(No Model.) 2 Sheets—Sheet 1.

R. D. & P. W. GATES.

ROCK OR ORE CRUSHER.

No. 530,102. Patented Dec. 4, 1894.

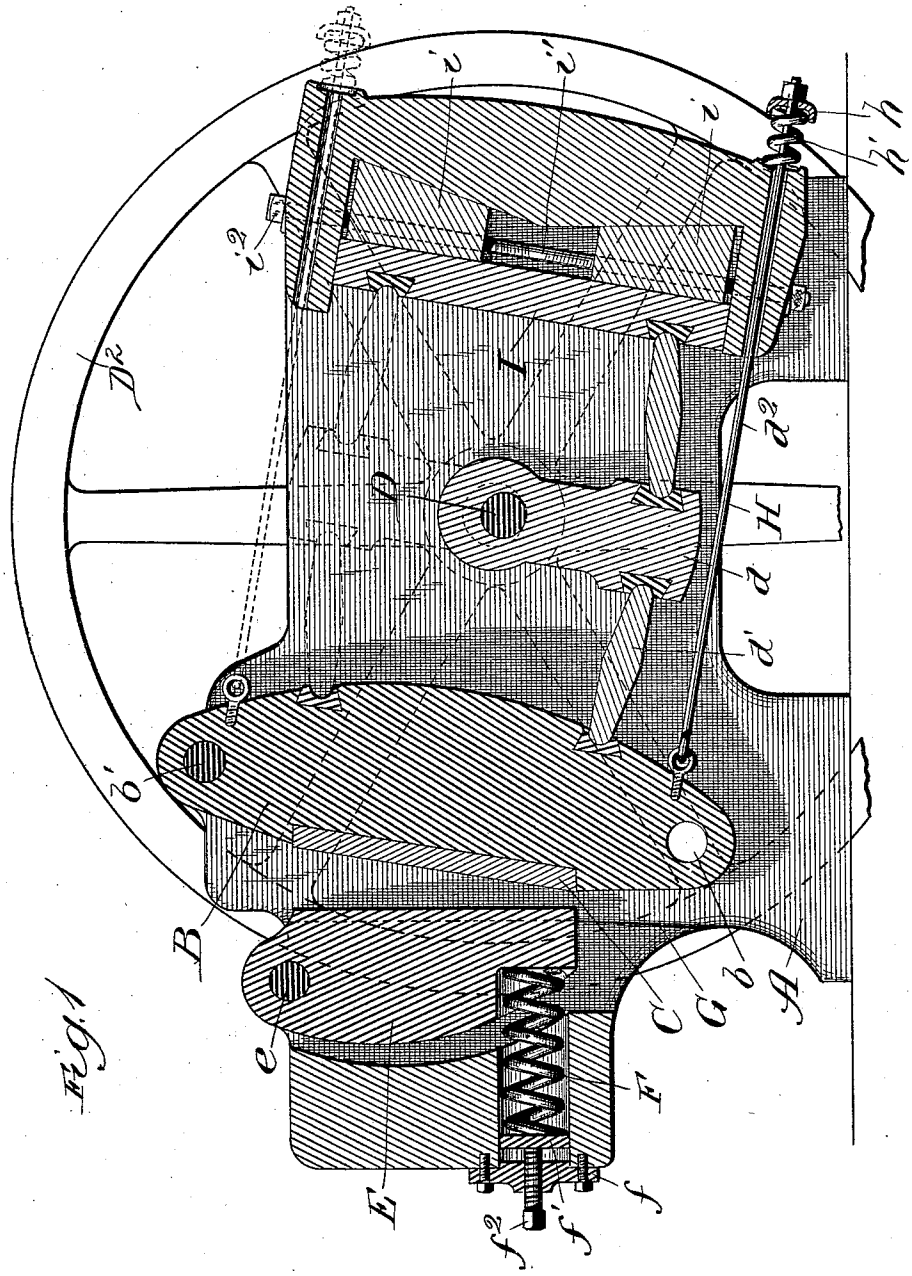

Fig. 1

Witnesses:
Chas. E. Gaylord.
Lute S. Alter.

