(No Model.)

C. G. BUCHANAN.

Stone Breaker.

No. 236,548. **Patented Jan. 11, 1881.**

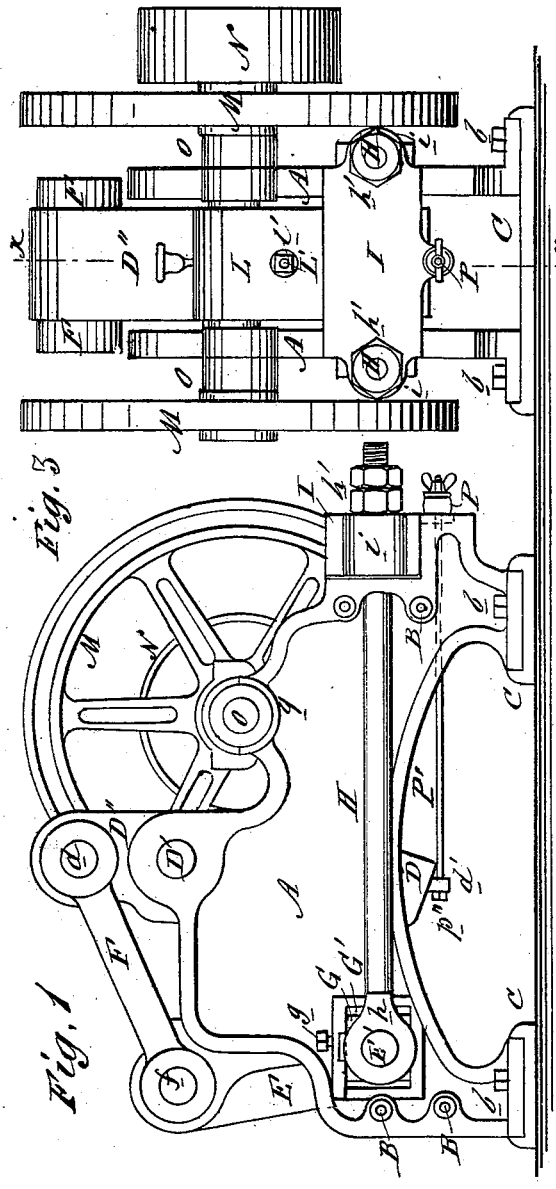

Fig. 1

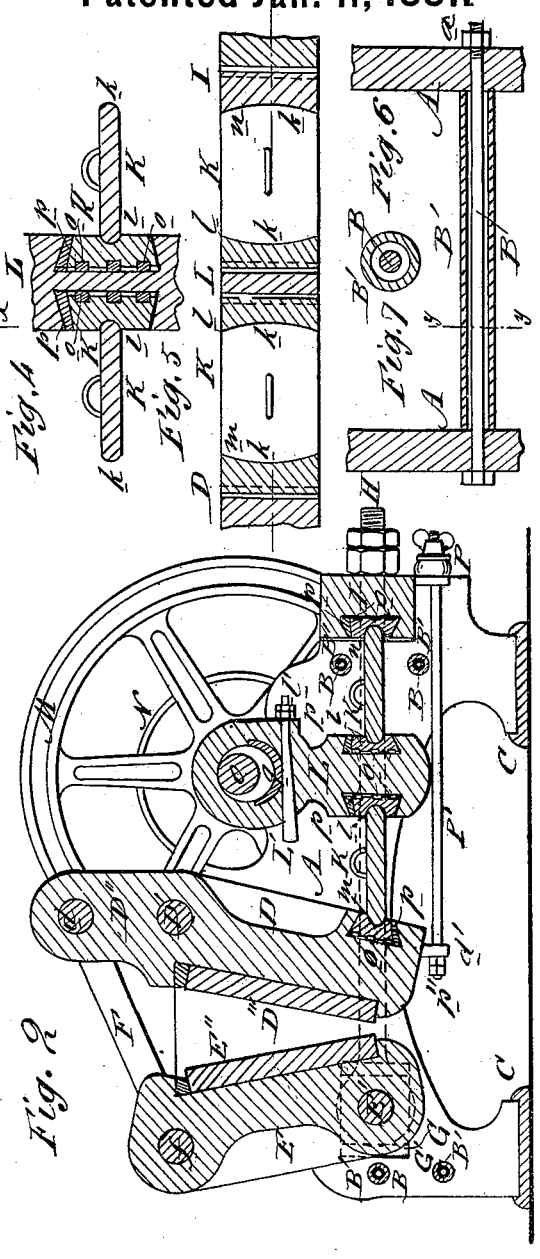

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

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STONE-BREAKER.

