A. DIETZ.

Machines for Crushing Stone.

No. 155,185. Patented Sept. 22, 1874.

Fig. 1.

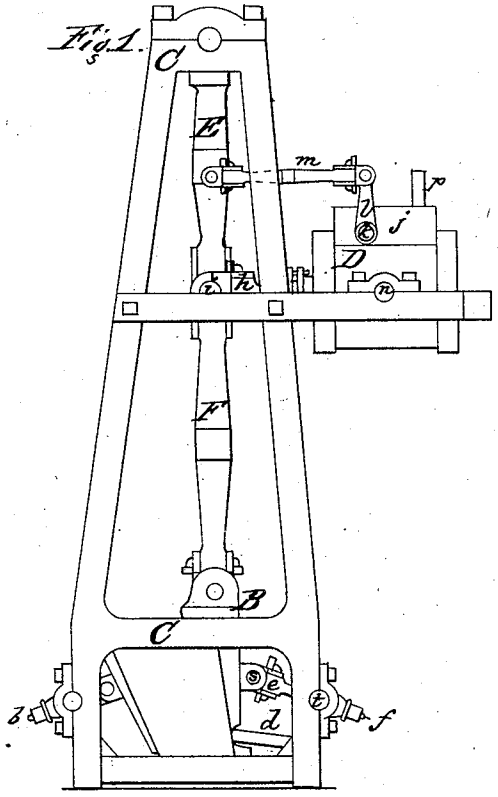


Fig. 2.

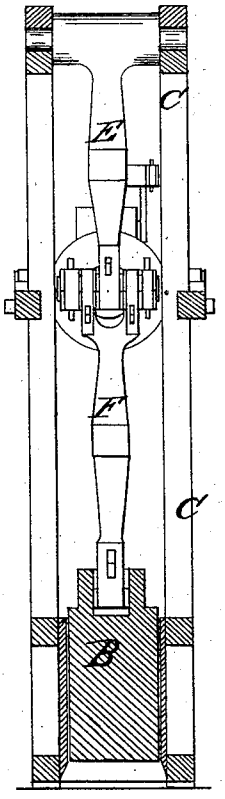


Fig. 4.

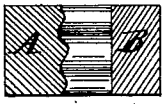
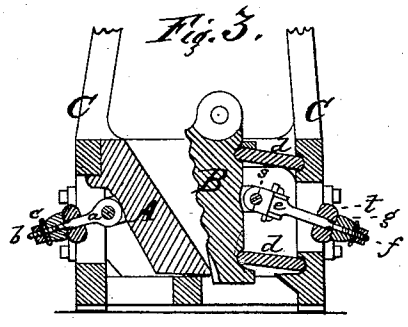


Fig. 3.



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UNITED STATES PATENT OFFICE.

ANDREW DIETZ, OF PLAINFIELD, NEW JERSEY.

IMPROVEMENT IN MACHINES FOR CRUSHING STONE.

Specification forming part of Letters Patent No. **155,185**, dated September 22, 1874; application filed February 12, 1874.

To all whom it may concern:

Be it known that I, ANDREW DIETZ, of Plainfield, in the county of Union and State of New Jersey, have made an invention of certain new and useful Improvements in Machines for Crushing Stones and other Materials; and that the following is a full, clear, and exact description and specification of the same.

The object of my invention is, primarily, to combine in one machine both the mechanism for acting on the stone, and the motor for operating that mechanism, so as to produce a portable self-operating stone-crusher, which can be readily transferred from place to place, and does not require belts, shafting, or other transmitting mechanism, to transmit the power from the motor to the stone-crushing mechanism. Another important object of the invention is to prevent in whole or in part the breakage of the machine when the jaws become clogged, or when the force required to crush material between the jaws is greater than the machine is capable of sustaining. The new combinations by which these objects are attained are specified in detail at the close of this specification.

In order that my invention may be fully understood, I have represented in the accompanying drawing, and will proceed to describe, a direct-acting steam stone-crusher, embodying all my improvements in the best form known to me at the present date. But I propose to vary the form and construction of the machine as circumstances or the views of users may render expedient.

In the said drawings, Figure 1 represents a side view of the machine. Fig. 2 represents a front view of the same with certain portions removed. Fig. 3 represents a central vertical transverse section of the crushing-jaws, and their immediate connections. Fig. 4 represents a horizontal section of said jaws.

The said machine has two upright crushing-jaws, A B, one of which, A, is, by preference, made stationary or fixed, and the other, B, is constructed to move up and down. The fixed jaw A is firmly secured to the frame C of the machine, a link, *a*, with a screwed shank, *b*, and nut *c*, being employed to hold it in its place, and to permit of its convenient removal, so that it may be replaced by a new jaw when worn by use. The movable jaw is connected with the frame by two radius-blocks, *d d*, and by a link, *e*. The ends of the radius-bars rest in curved seats formed, respectively, in the back of the movable jaw, and in the cross-bars of the frame C, so that the radius-blocks may vibrate as the movable jaw is raised and depressed. The link *e* is connected at one end with the back of the movable jaw by a joint-pin, *s*, and has a screwed shank, *f*, which is passed through a slot in a rock-shaft, *t*, and through a spring, *g*, which bears against the said shaft. The end of the shank is fitted with a nut and washer, the last of which bears against the spring *g*, and the ends of the rock-shaft are formed into journals which are fitted to rock in grooves formed in the sides of the frame C. By reason of the connection of the movable jaw with the frame by the radius-blocks, it is caused to approach the face of the fixed jaw when it is depressed, and to withdraw from that face by the action of the spring *g*, when it (the movable jaw) is raised.

