H. P. ANDRESEN.

CRUSHER.

APPLICATION FILED APR. 30, 1920.

1,346,871. Patented July 20, 1920.

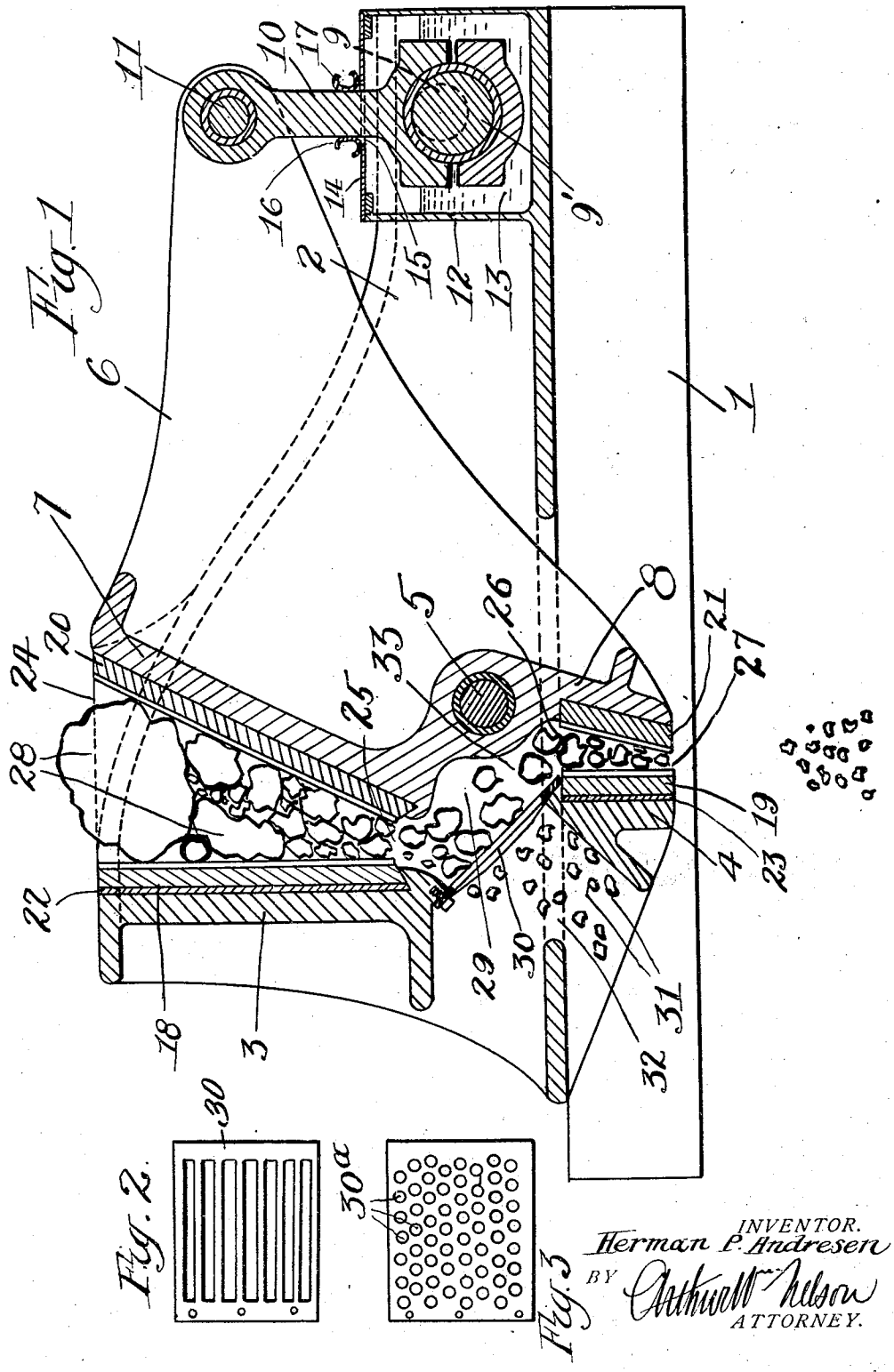


Fig. 2.