SPECIFICATION forming part of Letters Patent No. 236,548, dated January 11, 1881.

Application filed August 6, 1880. (No model.)

To all whom it may concern:

Be it known that I, C. GORDON BUCHANAN, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Stone-Breaker, of which the following is a specification.

This invention relates to that class of breakers or crushers having two movable jaws; and it consists of two jaws, one of which is pivoted at the top and the other at the bottom. The said jaws are connected at the top by rigid links and at the bottom by tension-rods or tie-bolts in such a manner that almost all the tensile strain due to crushing is imposed upon the said links and rods, instead of upon the breaker-frame, thus obviating the necessity of casting the frame in one piece or of employing the great weight and strength usually found in crusher-frames; and by pivoting the two jaws so that the motion of one is from the top and the motion of the other is from the bottom I obtain, if desired, a uniform crushing motion from the top to the bottom of the crushing-plates, and by having the motion uniform (or nearly so) the throw or stroke of the jaws is shorter, thus saving power and producing greater uniformity in crushing.

Figure 1 is a side elevation of the improved breaker. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a rear elevation of the same. Fig. 4 is an enlarged longitudinal vertical section of the improved toggle and toggle-bearings. Fig. 5 is a plan of the same. Fig. 6 is a longitudinal sectional elevation, showing the manner of holding the sides of the breaker-frame together. Fig. 7 is a transverse section on line *y y*, Fig. 6.

Similar letters of reference indicate corresponding parts.

In the drawings, A A represent the frame of the breaker, constructed in two like parts, and preferably of cast-iron. Said parts or sides A A of the frame are held together by the transverse rods B B, that have nuts *a a* on their ends, and said sides A A are held firmly at a suitable distance apart by the tubes B′ B′, through which the rods B B pass, and whose ends are in contact with the inner faces of said sides A A.

To keep the sides A A of the breaker in line, the independent shoes C C are provided for each end of the breaker, and the four feet of said breaker are secured to the said shoes C by means of the bolts *b b*, as shown. The machines, being fitted up in these shoes C C, will always come in line in moving or resetting. This device is a strong and cheap method of holding the frame rigidly together, and enables me to dispense with the usual cast-iron end pieces and planed joints, which are both heavy and expensive, my method uniting strength and lightness to an eminent degree.

D E represent the two jaws of the breaker, the main jaw D being pivoted at its upper end on the rod or shaft D′, and having its upper end extended vertically above the rod or shaft D′, so as to form a lever, D″, which is bored transversely near its upper extremity to receive the rod or shaft *d*.

E is the small jaw, pivoted near its lower extremity on the transverse rod or shaft E′, and having its upper extremity bored transversely to receive the pin *f*.

F F are the links, secured rigidly to the shaft and pin *d f* and connecting the jaws D E. Said links F F are preferably made of wrought-iron or steel, and transmit motion through the lever D″ of the main jaw D to the small jaw E, producing a uniform crushing motion from top to bottom of the crushing-plates D‴ E″, and making the actual advance or movement of said jaws D E as slight as is consistent with desired efficiency, thereby saving power and producing greater uniformity of crushing.

It is well known that in stone crushers or breakers having only one movable jaw suspended from the top, said jaw must have motion enough at the top to break the stone, and that to produce such necessary motion the advance at the bottom of the said jaw must be and is in great excess, thereby giving exit to large pieces of stone when opening, and this required increase of motion requires a corresponding increase of power. There are also stone-breakers having jaws supported or pivoted at the bottom and having most motion at the top; but these are incorrect in principle, because in this case the least power is applied where the resistance is greatest—where the stone is first broken—and uniformity of crushing in such a machine is only obtained by a great sacrifice of power and through excessive wear upon the moving parts. By the construction and arrangement herein shown and

described these objections that relate to breakers in common use are overcome, and by combining the two motions—or, in other words, by giving one jaw motion from the bottom and the other jaw motion from the top—a uniform, or nearly uniform, crushing motion is obtained from top to bottom of the crushing-plates D''' E'', thus saving power and reducing the wear and tear on the machine to a minimum.

The jaw E is, as before said, supported on the rod or shaft E', which rod or shaft E' is keyed or secured at each end in the adjustable boxes G G, which are fitted into larger slots or recesses G' G' in the sides A A of the machine and held in place by the set-screws *g g*. The ends of this rod or shaft E' project far enough through the boxes G G to enter the eyes *h h* of the tension-rods H H on each side of the machine. These tension-rods H H extend rearward and have their ends passed through the side lugs, *i*, of the toggle-block I, and are provided with nuts *h' h'*, whereby they can be drawn up or slackened, so as to make the jaw E approach to or recede from the jaw D, and thereby regulate or determine the grade of the crushed material passing through the machine. These rods H H, besides serving to adjust the machine to crush fine or coarse, receive the thrust of the toggles and nearly all the pressure due to crushing.