Inventors
{ Ryerson D. Gates,
Philetus W. Gates,
By Banning & Banning & Payson,
Attys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

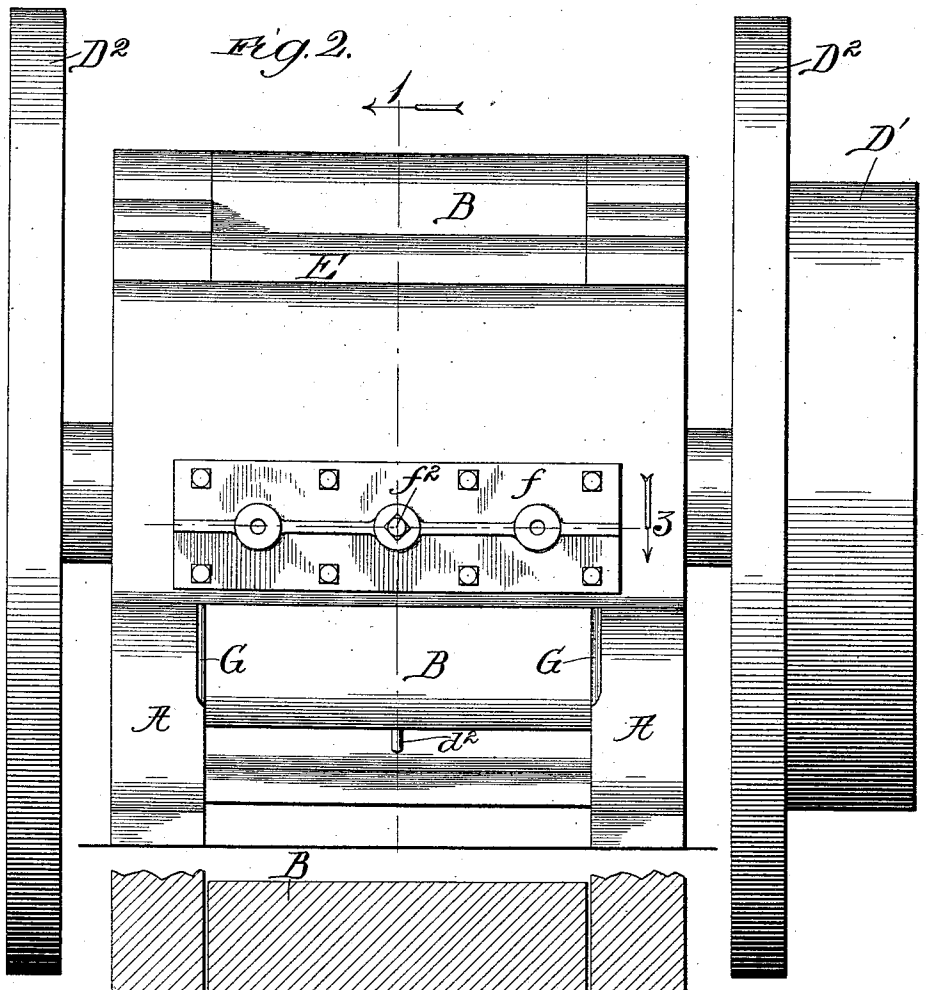
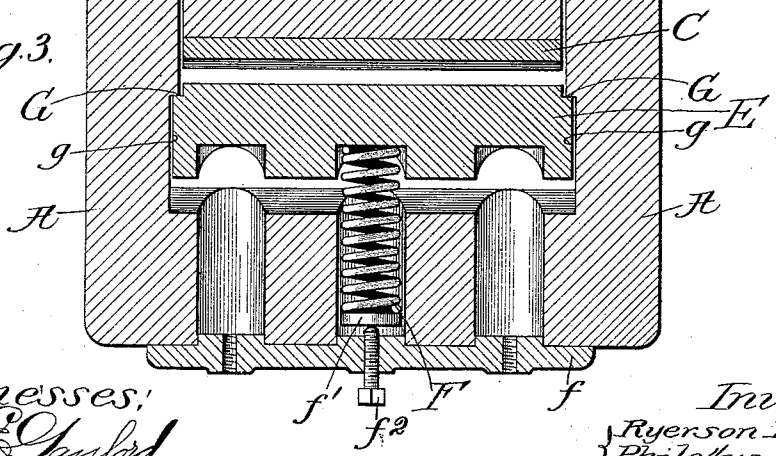


Fig. 3.



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Inventors
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Philetus W. Gates.
By Banning & Banning & Payson.

UNITED STATES PATENT OFFICE.

RYERSON D. GATES AND PHILETUS WARREN GATES, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE GATES IRON WORKS, OF SAME PLACE.

ROCK OR ORE CRUSHER.

SPECIFICATION forming part of Letters Patent No. 530,102, dated December 4, 1894.

Application filed October 24, 1893. Serial No. 488,992. (No model.)

To all whom it may concern:

Be it known that we, RYERSON D. GATES and PHILETUS WARREN GATES, citizens of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Rock or Ore Crushers, of which the following is a specification.

Our invention relates to that class of crushers known as reciprocating rock and ore crushers, which are provided with a reciprocating jaw for crushing the rock or ore against a stationary or yielding jaw.