Fig. 3

INVENTOR.
Herman P. Andresen
BY Arthur W. Nelson
ATTORNEY.

UNITED STATES PATENT OFFICE.

HERMAN P. ANDRESEN, OF CHICAGO, ILLINOIS.

CRUSHER.

1,346,871. Specification of Letters Patent. Patented July 20, 1920.

Application filed April 30, 1920. Serial No. 377,827.

To all whom it may concern:

Be it known that I, HERMAN P. ANDRESEN, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Crushers, of which the following is a specification.

My invention relates generally to improvements in crushers or breakers such as are used for crushing or breaking rock, ore, and other materials.

There are two types of crushers in general use, one being known as a gyratory crusher and the other as a jaw crusher. Both of these types have certain outstanding advantages and certain inherent disadvantages. For example, the gyratory crusher has the advantage of operating continuously and, at the same time, crushing the material evenly and uniformly. Because of its continuous operation, the capacity is large, and because of its annular discharge no limitation is imposed upon the machine by the discharge outlet as in a jaw crusher, but, on the other hand, it is necessarily a machine which is of considerable height in order to secure the necessary leverage. This results not only in increasing the cost of the machine itself, but also often results in requiring a building of greater height than would otherwise be necessary. Again, because of the continuous movement of the parts in the same direction, the power demands are relatively small. The jaw crusher has the advantage of being low in height and cost. Some of its disadvantages are that its capacity is limited to that amount of material that can find its way through the discharge opening. The discharge opening, in turn, must be relatively small in order that the material can be crushed to desired size. Hence a machine that has otherwise the capacity for more work is restricted in its output by the discharge conditions mentioned. Again it crushes only on one stroke, being idle on the other stroke of the cycle. A disadvantage inherent in the intermittent action of the jaw crusher lies in the fact that the power demands are relatively high, due to the necessity of overcoming the inertia of heavy, rapidly moving parts.

The general object of my invention is to produce a crusher which shall have, to a marked extent, the advantages of both the gyratory and the jaw crushers without any of the serious disadvantages of either. In other words to provide a crusher which shall be relatively low in height and cost; in which the usual limitations of the discharge outlet prevailing in jaw crushers heretofore devised shall be obviated and which shall operate practically continuously and hence be of large capacity.

I also aim to provide a crusher of a type such that considerable variations of the crushed product within a single crusher can be secured, and which shall be of such construction as will readily lend itself to manufacture in different sizes for widely differing purposes, or for the crushing of material of widely different sizes.

My invention consists generally in the form, arrangement, construction and cooperation of the parts, whereby the above named objects, together with others that will appear hereinafter, are attainable; and my invention will be more readily understood by reference to the accompanying drawing which illustrates what I consider, at the present time, to be the best embodiment thereof.

In said drawings:

Figure 1 is a central vertical longitudinal section through a crusher embodying my invention.

Fig. 2 is a plan view of the sizing grid removed from the machine; and

Fig. 3 is a plan view of a modified form of sizing device.

In general appearance, my crusher resembles more nearly that of the ordinary jaw crusher than it does that of the gyratory crusher, while functionally it corresponds more nearly to the gyratory crusher than it does to the jaw crusher. In the ordinary jaw crusher there is a direct relation between the size of the discharge opening and the capacity of the machine, and, to a considerable extent, the size of the discharge opening in the ordinary jaw crusher may be said to limit the capacity of the machine. Of course, the size of the material to be crushed and the finished product desired, also enter as a factor in determining the capacity of a crusher. In the gyratory crusher there is a discharge opening, in effect, around the entire circumference of the shell and hence its capacity to free itself of the crushed material is ample. By

a novel construction and method I have overcome the usual limitations in a crusher of the jaw type. I shall refer to the crusher as of the jaw type, simply for convenience in description, and not as a limiting statement.

