J. D. OCHTERBECK.

CRUSHING MACHINE.

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1,189,471. Patented July 4, 1916.

Fig. 1.

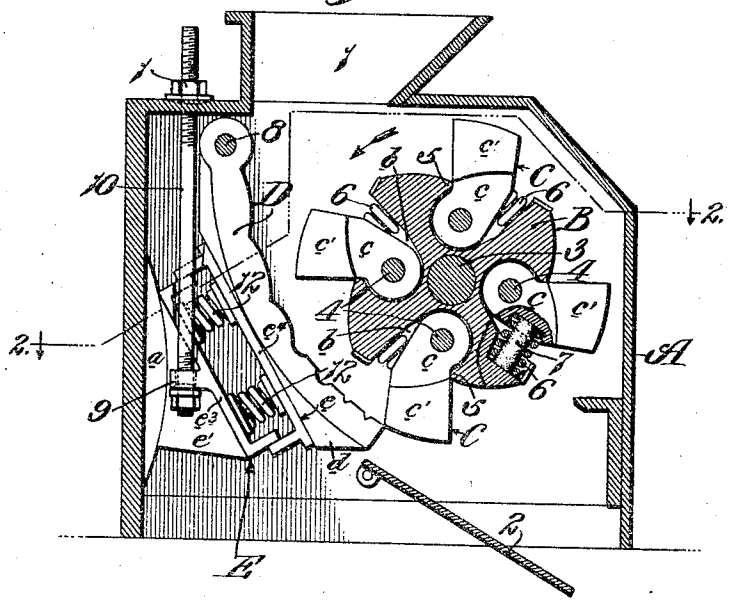
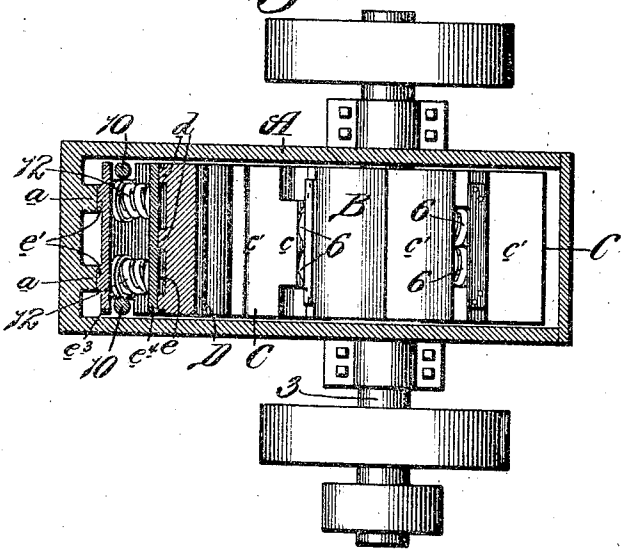


Fig. 2.



Witnesses:
Geo. P. Ladeau.
C. M. Badger.

Inventor:
John D. Ochterbeck.
By Bakewell & Church attys.

UNITED STATES PATENT OFFICE.

JOHN D. OCHTERBECK, OF CLAYTON, MISSOURI.

CRUSHING-MACHINE.

1,189,471. Specification of Letters Patent. Patented July 4, 1916.

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To all whom it may concern:

Be it known that I, JOHN D. OCHTERBECK, a citizen of the United States, residing at Clayton, Missouri, have invented a certain new and useful Improvement in Crushing-Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to crushing machines, and more particularly to that class of machines that are used for crushing or pulverizing large pieces of rock, ores, or other material. In machines of this character that have heretofore been in use, great difficulty has been experienced because of the constant breaking of the hammers, and the general practice has been, in order to partially obviate this trouble, to pass the material through the machine several times in order to reduce it to very small particles. This method, while preventing to some extent the breakage of the hammers, necessitates an adjustment of the breaker-plate with respect to the path of the hammers, at each operation, thus materially increasing the time and labor spent in reducing large pieces of material to small particles.

The main object of my invention is to provide a machine of the class described which is constructed in such a manner that large pieces of material may be broken or crushed into very small particles by a single passage therethrough.

Another object is to provide a machine of the class described in which the crushing hammers are mounted in such a manner that there is no liability of them becoming broken by contact with the material being crushed.

