

# WEBSTER & MORGAN.

Ore Crusher.

No. 51,104.

Patented Nov 21, 1865.

Fig: 1.

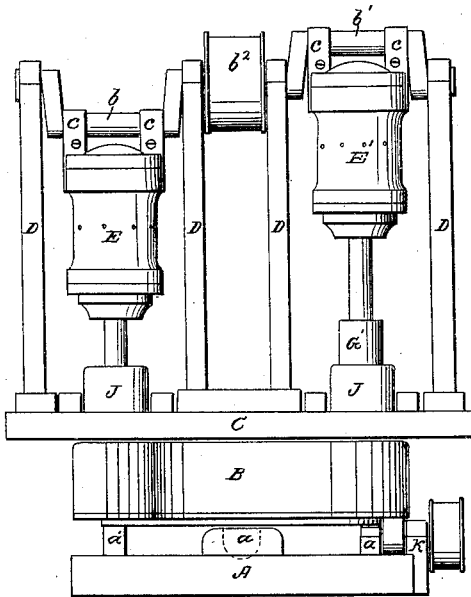


Fig: 2.

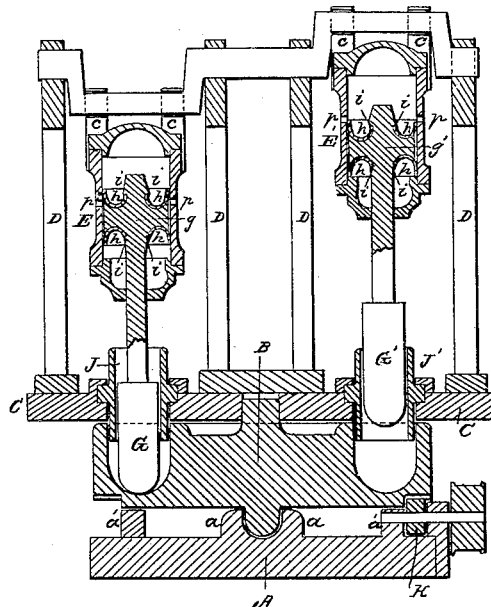


Fig: 4.

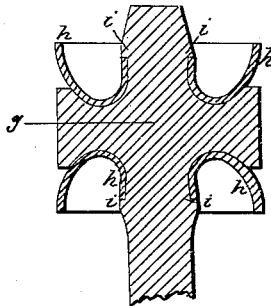


Fig: 5.

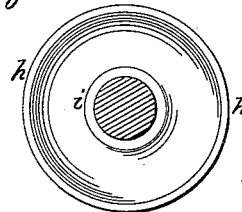
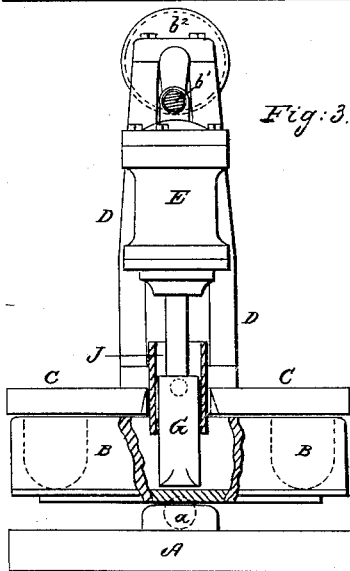


Fig: 3.



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# UNITED STATES PATENT OFFICE.

JOEL WEBSTER AND JAMES G. MORGAN, OF BROOKLYN, NEW YORK.

## IMPROVED ORE-CRUSHER.

Specification forming part of Letters Patent No. 51,104, dated November 21, 1865.

*To all whom it may concern:*

Be it known that we, JOEL WEBSTER and JAMES G. MORGAN, of Brooklyn, Kingscounty, State of New York, have invented a new and Improved Ore-Crusher; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is an elevation of one side of our improved ore-crusher. Fig. 2 is a vertical central section through the same. Fig. 3 is a sectional view, showing one of the stampers in a vertical position resting upon the bottom of the crushing-bed. Fig. 4 is a diametrical section of one of the pistons enlarged. Fig. 5 is a plan view of one of the pistons.

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

Our invention relates particularly to that class of ore-crushing machinery wherein pestles or reciprocating stampers are employed for crushing the ore.

The main object of our invention is to employ pneumatic springs, in conjunction with reciprocating stampers and a movable bed upon which the ore is crushed, in such manner that these springs will admit of very rapid and regular movements being given to the stampers without liability of injuring the machinery in consequence of the concussions incident to sudden blows of the stampers upon hard substances.

Another object of our invention is to communicate an up and down movement to the stampers and at the same time to give these stampers a vibrating movement for the purpose of obtaining a slight rubbing action simultaneously with every blow, as will be hereinafter described.

Another object of our invention is to contrive a packing for the piston-heads of the stampers, which, when applied to said heads, will not be liable to get out of place or to become detached from the heads, and which will constitute an expansible packing that will be expanded with greater or less force against the sides of the cylinders within which the pistons move in proportion to the pressure acting upon them, as will be hereinafter described.

To enable others skilled in the art to understand our invention, we will describe its construction and operation.

In the accompanying drawings, A represents a solid foundation upon which the machine is erected; and B represents a horizontal bed of a circular form, upon or within which the ore is broken by the stampers. This bed is supported centrally upon a bearing, *a*, so that the bed may be rotated or oscillated about its own axis, and it has an annular chamber formed in its upper side adapted for receiving the ore and conducting the same beneath the stampers. This chamber prevents the ore from flying off during the operation of crushing it. The movable bed B is further supported directly beneath the stampers by means of blocks *a' a'*, which resist the concussions of the stampers upon this bed.