Referring now to the drawings for the details of construction, 1 represents a foundation on which the metal frame 2, is rigidly mounted. The frame 2 at one end is provided with upper and lower portions 3 and 4 which, for convenience, will be referred to as stationary jaw portions. Mounted in the frame is a shaft or journal 5 upon which a member 6 is mounted for rocking or swinging movement. The member 6 is in effect a swinging jaw and carries above and below the journal 5, the jaw portions 7 and 8 respectively. For rocking the swinging jaw element, a shaft 9 having an eccentric portion 9′ thereon is provided which shaft can be rotated by any suitable means, not shown.

A pitman 10 connects the eccentric portion 9′ with the shaft or pin 11 carried by the swinging jaw member 6. Obviously rotary movement of the shaft 9 causes rocking or swinging movement of the jaw member 6. I prefer to mount the eccentric portions 9′ in a boxlike portion 12 of the frame, wherein a suitable supply of oil 13 can be kept. A cover 14 is provided having an opening 15 therein of a size sufficient to permit movement of the pitman therein which opening is closed as by means of the yieldable members 16 and 17.

Referring again to the material crushing end of the mechanism; the stationary jaw portions 3 and 4 are provided, respectively, with removable jaw plates 18 and 19, and the movable jaw portions 7 and 8 are provided, respectively, with removable jaw plates 20 and 21, so that they may be easily renewed when they become too greatly worn. As it may be desired, under certain circumstances, to provide crushed material of different sizes from to time, I prefer to provide means for adjusting the parts to this end. These means may be of any desired construction, and, as here shown, take the form of ordinary shim plates 22 and 23, respectively, which are placed behind the stationary jaw plates 18 and 19, respectively. By such means the distance between the stationary and coacting swinging jaw portions can be varied, as desired.

It will be observed that the lower stationary and swinging jaw portions 4 and 8, respectively, are spaced below and somewhat to one side of the upper stationary and movable jaw portions 3 and 7, respectively, *i. e.* they are offset. In this manner there are provided two discharge openings and two receiving openings. Thus 24 is the receiving opening in which the material is initially placed; 25 is one discharge opening; 26 is a secondary receiving opening; and 27, a secondary discharge opening.

The operation of the device is as follows: The swinging jaw member 6, oscillates or rocks constantly moving the jaw portions 7 thereof toward the stationary jaw portion 3 while the movable jaw portion 8 thereof moves away from the stationary jaw portion 4, and conversely causing the movable jaw portion 8 to approach the stationary jaw portion 4 as the movable jaw portion 7 moves away from the stationary jaw portion 3. The rock or other material as placed in the receiving opening 24 will usually be composed of a number of relatively large pieces, as indicated at 28, and, which are caught between the face plates 20 and 18, and broken up as the jaw plate 20 moves toward the stationary jaw plate 18. By the time the material reaches the initial discharge opening 25 much of the material will already have been reduced to a size desired in the finished product even through no portion of the fixed and movable crusher plates ever reach a spaced relation as small as the size of the finished product. In other words, when the material is subjected to the crushing and breaking action of the jaws, certain parts or fragments break off as the material is fractured and they are of a size sufficiently small to go at once into the finished product. In crushers, as heretofore constructed, this material remained between the confines of the fixed and swinging jaws until all of the product of the crusher was discharged through a discharge opening, which necessarily approximated in size, the size sought in the finished product. This resulted in cutting down the capacity of the machine as well as causing useless work to be performed upon material already reduced to the desired size. I overcome these objectionable features by removing, at a point in the travel of the rock or other material through the crusher, a certain amount which has been reduced to the desired size, or under, thence subjecting the remainder to such further crushing action as may be required. I might add that the total jaw or crushing plate length may be, if desired, substantially the same as that of the usual jaw crusher. In other words, it may be said that the lower jaw plates 19 and 21, respectively, have been broken away from the upper jaw plates 18 and 20, respectively, and spaced below and at one side thereof, thus forming an intermediate sorting chamber, 29. Substantially below the initial discharge opening 25, I arrange a grid or sizing device 30 which as in Figs. 1 and 2 is composed of bars spaced apart the desired distance depending upon the size to which the product is to be reduced, and which in the modified form shown in Fig. 3 is a plate provided with a plurality of openings

