 3,) and working in a concave on the back of the sliding jaw H, which moves in a rectilinear path along the guide-plates $a\ a^{\times}$, and is kept in contact with the jaw by the collars $b\ b$ at its ends, Figs. 1, 2, 3. The jaw H′ is immovable, except for adjustment along its guide-plate a' by the keys $c\ c$ between it and the key-seats $c'\ c'$, and extends, as well as the jaw H, across the whole space between the standard-plates, to which it is also secured by bolts working in slots for adjustment, as seen at $d\ d$, Figs. 2 and 3. Both jaws H and H′ are faced with steel on their contiguous sides, and these form an angle with each other, as represented in Fig. 3, being farther apart at the top than at the bottom, the degree of divergence depending on the nature of the ore to be broken.

The shaft B has securely keyed upon it the sleeve-rings K K K K, which are corrugated on their surfaces in such a manner as to form teeth with rounded corners, and are so placed that their corrugations form continuous lines throughout the combined length of their faces—that is, from the inside of one standard plate A to the other. The teeth thus formed by the corrugation of the surfaces of the sleeve-rings K mesh into similar corrugations on the sleeve-rings L L L, which are greater in diameter than the rings K, and are keyed on the shaft M in such a manner that the rings K shall break joints with the rings L. (See Fig. 4.) Motion is given by the sleeve-rings K, which thus form a toothed wheel, to the toothed wheel constituted by the rings L, and thence to the shaft M, which has at each end, on the outside of the plates A A, a crank, N, Figs. 1 and 2.

The shaft O, Figs. 1, 2, and 3, has its bearings in the standard-plates A A, and supports on its ends the fulcrums of the bell-crank levers P P P′ P′. The arms P P of these levers have each a slot, in which the pins of the cranks N rotate on each end of the shaft M. The other arms, P′ P′, Fig. 2, of the bell-cranks carry adjustable bearings for the gudgeons of the pulverizing-roller R, the axle of which passes through openings in the standard-plates A A, the length of the roller being the same as the width between the plates. This roller is in contact with a circular concave, *e*, having

for its center the axis of the shaft O, fixed solidly, and terminating at its upper end in an inclined plane, which extends up nearly to the under side of the wheel K, so as to be just cleared as the wheel revolves. The roller R is kept in contact with the concave *e* by the key *f*, driven between the bearing of its gudgeon and the socket that receives the bearing-block in the arm P′.

The bearings of the shaft M are adjustable laterally, as will be seen in Fig. 2, where the block *g*, which is the bearing, slides on the guides *g′ g′*, and is retained in position by the screw *h*. The bearings of the shaft B are adjusted laterally by a key similar to that used in the arm P′ of the bell-crank, either driven or moved by a screw.

The jaws being opened to their widest extent, and the friction-rollers E E resting against the ends of the shortest radii of the cams C, lumps of ore are placed in the hopper formed by the inclination of the faces of the jaws H H′, and the engines are started. As the shaft B revolves the cam C forces out the lower end of the lever D D′, causing the eccentric G to turn in its bearing on the back of the jaw H, making it slide on the guide-plate *a* with such force as to break the lumps between it and H′. As the cam C revolves farther and lets the end of the lever D D′ down again, drawing back the jaw H, the lumps fall until they find space to suit them, whether big or little, and are again subjected to the breaking force, which operation is repeated until the lumps have become small enough to pass through the opening between the bottoms of the jaws H H′ and fall upon the wheel L, the corrugations or rounded teeth of which carry them down until they are caught by the teeth of the wheel K, which gives motion to the wheel L and shaft M, as well as grinds the ore that drops upon them from the jaws H H′. As the ore is liberated from the wheels K and L, between which it has been ground, it falls upon the inclined plane beneath them and finds its way to the concave *e*. The crank-pins on the ends of the shaft M now rotate in the slots of the arms P of the bell-cranks, elevating and depressing them, and causing the arms P′, which carry the journals of the pulverizing-roller R, to vibrate, so that the roller shall roll back and forth upon the concave *e*, completely pulverizing the ore which has been ground by the wheels K and L, and allowing the ore to pass beneath it to be removed. The mill is replenished with fresh lumps as often as is desirable.

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

The reciprocating jaw H, guided in a rectilinear path by the plate *a* and actuated by eccentric G and lever D D′, substantially as and for the purpose herein specified.

The above specification of my invention signed by me this 15th day of March, 1866.

C. W. STAFFORD.

Witnesses:

WM. T. MCNAMARA,

OCTAVIUS KNIGHT.