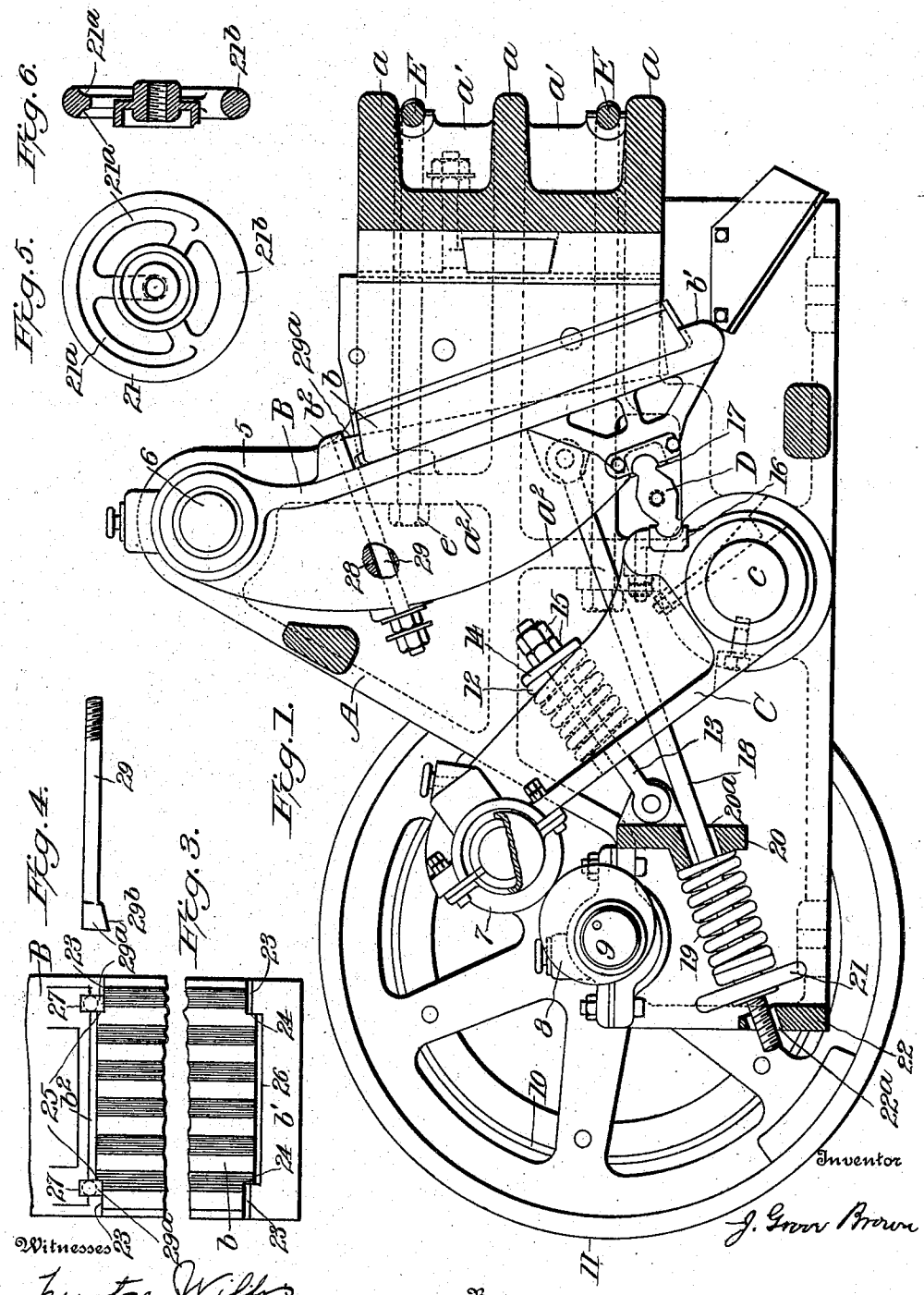
No. 885,717. PATENTED APR. 28, 1908.

J. G. BROWN.

ROCK CRUSHER.

APPLICATION FILED MAR. 15, 1907.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 6.

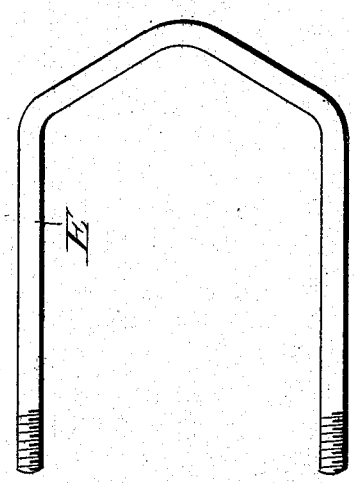


Fig. 7.

