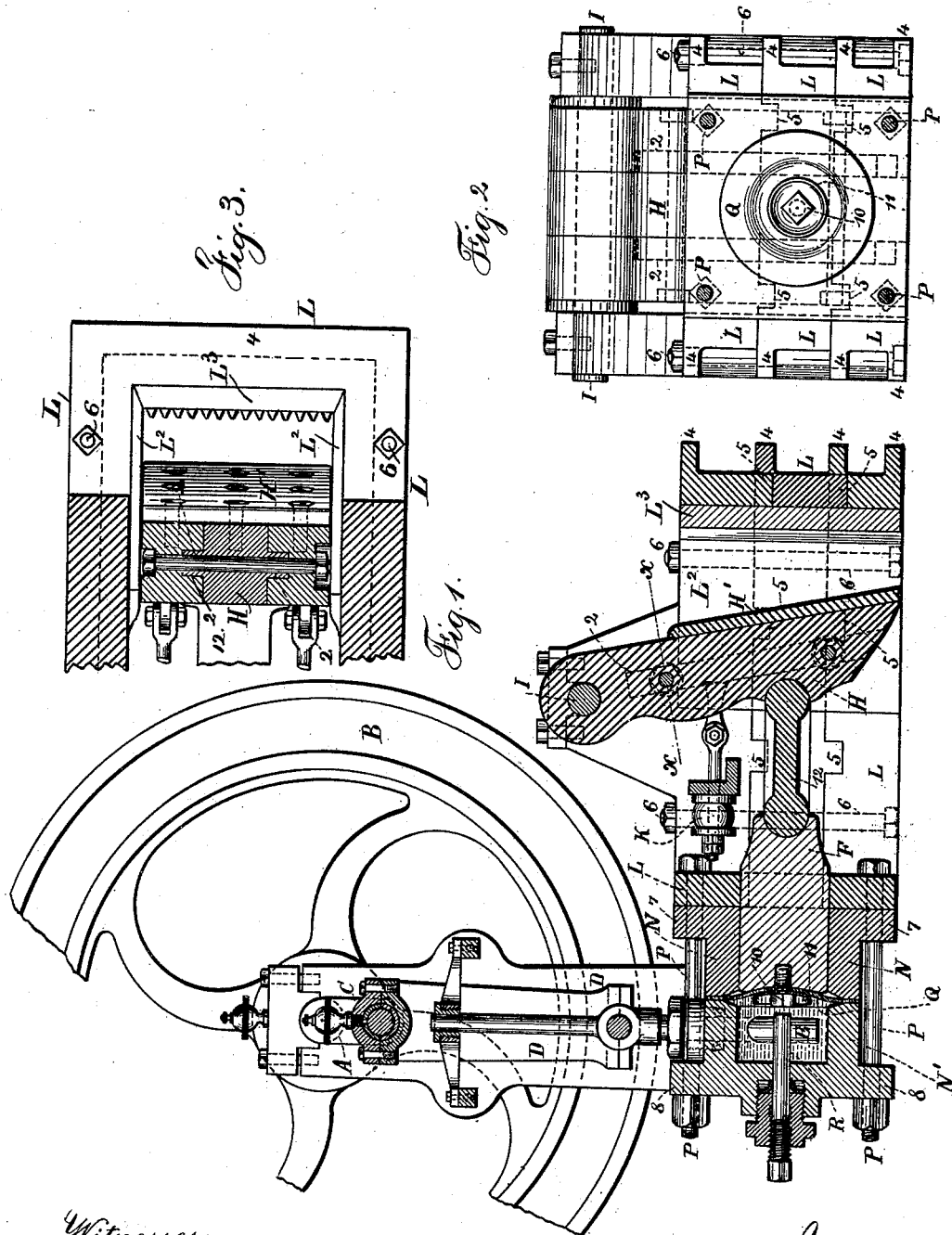


(No Model.)

A. H. SMITH.
STONE CRUSHER.

No. 423,282.

Patented Mar. 11, 1890.



Witnesses:
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UNITED STATES PATENT OFFICE.

AUSTIN H. SMITH, OF BROOKLYN, NEW YORK.

STONE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 423,282, dated March 11, 1890.

Application filed July 18, 1889. Serial No. 317,882. (No model.)

To all whom it may concern:

Be it known that I, AUSTIN H. SMITH, of Brooklyn, in the county of Kings and State of New York, have invented an Improvement in Stone-Crushers, of which the following is a specification.

In Letters Patent No. 120,784, granted to me, a stone-crusher is represented having a swinging jaw and a ram moving within a cylinder for giving motion to such swinging jaw, the ram itself being actuated by water within the cylinder, and a plunger moved by a shaft and crank to displace the water and give motion to the ram and jaw, and the backward movement of the swinging jaw was limited by a screw-stop. In stone-crushers of this character difficulty has been experienced in transporting the parts, especially where the same have to be carried over mountains, or where there are not railways, and another difficulty has been experienced in consequence of the hydraulic packing around the ram being liable to injury by the constant motion to which it is exposed.