In the drawings, Figure 1 is a vertical, sectional elevation, taken on line 1 of Fig. 2; Fig. 2 an end elevation, and Fig. 3 a longitudinal section, of a portion of the mechanism, taken on line 3 of Fig. 2.

The object of our invention is to provide a rock and ore crusher operated with reciprocating and yielding jaws, so constructed and arranged that it can be easily converted from one style of "Blake crusher"—in which the reciprocating jaw is pivoted at the top and actuated from the bottom so as to rapidly break or crush the ore or stone and discharge the same in a coarse state—to that style of "Blake crusher" in which the reciprocating jaw is pivoted at the bottom and actuated at the top, so that the greatest movement being at the top, and the least movement at the bottom, a finer grade of crushed material is obtained; also, to provide means by which the yielding jaw, against which the ore or stone is crushed during the operations of the reciprocating jaw, may be more conveniently and effectively made to perform its work; and our invention consists in the features, combinations and details of construction hereinafter described and claimed.

We are aware of the fact that yielding jaws are not new in combination with reciprocating jaws in the class of crushers above referred to, and that such yielding jaws have been operated by the tension of a powerful spring. In all of these cases, however, the machines have not been operative, from the fact that the pressure of the spring is directly against the yielding jaw, and that such jaw was allowed to come up against the reciprocating jaw. It will be readily seen that in these cases, if enough tension was put on the spring to give resistance enough to do the crushing of the material between the jaws, as the reciprocating jaw went forward, it would necessarily carry the yielding jaw backward at least a portion of the distance of the advancing throw given the reciprocating jaw, and that the yielding jaw would immediately return the material against the reciprocating jaw in its backward movement, and, therefore, the crushed material would be held against the reciprocating jaw and not be allowed to discharge through its opening.

Our invention is designed to obviate this objection; and, in order to overcome it, we make the springs which hold the yielding jaw in place of sufficient tension to break the material upon which the crusher is operating, without allowing the jaw to yield more than a small portion of the throw or advance of the reciprocating jaw, while at the same time if an unusual hard piece of material, or some solid substance—such as a sledge or piece of iron—should get between the jaws, the tension springs would allow the yielding jaw to yield the full amount of the throw of the reciprocating jaw, and thus relieve the other parts of the mechanism from breakage; and at the same time we provide means by which the yielding jaw is prevented from returning to a point beyond its proper position, so that the reciprocating jaw in its backward movement will leave an opening between the bottom of the two jaws for the discharge of the crushed material.

Another point in our invention is the pivoting of the yielding jaw. In the case where the yielding jaws are not pivoted, it is obvious that the throw of the reciprocating jaw, being greater at the bottom or top accordingly as its jaw is operated from the top or bottom, will neutralize the difference in throw in its length, from the fact that it would move the yielding jaw back parallel—that is, both top and bottom an equal amount, and thus overcome the benefit of the difference of the amount of motion of the jaw, thus making the machine less effective; but by pivoting the yielding jaw, we only allow it to yield at the lower end, thus entirely overcoming the defects, while the effect of the work is the same as if the jaw were

stationary, except in the case where the material is so hard as to make the jaw yield, and this will only be proportionate to the amount of pressure required to break the material.

In constructing our improved rock and ore crusher, we provide a frame, A, of the desired shape and strength to receive and support the operative parts of the machine, and provide a reciprocating jaw, B, having holes, *b*, at top and bottom, through which a pin, *b'*, may be inserted into the frame of the machine, for the purpose of pivoting the reciprocating jaw at the top or bottom, as necessity may require. In Fig. 1, we have shown the reciprocating jaw pivoted at the top, forming thereby what is known as the ordinary "Blake" style of crusher. The reciprocating jaw is provided with a crushing surface, C, dovetailed into the reciprocating jaw, and which may be secured therein by bolts or in any convenient manner, so that it may be removed and a new one inserted as often as seems desirable.

To operate the reciprocating jaw and give it the desired throw, we provide a crank shaft, D, and mount upon the eccentric portion of it a pitman, *d*, which moves upward and downward as the shaft rotates. The crank or operating shaft may be provided with the usual driving pulley, D', and fly wheels, D^2. Interposed between the pitman and the reciprocating jaw, and particularly shown in the solid lines of Fig. 1, is a toggle, *d'*, while between the pitman and the solid portion of the machine is a second toggle, d^2, the whole being so constructed and arranged that as the pitman rises and falls during the rotation of the operating shaft, the entire throw of the different positions that the toggle may assume is imparted to the reciprocating jaw.