The faces of the two jaws may be plain or ribbed. I prefer, however, to construct the face of one of the jaws (by preference the fixed jaw) with upright ribs, as seen in section at Fig. 4, and to construct the face of the other jaw (by preference of the movable one) with horizontal ribs, as seen in section at Fig. 3.

Moreover, when all my improvements are used the face of one of the jaws, or of the upper part of it, is made convex, as seen at Fig. 4, so that a large stone, when first introduced, is broken by straining it transversely upon the ridge of the convex jaw.

In order that the machine may be self-operating and direct-acting, a steam-cylinder, D, is connected directly with the frame C that holds the crushing-jaws A B, so that the said cylinder and jaws are directly combined by said frame, and constitute integral parts of one combined machine.

This steam-cylinder may be arranged, if preferred, directly above the movable jaw, and its piston-rod may be connected with the movable jaw by a single link, so that the

stroke of the steam-piston may be the same as the upright stroke of the movable jaw; or the steam-cylinder may be arranged behind the movable jaw and connected with it through the intervention of a lever-beam, having arms of the same or of unequal lengths, the latter enabling the stroke of the piston to be greater than the upright stroke of the movable jaw; but I prefer to arrange the steam-cylinder horizontally or thereabout, as represented in the drawing, and to connect its piston-rod *h* with the movable jaw B through the intervention of toggle-links E F, the upper, E, of which is hung from the upper end of the frame C of the machine.

By this arrangement the stroke of the piston may be made greater than the upright stroke of the movable jaw B; but, with all the arrangements above mentioned, the motor, consisting of the steam-cylinder and its appurtenances, forms an integral part of the machine, and the necessity of using belts and shafting to connect an independent motor with a simple stone-crusher is dispensed with.

The piston-rod *h* of the steam-cylinder passes through a stuffing-box in the cylinder-head, and is connected at its outer end directly with the joint-pin *i* of the toggle-links; and the toggle joint moves slightly up and down when the toggle-links are vibrated by the steam-piston. The steam-cylinder D is connected with the frame by trunnions *n*, which permit it to accommodate itself to such movement without straining the piston-rod.

The steam-cylinder is provided with a valve-chest, *j*, containing the valve or valves for controlling the admission and escape of steam to and from the cylinder, and the valve or valves may be operated by a rock-shaft, *k*, arm *l*, and link *m*, connected with the upper toggle-link E; or may be operated in any other desirable manner.

It is not deemed necessary to describe any particular valve mechanism, because the invention is not restricted to a peculiar valve mechanism, and because the valve mechanism may be the same as that of the steam-cylinders of direct-acting steam-pumps, many varieties of which are on sale in the market. As, however, the greater part of the power required must be extended during the descending stroke of the movable jaw, while the power to be exerted during the ascending stroke is comparatively small, the valve mechanism should be so adjusted as to supply less steam to the steam-piston during the ascending stroke of the jaw than during its descent; or, if preferred, the steam-cylinder may be made single-acting, and a spring may be used to raise the movable jaw after its descent.

In order that the machine may be put in operation the valve-chest *j* of the steam-cylinder is connected by a steam-pipe (which may be flexible if deemed best) with the steam-boiler. When the cylinder vibrates on trunnions these may be hollow, and the connection may be made through one trunnion, while the other connects with an exhaust-pipe, the trunnions being connected with the valve-chest by passages cast upon the steam-cylinder, as is common with oscillating engines; or, as the cylinder oscillates but slightly, an exhaust-pipe may be applied directly to the valve-chest, as at *p*, Fig. 1. The action of the steam, as controlled by the valve mechanism, will impart a reciprocating movement to the piston, and, consequently, to the toggle-links and to the movable jaw.

The stone to be broken is fed in at the upper ends of the jaws, and is crushed and forced downward between them by the movement of the movable jaw, which rises and descends, and also moves forward and backward to and from the movable jaw.

As the movable jaw is not connected with a rotating shaft, or other mechanism for defining its movement, it follows that the extent of movement in a downward and forward direction depends upon the resistance of the material and the force applied through the steam-cylinder. If the force is not sufficient to break the stone between the jaws at the first blow, or downward and forward movement of the jaw, it will be stopped before attaining a full stroke, and being moved backward and upward by the action of the motor will be driven against the stone a second time. Moreover, as there is no fly-wheel in the machine, the force exerted at any forward movement depends directly upon the force of the steam acting upon the piston at the time, and not upon force accumulated in a fly-wheel during the backward movement of the movable jaw.

As the steam exerts an elastic pressure, while the force accumulated in a fly-wheel operates when checked like a violent blow, the danger of the fracture of the machine when the jaws become clogged is greatly reduced as compared with the fly-wheel machines.

It will be noticed also that as the machine contains within itself both the motor and the crushing mechanism, the entire operating mechanism may be adjusted for use at the shop of the builder; and the machine may be readily transported from place to place, and set up for use without the services of skilled machinists.

This feature makes the machine of great value for the production of broken stone for country roads, as the machine can be moved along the road to places at which it is convenient to deliver stones gathered from the fields. In such cases a portable boiler on wheels may be used to supply the steam, and the connection between the machine and the boiler may be made by means of a flexible steam-pipe.

I claim as my invention—

1. The combination, substantially as before

described, of the upright crushing-jaws with the steam-piston, steam-cylinder, steam-valve, for controlling the admission and escape of steam to and from the steam-cylinder, and frame of the machine, without the intervention of a rotating shaft between the movable crushing-jaw and the steam-piston which moves it.

2. The combination, substantially as before set forth, of two upright crushing-jaws, one of which has a face which is ribbed in an upright direction, and the other of which has a face which is ribbed crosswise to the first.

Witness my hand this 6th day of February, A. D. 1874.

ANDREW DIETZ.

Witnesses:
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