Still another object is to provide a machine of the character described in which novel means is provided for yieldingly supporting the breaker plate and adjusting same with respect to the path of the crushing hammers.

A still further object is to provide a machine of the class referred to that comprises few simple parts that can be easily assembled or dismantled and which may be produced at a low cost of manufacture.

Other objects and desirable features of my invention will be hereinafter pointed out.

Figure 1 of the drawings is an elevational view, partly in vertical section, of a crushing machine constructed in accordance with my invention; and Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1.

Referring to the drawings which illustrate the preferred form of my invention, A designates the casing of the machine that is provided in its upper portion with a hopper 1 through which the material to be operated on is introduced into the machine, and at its lower portion with a chute 2 whereby the disintegrated material is discharged from the machine.

A shaft 3 extends transversely through the casing A and carries a hammer support B in which are mounted a plurality of crushing hammers C. The hammers C may be connected to the support B in various ways, but I prefer to provide each of said hammers with a reduced shank *c* having a curved inner end that coöperates with a correspondingly-curved pocket *b* formed in the support B. A pin 4 is preferably passed transversely through each of said shanks and the support B so as to pivotally connect said hammers to said support and also to retain them in operative position therein.

As shown in Fig. 2, the heads *c'* of the hammers C preferably extend transversely across the entire distance between the side walls of the casing A, and said hammers normally bear directly against abutments 5 on the support B, but under certain conditions in service, it is desirable to have said hammers yield slightly, and to accomplish this, I provide a plurality of coiled expansion springs 6 that are arranged between the rear edge of each of the hammers C and the support B; and a member 7 of any suitable elastic material, such as rubber, is preferably arranged inside of each of said springs for purposes hereinafter appearing.

The hammers C are adapted to rotate in the direction indicated by the arrow in Fig. 1, and coöperate with a breaker-plate D that is arranged directly beneath the feed-hopper 1, and which is pivotally connected at its upper end, as at 8, to the casing A. Means is provided for adjusting said breaker-plate D toward or away from the path of travel of the hammers C, so that the size of the particles of material that are discharged from the machine may be varied, and in the embodiment of my invention herein shown, I provide the breaker-plate with a plurality of inclined ribs *d* that co-

operate with the inclined face e of a vertically adjustable member E. A plurality of curved ribs e' are arranged on the rear wall of the member E and coöperate with correspondingly curved ribs a integrally arranged on the vertical end wall of the casing A; and said member E is also provided with one or more horizontally-disposed lugs 9 to which adjusting rods 10 are secured, said rods extending upwardly through the top wall of the casing A and being provided at their upper ends with an adjusting nut 11 that bears against said top wall.

Whenever it is desired to change the position of the breaker-plate D with respect to the path of the hammers C, the adjusting nut 11 is rotated so as to either raise or lower the member E, thus causing the breaker-plate to swing about the pivot 8. The angle of the meeting faces of the member E and the plate D, of course, changes with such adjustment, and the member E tilts or rocks about the curved rear bearing thereof, thus compensating for the change of angle of the breaker-plate bearing surface, and insuring a perfectly flat bearing between said plate and the member E at all times.

In order to prevent the breaker-plate from breaking when subjected to an unusual shock, I provide means whereby said plate can yield or give slightly at such a time, and, to this end, I form the member E of two separate and distinct parts e^2 and e^3 that are normally held spaced apart by a plurality of coiled expansion springs 12. Each of the parts e^2 and e^3 is provided with laterally projecting overlapping flanges e^4 that coöperate to hold said parts in operative relationship and which permit of movement toward or away from each other.

By constructing the breaker-plate and its supporting structure in the manner just described, the liability of said plate becoming broken in service is reduced to a minimum, and said plate can be easily and quickly adjusted from a point outside of the casing of the machine.