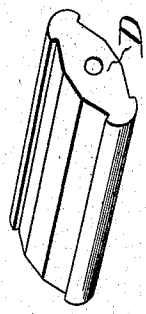
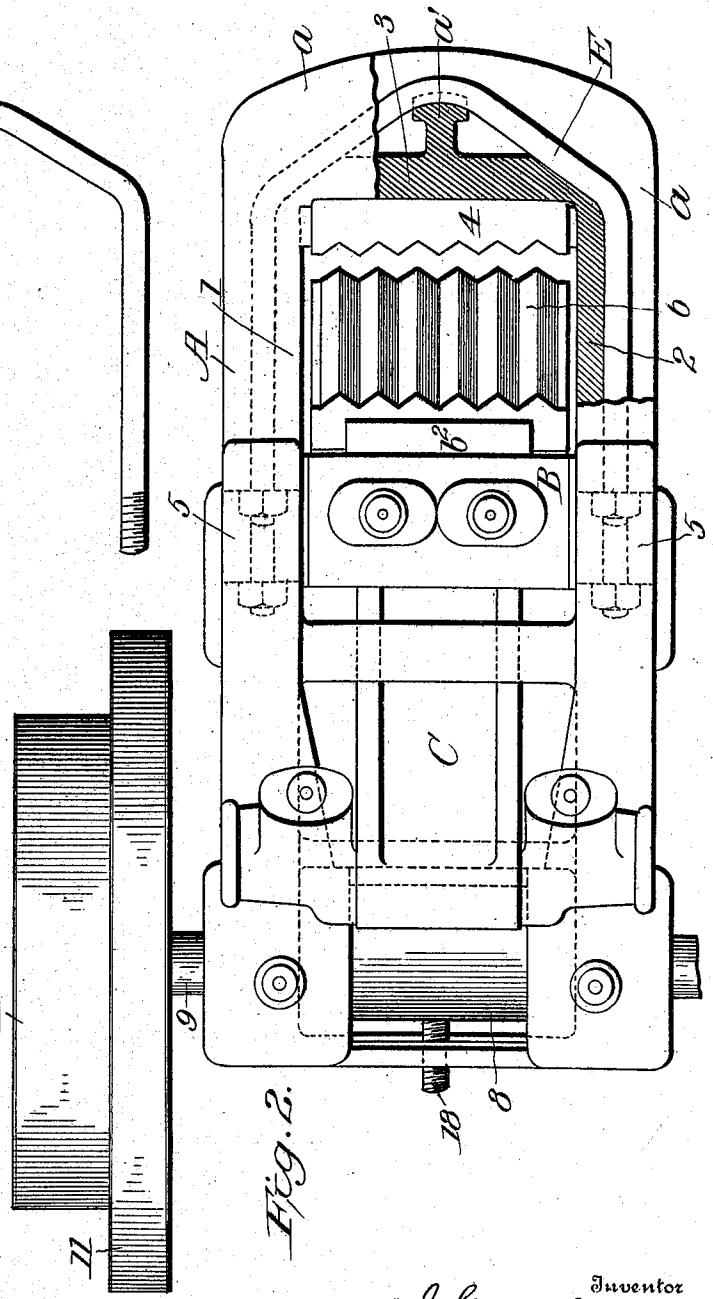


Fig. 2.



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J GROVE BROWN, OF KINGSTON, NEW YORK.

ROCK-CRUSHER.

No. 885,717. Specification of Letters Patent. Patented April 28, 1908.

Application filed March 15, 1907. Serial No. 362,520.

To all whom it may concern:

Be it known that I, J GROVE BROWN, a citizen of the United States, residing at Kingston, in the county of Ulster and State of New York, have invented certain new and useful Improvements in Rock-Crushers, of which the following is a specification.

My invention comprises certain improvements in the construction of rock-crushers, the details and advantages of which will be pointed out in the following specification, taken in connection with the accompanying drawing in which,

Figure 1 is a side elevation of the working parts of the rock-crusher, the frame being shown in central longitudinal section; Fig. 2 is a top plan view of the crusher, one end of the frame being partly broken away and partly in section; Fig. 3 is a front view of a portion of the swinging jaw with jaw plate attached; Fig. 4 is a side view of one of the bolts for connecting the jaw plate to the swinging jaw; Figs. 5 and 6 are, respectively, a side view and central section through the hand wheel for adjusting the position of the swinging jaw and the tension of the spring which holds the swinging jaw against the toggle lever or distance block; Fig. 7 is a perspective view of the toggle or distance block, and Fig. 8 is a plan view of one of the brace rods which extend around one end and partly along the sides of the crusher frame.