My invention is made for overcoming the before-mentioned difficulties, and relates to a peculiarly-constructed sectional frame and sectional swinging jaw that allows the heavy parts to be separated to facilitate transportation, and I make use of a flexible diaphragm between the ram and the cylinder that allows the movement of the ram within the cylinder and renders it unnecessary to employ a hydraulic packing around the edge of the ram.

In the drawings, Figure 1 is a vertical section of the crusher. Fig. 2 is an end view of the frame with part of the cylinder detached, and Fig. 3 is a section through the swinging jaw at the line *x x*, Fig. 1.

The main driving-shaft A, fly-wheel B, crank C, connecting-rod D, and plunger E are similar to the devices shown in my United States patent, No. 120,784, and English Patent No. 23 of 1873, and the ram F is provided with a strut 12, extending from the end thereof to the back of the swinging jaw H, that is hung upon the cross-shaft I, and there is a spring K to draw back the jaw, as before made use of by me; but the swinging jaw H is made of sections, there being preferably three sections, as shown in Fig. 3, and bolted together, and there are interlocking ribs 2

passing into corresponding grooves in the adjacent faces of the jaw-sections, so that such jaw-sections are supported and operated as advantageously as though the same were cast in one piece; but these sections can be taken apart for convenience in transportation, and upon the face of this swinging jaw H there is a plate H', that receives the wear and abrasion in crushing the ore. This plate is preferably bolted on with counter-sunk bolts.

The main frame L of the machine is made rectangular and in sections. I have shown three such sections, and each section is provided with one or more flanges 4, as represented, and there are interlocking lugs at 5 upon one section passing into corresponding notches upon the adjoining section, and there are bolts 6 passing through holes in the flanges 4 and uniting the respective parts or sections of the frame firmly together, and by the removal of these bolts the frame can be taken apart for convenient transportation.

At one end of the frame L is an opening, through which the ram F passes, and this end of the main frame L is adapted to receive the flanges 7 of the cylinder N, within which the ram F is moved.

The cylinder is made in two parts, the portion N' corresponding in diameter with the portion N of the cylinder, and this part N' has flanges 8, through which pass the bolts P, that hold the parts of the cylinder together, and also connect the cylinder with the frame L of the machine; but before these bolts P are inserted the diaphragm Q is applied between the respective parts of the cylinder, and it extends across the end of the ram F, and the surfaces or inner edges of the two portions N N' of the cylinder that come together are rounded, and the outer edges of the ram F are also rounded, as represented, so that the diaphragm Q will not be injured by contact with any sharp edge, and the proper extent of movement will be given to the ram F and to the jaw H by the movement of the plunger E as the same rises and falls by the action of the crank C and connecting-rod D, such plunger E acting upon the water within the cylinder N' to give a powerful motion to the ram F and jaw H, the diaphragm Q yielding to allow of this movement, and the spring K

draws back the jaw against a stop R, that is preferably in the form of a screw passing through the head of the cylinder N' and provided with a packing, and the point of the screw being adjacent to the end of the ram F, or preferably near the head of the screw 10, that connects the central clamping-washer 11 of the diaphragm Q with the end of the ram F.

10 The action of the water upon the ram is the same as described in my aforesaid patent; but by the use of the diaphragm Q, I am enabled to accomplish two objects. The first is to separate the cylinder N N' into two parts 15 to facilitate transportation and to render the joints between these two parts tight when they are put together, and, second, to allow the ram to move endwise without the use of the hydraulic packing around the edge of the same, the flexible diaphragm taking the place 20 of such hydraulic packing.

These present improvements do not in any manner lessen the efficiency of the stone-crusher as a whole. They greatly facilitate 25 transportation, and the flexible diaphragm is more easily replaced, especially in mining regions, than the hydraulic packing heretofore necessary around the ram.

30 The lining-plates L² L³ for the interior surface of the frame L at the hopper serve to take the wear in crushing the stone, and these and the jaw-plate H' are usually of steel.

I claim as my invention—

35 1. The combination, with the main frame of the machine and the swinging jaw, of the ram for acting upon the swinging jaw, the

two-part cylinder, within one part of which the ram slides, the elastic diaphragm introduced between the two parts of the cylinder and against the end of the ram, and bolts for 40 connecting the respective parts, substantially as set forth.

2. In a stone-crushing apparatus, a swinging jaw pivoted at its upper end and made of two or more sections bolted together and 45 having interlocking ribs and grooves running vertically between the sections of the jaw, substantially as set forth.

3. The combination, with a swinging jaw in a stone-crushing machine, of the frame supporting the pivot of the jaw and within 50 which such jaw is swung, the said frame having flanges 4 and lugs 5 passing into recesses in the adjacent portions of the frame to lock the parts together, and the bolts passing vertically through the flanges of the frame-sections, substantially as set forth. 55

4. The combination, in a stone-crushing apparatus, of a cylinder and plunger to act upon the water within the cylinder, a diaphragm introduced within the two parts of 60 the cylinder, bolts for connecting the parts and clamping the diaphragm, a ram acted upon by the water in the cylinder and the flexible diaphragm, a frame and swinging jaw, 65 and the strut between the ram and the swinging jaw, substantially as set forth.

Signed by me this 15th day of July, 1889.

AUSTIN H. SMITH.

Witnesses:

GEO. T. PINCKNEY,
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