In operation, the material to be crushed is introduced onto the breaker-plate D through the feed-hopper 1, and the rapidly-rotating hammers C come into successive contact therewith, crushing said material and discharging the same from the machine by means of the chute 2. The springs 6 and elastic members 7, which are placed in position behind the hammers C when under tension, only come into service when the hammers come into contact with the material being crushed with such force as to overcome the tension exerted by said springs. Whenever one of the hammers C comes into contact with a piece of material, such as a large rock, that resists the initial impact of the said hammer, the spring 6 and elastic member 7 will yield and permit the hammer to remain momentarily stationary with respect to the support B, but on the reaction of said hammer, it will strike the piece of material with greater force than the initial impact, owing to the fact that the expansion of the springs and elastic members is added to the constant speed of the hammer-support B. In other words, the support B is constantly rotating at a certain speed when in service, and if one of the hammers carried by said support is momentarily brought to rest by contact with a hard piece of material, it must necessarily go forward after said stop at a greater speed than before in order to catch up to the speed of the support B. The force of the reactive blow of said hammer is consequently greater than the initial impact, because of the additional speed and the additional power exerted by the compressed springs 6, the result being that large pieces of material being operated on are shattered and reduced to very small particles by a single passage through the machine.

By employing the combination of the springs 6 and the contained elastic members 7, the hammers C are caused to operate against the great resistance offered by said metallic springs, upon encountering a piece of material that resists their initial impact, but upon the reaction, are acted upon immediately by the elastic members 7, as it has been found in actual practice that these members 7, formed of rubber or like material, will expand much more quickly than a metallic spring, and will therefore cause the hammers C to give a sharper blow on the reaction than would otherwise occur.

A machine of the character above-described is especially adapted for crushing or pulverizing large pieces of hard material, which have to be passed through the machine only once in order to become thoroughly disintegrated. It comprises few, large, simple parts that are assembled in such a manner as to reduce to a minimum the liability of breakage thereof, and it can be produced at a low cost of manufacture.

I am aware that many minor changes may be made in the construction and arrangement of parts constituting my invention without departing in the least from the spirit thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a crushing machine, a rotary hammer support, a plurality of hammers pivotally mounted in said support, said support having integral abutments thereon that limit the pivotal movement of said hammers in one direction, and resilient means that limit the movement in the opposite direction, each of said resilient means compris-

ing a pair of expansible members, one of said members having a higher degree of expansion than the other.

2. In a crushing machine, provided with end walls and side walls, a rotary crushing element, a coöperating breaker-plate pivotally mounted at one end between said side walls and provided with an inclined rear face, and a wedge composed of a pair of telescoping sections normally held spaced apart by yielding devices, said wedge having one face bearing against the inclined rear face of said breaker-plate and its opposite face bearing against the end wall of the machine.

3. In a crushing machine, a rotary crushing element comprising a solid one-piece hammer support, a plurality of pockets arranged in said head, crushing hammers provided with reduced shanks that are pivotally mounted in said pockets, rigid means in said pockets that limits the pivotal movement of said hammers in one direction, and resilient means in said pockets that limits the movement in the opposite direction.

4. In a crushing machine, a rotary one-piece hammer support provided with a plurality of substantially semi-circular pockets, a crushing hammer mounted in each of said pockets, the advancing edge of said hammer being normally in engagement with one end wall of said pocket, and a yielding device interposed between the rear edge of said hammer and the opposite end wall of said pocket.

5. In a crushing machine, a rotary crushing element, a breaker plate arranged adjacent the path of movement of said crushing element, said plate having a plurality of inclined ribs arranged thereon, a yielding wedge having its front face inclined and bearing against said inclined ribs and having its opposite face curved and bearing against a stationary curved part of the machine, and means for adjusting said wedge vertically so as to cause it to rock about said curved stationary part and thus change the angle of inclination of the front face thereof.

6. In a rotary crushing machine having one end wall provided with a plurality of curved ribs, a breaker plate having one end pivotally mounted in said machine adjacent said end wall, a yielding wedge interposed between said breaker plate and said curved ribs, and means for causing said wedge to rock about said curved ribs.

7. In a disintegrating machine, a horizontally mounted rotating member and an opposing jaw, the upper face of said working jaw being provided with retarding projections and the lower portion with a grinding surface, said rotating member being provided with pivotally mounted heads, said heads having shock absorbing means.

In testimony whereof I hereunto affix my signature in the presence of two witnesses, this seventh day of January, 1914.

JOHN D. OCHTERBECK.

Witnesses:
GEORGE BAKEWELL,
GEO. R. LADSON.