Referring to Figs. 1 and 2 of the drawing, A indicates the frame of the crusher which consists of a hollow casting having the sides 1, 2, and end 3, the sides and said end being formed with horizontal strengthening ribs *a*. A jaw plate 4 is secured to the end 3, said end and plate forming the stationary jaw of the crusher. The sides of the frame are extended upwardly to form standards 5 in which is arranged a shaft 6 from which the swinging-jaw or movable member B of the crusher is suspended. This member carries a detachable jaw plate *b* which is arranged opposite the stationary jaw plate 4, the plate *b* being attached to the swinging jaw as hereinafter more particularly described. Upon a rock-shaft *c*, which is suitably journaled on the lower part of the frame, is arranged a rocking-lever C, which has at its free end a roller 7 arranged to bear upon a cam or eccentric 8, the latter being secured to the shaft 9 which carried the driving wheel 10 and fly wheel 11 of the crusher. The cam 8 is cylindrical and the roller 7 is kept constantly in engagement with the surface of the cam by a spring 12, which latter is arranged upon a rod 13, pivoted at one end to the frame of the crusher and extending through a suitable opening in the rocking-lever, the spring 12 being interposed between the lever and an adjustable washer 14, which is held in place upon the end of the rod by the lock nuts 15. The tension of the spring 12 may be adjusted by means of the nuts 15, so as to keep the roller on the lever in constant engagement with the cam without undue pressure. The free end of the swinging jaw B is supported in proximity to the stationary jaw of the crusher by a toggle or distance block D, one edge of which fits within a suitable bearing 16, arranged upon the rocking-lever C near the pivotal point of the latter, while the other edge of the said block fits within a bearing 17, arranged at the rear side of the swinging jaw. The rock-lever and distance-block form two members of a toggle lever. This distance-block is removable and a number of such blocks of varying widths are provided and adapted to fit interchangeably within the bearings 16 and 17, so as to vary the distance between the jaws of the crusher and thus regulate the size of the crushed material.

The swinging-jaw B is held against the block D, so that the jaw cannot be thrown away from the block while the crusher is in operation, by means of a rod 18, pivotally connected at one end to the swinging-jaw, and a spring 19, arranged upon said rod and interposed between a stop 20 on the frame and a hand wheel 21, which is threaded on to the opposite end of the rod. The tension of the spring can obviously be regulated by turning the hand wheel. The rod extends through an opening 20^a, in the stop 20 and also through an opening 22^a in the stop 22, which latter is a part of the frame. When it is desired to remove a block D and insert another block of different size, the hand wheel 21 is turned in the direction to relieve the pressure on the spring 19 and then by continuing to turn the hand wheel in the same direction, the hub of the wheel will bear against the stop 22, and the continued rotation of the wheel will force the rod in the direction to lift the free end of the swinging-jaw away from the block, so that the latter can fall out or be removed and another block can be inserted.

In operation, the back and forth movement of the rod 18 would tend to jar the hand

wheel so that the latter, if constructed in the ordinary manner would work loose, unless some locking device were provided to lock the wheel to the rod. Instead of providing locking devices, I provide a wheel which is over-balanced at one side, so that the heavy portion of the wheel will hang below the rod and tend to prevent the rotation of the wheel. As shown in Figs. 5 and 6, the rim of the wheel is cut away, as indicated at 21^a, throughout the greater portion of its length, while the part 21^b is left solid or circular in cross section so that the rim is over balanced at one side and will not turn upon the shaft with the jarring of the machine.

In the operation of rock-crushers the plate on the movable jaw has tendency to work to one side of the jaw, thus causing friction and chafing at one side and leaving a space at the opposite side of the jaw-plate which permits small pieces of stone to either pass through or wedge between the jaw-plate and the side of the hopper. In order to secure the jaw-plate in position and prevent this side movement, the upper and lower ends of the jaw-plate in my invention are rabbeted at the corners, as indicated by the numerals 23, in Fig. 3, so that the side portions of the plate are a little shorter than the central portion, and shoulders 24 and 25 are thus provided at the ends of the plate. The lower end of the plate fits within a long notch 26 in the rib *b* at the lower end of the swinging-jaw, the shoulders 24 abutting against the end walls of said notch so that side movement of the lower end of the plate is prevented by said end walls. Notches or recesses 27 are cut in the under face of the rib b^2 of the swinging-jaw, opposite the rabbeted or cut away portions of the upper end of the jaw-plate, and bolt holes 28, extend from these notches through the swinging-jaw. Bolts 29 extend through these openings and these bolts are provided with wedge shaped heads 29^a, which fit partly within the recesses 27 and partly against the shoulders 25 and thus hold the upper end of the jaw-plate against side movement. The upper and lower ends of the jaw-plate are beveled in the usual manner and the inclined faces 29^b (Fig. 4) of the bolts bear against the beveled surfaces on the jaw-plate and thus hold the latter securely to the jaw. The shoulders 24 on the jaw-plate being the same distance apart as the shoulders 25, it will be seen that the plate can be reversed on the jaw.