To provide a jaw against which the material is crushed during the motions of the reciprocating jaw, we make what we term a yielding jaw, E, pivoted on a shaft, *e*, having suitable bearings in the framework of the machine. We prefer, as shown in the drawings, to pivot this yielding jaw at its upper portion, and to provide means for allowing the jaw to yield at least a small portion of the advance throw of the reciprocating jaw, we interpose several spiral tension springs, F, between the lower rear end of the yielding jaw, and suitable caps, *f*, secured in any convenient manner to the forward portion of the framework of the machine. These springs, which may consist of any convenient number, should be of sufficient tension or strength to perform the legitimate crushing of the material as it passes between the jaws during their operation; but to provide means by which this tension may be regulated at will, we insert a plug of metal, *f'*, in the spring recesses, and an adjustable screw, f^2, having its threaded portion bearing in the caps, *f*, so that by rotating these screws, the plug, *f'*, is caused to be either pressed forward or allowed to go back, and thus regulate the tension of the springs, F.

To prevent the yielding jaw from following the reciprocating jaw backward during the entire distance of its rearward throw, and thus prevent the discharge of the crushed material, we provide shoulders, G, in the framework—particularly shown in Fig. 3—and corresponding projecting lugs, *g*, on the yielding jaw, so that the yielding jaw can only be pushed forward by the tension springs until it contacts these shoulders and be kept there while the reciprocating jaw returns to its rearmost position, thus allowing the crushed material to pass out of the lower opening between the jaws. To bring the reciprocating jaw backward after it has been moved forward, we provide a rod, H, which is preferably connected to the lower end of the yielding jaw, and its opposite end provided with a washer and nut, *h*, having interposed between it and the solid portion of the frame, a spiral spring, *h'*, so arranged that the tension of this spring operates to return the yielding jaw back to what we term its initial position.

To regulate the degree of fineness of the crushed material, and the distance between the yielding and reciprocating jaws, we mount in suitable ways in the framework of the machine a block, I, upon which one end of the toggles, d^2, have their bearing surface, and between this block, I, and the framework of the machine are interposed wedge-shaped sliding blocks, *i*, having an operating screw, *i'*, provided with a squared head, i^2, at its upper end, and having its opposite ends where it engages the sliding blocks provided with threads, so that as the screw is rotated in one direction it operates to move the sliding blocks forward toward the apex of the angle, thus moving the block, I, forward and lessening the distance between the operating jaws of the machine; and when it is rotated in the other direction, the sliding blocks are moved away from each other, thus allowing the block, I, to be moved backward and increasing the distance between the crushing jaws.

To change the crusher from a coarse or ordinary Blake crusher into a fine or old Blake crusher, all that is necessary to do, in the case of our improvement, is to remove the rod, H, from the lower end of the reciprocating jaw, and pin, *b'* from the upper end of the reciprocating jaw, and insert it through the frame and the opening, *b'*, in the lower end of such jaw, thus pivoting it at the bottom; remove the toggles, *d'* and d^2, from their position; swing the pitman around to the position shown in dotted lines (Fig. 1); insert the toggles between the pitman and the reciprocating jaw and the pitman and the block, I, as shown in the dotted lines; and connect the rod, H, through the eye-bolt in the upper part of the reciprocating jaw, also shown in

dotted lines, thus changing the machine immediately into the desired form of crusher.

We claim—

1. In rock and ore crushers, the combination of a reciprocating jaw adapted to be pivoted at either end, means for vibrating such jaw, and a jaw opposite the reciprocating jaw so arranged that the material is crushed between the jaws during the vibration of the reciprocating jaw, substantially as described.

2. In rock and ore crushers, the combination of a reciprocating jaw adapted to be pivoted at either end, a frame upon which such jaw is pivoted, means for actuating such jaw, so constructed that it may be connected to such jaw at either end for converting the machine into a fine or coarse crusher as desired, and a second jaw opposite the reciprocating jaw so arranged that the material is crushed between the jaws during the vibration of the reciprocating jaw, substantially as described.

3. In a rock and ore crusher, the combination of a reciprocating jaw adapted to be advanced and retracted and a pivoted crushing jaw whose pivotal point is stationary or fixed and the opposite end yielding, substantially as described.

4. In a rock and ore crusher, the combination of a reciprocating jaw adapted to be advanced and retracted, means for advancing and retracting the reciprocating jaw, and a crushing jaw pivoted at the top and having its lower end yielding, substantially as described.

5. In a rock and ore crusher, the combination of a reciprocating jaw adapted to be advanced and retracted, means for actuating such jaw, a crushing jaw pivoted at the top and yielding at the bottom having a stop to prevent its following the reciprocating jaw beyond a given point, and means for giving the desired tension to the lower end of such crushing jaw, substantially as described.

RYERSON D. GATES.
PHILETUS WARREN GATES.

Witnesses:
CHARLES L. CARMAN,
JOHN J. BREWIS.