Directly above the bed B, and supported in a suitable manner in a horizontal plane, is a platform, C, upon which are erected four standards, D, that support upon their upper ends the two-throw cranks *b b'*, and also a belt-wheel, *b<sup>2</sup>*, which latter is keyed to the crank-shaft at an intermediate point between the two cranks, as shown in Fig. 1.

E E' are two cylinders, which are suspended by means of bearings *c c* from their respective cranks *b b'*. Both cylinders are constructed precisely alike, and both are adapted for receiving piston-heads, which are formed on the upper ends of the rods of the stampers G G', as shown in Fig. 2.

The heads of the cylinders E E' are chambered, as shown in Fig. 2, and the piston-rods pass through stuffing-boxes in the bottom heads of the cylinders.

The upper ends of the piston-rods have enlarged heads *g g'* formed on them, which are made concave on both their upper and their lower sides, and otherwise adapted for receiving and keeping in place the packing-rings *h h*, which may be made of leather or other suitable substance possessing flexibility. These packing-rings *h h* are in the form of segments of hollow rings, as shown clearly in Figs. 4 and 5, and their inner edges are received by the shoulders *i i*, which are formed on the central stems of the piston-heads *g g'*, as shown in Fig.

3, while their outer edges press against the inside surfaces of the cylinders.

By constructing the piston-heads with the concave depressions and the shoulders *ii* they receive and retain in place the packing-rings without the use of bolts or nuts or other movable contrivances, which are liable to wear loose in a short time. When pressure is brought to act upon such a packing it is expanded and more firmly held in place in proportion to the amount of such pressure. The pressure of air in the cylinders, acting upon the packing-rings, *hh* has a tendency to flatten these rings, which tendency is counteracted by the shoulders at *ii* and the sides of the cylinders; hence the packing will work very tightly, but freely, within the cylinders *E E'*. These cylinders *E E'* may be constructed like common steam-cylinders; but instead of employing steam we use air and perforate the sides of the cylinders at *p p* for the admission of air above and below the pistons, so that by the condensation or compression of the air in the opposite ends of each cylinder we form spring-cushions for preventing the piston-heads from striking against the cylinder-heads in the ascending and descending strokes of the stampers. When the crank-shaft of the two-throw cranks *b b'* is rotated the cylinders *E E'* are alternately raised and depressed, and during this movement the piston-heads will pass by the air-passages *p p* and compress all the air that may be contained in the cylinders and between said passages and the heads of the cylinders which may be approaching the piston-heads. This compression of the air in the cylinders while they are ascending will operate as a spring to gradually overcome the inertia of the stampers and prevent the piston-heads from coming in contact with the bottom heads of the cylinders. As the cylinders descend the pistons will compress the air in the upper ends of the cylinders, and this compressed air will act as springs to accelerate the downward movement of the stampers, and also to react upon the cylinders to start them upward again as the cranks pass their lowest points. The pneumatic springs not only serve as elastic cushions for relieving the driving machinery from injurious concussions, but they also operate as reservoirs of power to assist in reversing the motion of the stampers and to equalize the motion of the crank-shaft, similar to the action of a "fly" or balance wheel in an ordinary engine.

The stampers *G G'*, which are secured to the lower ends of the piston-rods, have their lower extremities rounded to conform to the chamber which is formed in the movable bed *B*, as shown in Fig. 2. These stampers are guided in their up and down movements by means of oscillating tubes *J J'*, which have their trunnion-bearings upon the platform *C*, as shown in Fig. 2, and which project down through

openings made through the platform. The stampers pass loosely through the oscillating tubular guides *J J'*, and these guides give to the lower ends of the stampers a slight lateral or rubbing motion while striking the blows upon the bed *B*. By locating the trunnions of the tubular guides *J J'* higher or lower the vibrating or rubbing movements of the lower ends of the stampers may be increased or diminished, as circumstances require. These oscillating guides enable us to employ cranks for actuating the stampers, and admit of the attachment of the pneumatic cylinders directly to said cranks.

In practice we desire to employ our improved packing-rings for packing the pistons at the points where they pass through the heads of the cylinders.

The bed *B*, for containing the ore which is to be crushed, may be rotated simultaneously with the movements of the stampers by means of a pinion-wheel, *K*, engaging with the teeth of a circular rack, which is applied to the bottom, and near the outer edge of the bed *B*. Instead of rotating this bed it may be oscillated, so that the large lumps of ore can be supplied at one point, and, as fast as it is pulverized, can be removed at another point, without stopping the movements of the stampers.

We do not claim the application of cup-leather packing to the piston-rod by setting said cup-leather in the hollow head or basin of the end of the cylinder.

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

1. The application of a pneumatic spring to the stampers of an ore-crushing machine, substantially as described.
2. Connecting the pneumatic springs to the cranks which operate the stampers, and guiding the lower ends of the latter so that they will receive an up and down motion, and also a vibrating motion, substantially as described.
3. The employment of a packing for the piston of the pneumatic spring, which is constructed and applied substantially as described.
4. Constructing the piston of the pneumatic cylinder with concave faces and shoulders *ii*, adapted to receive an annular concavo-convex packing, substantially as described.
5. Securing the leather packing of the piston in their places by the raised offsets or shoulders *ii* on the piston-rod, as described.
6. The combination of the movable bed for receiving the ore to be crushed, with pneumatic-spring stampers, substantially as herein described.

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