The frame A is a casting of iron or steel, and it is important that this frame shall be sufficiently strong to withstand the severe stress due to crushing the hardest material and still be light in weight, so that the crusher can be readily moved from place to place. This object is accomplished by strengthening the frame, at the points liable to fracture, with a pair of wrought metal reinforcing rods E, E which pass around that end of the frame which supports the stationary jaw, the end portions of the rods extending partly along the sides of the frame, as shown in dotted lines in Fig. 1 and partly in dotted lines and partly in full lines in Fig. 2. One of these rods is shown in detail in Fig. 8. A rib a', integral with the frame, projects outwardly from the central portion of the end which supports the stationary jaw plate, and extends vertically between the horizontal flanges *a*. This rib strengthens the end of the frame and also forms a strut against which the tie or reinforcing rods E bear, the rib and rods forming a trussed construction. The rods bear against the outer edge of the ribs a', and the ends of the rods extend through suitable openings in ribs a^2 on the sides of the frame and are secured by nuts *e*. These rods are heated before being placed on the frame and, after being placed in position, the nuts are tightened while the rods are hot so that when the rods cool they will have the required tension. These rods extend along the sides of the frame to points at or near a line joining the shafts 6 and *c*, as the tensile stress due to the resistance of the material between the jaws is carried by the frame in the area between the end of the frame and a line passing through said shafts, and this portion of the frame is particularly liable to fracture. Experience has demonstrated that such fracture almost invariably occurs at the corners where the sides join the end of the casting, indicating that the tensile strain put upon the sides is combined with a flexural strain due to the yielding of the end of the frame in flexure under the pressure to which it is subjected. It will be seen therefore that the reinforcing rods serve the double purpose of a truss for preventing the end of the frame from yielding and also a reinforcement of the sides of the frame.

As the distance-block is arranged so that a combined thrust and toggle action is produced instead of merely a direct thrust, it will be seen that the resistance offered to the movement of the operating lever is equalized and, therefore, a less weight and momentum is required in the fly-wheels than if only a direct thrust were given to the distance-block. An important result secured by this arrangement is a material reduction in the pressure on the journals of the cam shaft and the roller on the operating lever, which minimizes the tendency of these journals to heat.

The entire crusher is designed with a view to making it as light as possible consistent with the required strength, and to this end the construction and arrangement of the various parts is such that the stress on the parts is made as uniform as possible throughout the crushing movement of the swinging jaw, thus avoiding shocks to the frame and requiring less weight in the fly-wheels, and,

on account of the strengthening rods and the uniformity of the stress on the frame, during the crushing action, the frame can be made much lighter in weight than usual.

What I claim is

1. In a rock crusher, a hollow frame of cast iron or steel, stationary and movable jaw plates therein, said stationary jaw plate fitting against one end of the frame, and said end being integral with the sides and having on its outer side a centrally located rib or projection, extending outwardly beyond the body and forming a strut, and one or more metal reinforcing rods extending around said end and partly along the sides of the frame and bearing against the outer surface of said rib or projection, the ends of said rod or rods being anchored at the sides of the frame.

2. In a rock crusher, a hollow frame of cast iron or steel, stationary and movable jaw plates therein, said stationary jaw plates fitting against one end of the frame, and said end being integral with the sides and having on its outer side horizontal flanges and a centrally located, vertically extending, rib between said flanges, and one or more metal reinforcing rods bearing against the outer side of said rib and extending partly along the sides of the frame, the ends of said rod or rods being secured to the frame.

3. In a rock crusher, a hollow frame, a stationary jaw plate at one end of the frame, a swinging jaw journaled at the upper part of the frame, a cam shaft having a cam thereon, a lever arranged between said shaft and swinging jaw, said lever being journaled in the lower part of the frame and having its free end engaging said cam, a toggle or distance block resting against said lever near its pivotal point and supporting the free end of the swinging jaw, a rod connected to said swinging jaw, a pair of stops, a hand wheel threaded on to said rod between said stops, and a spring interposed between said wheel and one of said stops.

4. In a rock crusher the combination with fixed and swinging-jaws, of a cam shaft, a lever movable thereby, a removable toggle or distance block arranged between said lever and swinging-jaw, a rod pivotally connected, at one end, to the swinging-jaw, a pair of stops, an adjusting device threaded on to said rod between said stops, and a spring interposed between said device and one of said stops.

5. In a rock crusher, the combination with fixed and swinging-jaws, of a cam shaft, a lever movable thereby, a removable toggle or distance block arranged between said lever and swinging-jaw, a rod pivotally connected, at one end, to the swinging-jaw, a pair of stops, a hand-wheel threaded on to said rod between said stops, said wheel being overbalanced at one side, and a spring interposed between said wheel and one of said stops.

In testimony whereof I affix my signature, in presence of two witnesses.

J GROVE BROWN.

Witnesses:

PHILIP ELTING,

C. K. LOUGHRAN.