I am aware that tension-rods or tie-bolts are not new; but I am not aware that this combination of the tension-rods H H, attached directly to the supporting rod or shaft E', and in combination with the adjustable blocks or boxes G G of the jaw E, has ever before been made.

I do not confine myself to the precise method herein shown of connecting the tension-rods H H with the boxes G G, as obviously the said rods could be connected therewith in other ways—as, for instance, lugs could be cast on the said boxes G G and the ends of the tension-rods H H be passed through suitable holes therein and be secured by nuts, keys, or heads, or other suitable contrivance; but the method herein shown is effective, simple, and strong.

The pitman and toggles of a stone-breaker, being well-known agents, require no explanation of their action. The toggles K K herein shown are, however, of a new form, and were designed with a view of resisting unequal strains, and to remain always in contact with their seats, even should the toggles be thrown out of line; and they differ from the ordinary toggle by being formed with convex faces or ends *k k*, that fit into corresponding concave bearings *l m n*, respectively, in the pitman L, jaw D, and toggle-block I. The curved ends of the toggles K K may be made concave and the corresponding bearings convex, the result being the same in each case; or the toggles could be made straight on their faces, as usual, and the bearing-seats could be made concave or convex on their backs, and fitting into corresponding grooves in the pitman, toggle-block, and jaw, and I do not wish to confine myself to the exact method as illustrated by the drawings. The advantage of this improved toggle and toggle-bearing is, that should there be any tendency to wear more on one side than on the other, or should the toggles from any cause be moved in a lateral direction or thrown out of line with each other, their surfaces of contact with their bearings in pitman L, jaw D, and toggle-blocks I will still be coincident, which would not be the case if the bearing-surfaces were straight and rigid.

The bearing-blocks *l m n*, Fig. 5, are subjected to immense pressure, and consequently wear away very rapidly, and as it is desirable to have the surfaces exposed to wear as hard as possible I make the bearing-blocks *l m n* of the hardest mixture of chilling iron, and as such iron is too hard to plane or turn under an ordinary lathe or planer—even if said iron be cast in sand alone—I introduce strips, *o*, of wrought-iron, steel, or other suitable metal in the backs of said toggle blocks or bearings *l m n* when casting them, so that they can be turned or planed off true in an ordinary lathe or planer. The wrought-iron or steel strips *o* are secured in the sand above or on the iron chill that chills or hardens the grooves in the toggle-bearings, and the molten cast-iron partly surrounds said strips *o*, and in cooling contracts and holds the said strips *o* firmly in the body of the bearing. The strips *o* should be beveled so that the broadest side should be embedded in the surrounding cast-iron; or round bars could be used and said bars be embedded more than half their diameter in the cast-iron, the object in either case being to prevent beyond a doubt the possibility of their ever coming out. These toggle blocks or bearings *l m n* are held in their places by wedges or keys *p p*.

The box or brass *q* of the pitman L is adjusted by means of the key L', operated by the nut *l'*.

The fly-wheels M M and the pulley N are secured to the driving-shaft O in the usual manner. The said shaft and eccentric O and wheels M M are of the usual construction, and, being common agents to all crushers, need no further explanation.

The jaw D is forced in contact with the toggles K K by the use of rubber spring P and spring-rod P', which latter is secured to the lug *d'* on the jaw D and provided with a head or nuts, *p''*, and is in every respect similar to the devices used in other crushers.

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

1. In a stone-breaker, the combination, with the frame A A and shafts D' E', respectively, of the movable jaws D E, the former of which is pivoted at the top and the latter at the bottom, and rigid connecting-links F F, as and for the purpose set forth, which links transmit motion from jaw D to jaw E, and thereby produce motion in the latter.

2. In a stone-breaker, the main jaw D, constructed, substantially as herein shown and described, with vertical lever-extension D″, whereby the motion of the said lever D″ will be the reverse of the motion of the lower portion of the jaw D, for the purpose of producing and controlling the motion of the jaw E, as set forth.

3. The combination, with the movable jaw E and shaft E′, of the adjustable boxes G G, tension-rods H H, and toggle-block I, substantially as herein shown, and for the purpose described.

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Witnesses:
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