30a. As is well shown, the material in discharging from the opening 25 falls upon the sizing grid 30 and such particles as 31, which are sufficiently small, pass through the grid and out through the supplemental discharge opening 32. Larger or oversize particles, such as indicated at 33, are directed by the grid into the receiving opening 26 and between the crushing plates 19 and 21 are further reduced so that upon discharging from the opening 27 they will be found to be of a size desired in the finished product. Obviously there is a continuous crushing action together with a continuous discharging action because material is either being crushed between the crusher plates 18 and 20 above, or it is being crushed between the crusher plates 19 and 21, depending upon the position of the swinging jaw element 6; and likewise material is either discharging from the discharge opening 25, through grid 30, and the supplemental discharge 32, or else it is discharging through the discharge opening 27. In this manner the discharge capacity of the crusher is greatly increased. That is to say whereas in the ordinary jaw crusher, the discharge capacity is limited to that quantity of crushed material that can pass through a relatively small single discharge opening, as for instance through an opening similar to 27, the capacity of my crusher is increased by providing a plurality of openings and discharging the initially properly reduced material through one and discharging through the other only the remainder. In other words, I withdraw the properly crushed material intermediate the spaced pairs of crushing jaws. Thus not only is continuous crushing and continuous discharge obtained, but also absence of vibration, for the element 6, is always under load and hence no power is lost in simply overcoming inertia. I might add that the pitman 10 works alternately under compression when the swinging jaw portion 7 moves toward the stationary jaw 18, and under tension when the swinging jaw plate 21 moves toward the stationary jaw plate 19.

The sizing device may be removed, if desired, in which event material discharges from the initial discharge opening 25 directly through the supplemental discharge passage 32. In this manner the crusher can be converted very quickly into a coarse crusher.

The crusher is extremely simple in construction, easily maintained in a state of good repair, due to the novel features of construction and operation before recited, and without further comment will be understood to be a distinct step in advance by those skilled in this art.

I do not wish to be limited to the specific construction shown and described except only as may be necessary by limitations in the hereunto appended claims.

I claim:

1. A crusher embodying therein a frame, spaced stationary jaw portions thereon, a swinging jaw member pivotally mounted in the frame, and spaced jaw portions thereon positioned for coaction with the stationary jaw portions, one of said stationary jaw portions and coacting swinging jaw portion being positioned to define a receiving opening below and offset with respect to the discharge opening defined by the other coacting stationary and swinging jaw portions, and a sizing device arranged under the discharge opening of the upper coacting jaw portions and positioned to receive material that is discharged from said discharge opening and to deliver the oversize material to the lower receiving opening.

2. A crusher embodying therein a frame, spaced stationary jaw portions thereon, a swinging jaw member pivotally mounted in the frame and spaced jaw portions thereon positioned for coaction with said stationary jaw portions, one of said stationary jaw portions and coacting swinging jaw portion being positioned to define a receiving opening below and offset with respect to the discharge opening defined by the other coacting stationary and swinging jaw portions, and a sizing device arranged under the discharge opening of the upper coacting jaw portions, said sizing device being arranged at an angle and being positioned to direct the oversize material into the receiving opening of the lower coacting jaw portions.

3. A crusher embodying therein a frame, spaced upper and lower stationary jaw portions thereon, a swinging jaw member pivotally mounted in the frame, jaw portions upon said swinging jaw member on opposite sides of the pivot, a sizing device arranged under the upper coacting stationary and swinging jaw portions, said crusher having a supplemental discharge opening arranged under the sizing device, whereby material is crushed between one pair of jaws while it is discharged from the other, and whereby material which is properly crushed between the first pair of jaws is discharged through said sizing device and supplemental discharge opening.

4. A crusher embodying therein a double action jaw member mounted for swinging movement, spaced crushing portions thereon, spaced stationary crushing portions with which they coact, the crushing portions on the swinging jaw member and the stationary crushing portions forming spaced pairs of crushing portions, and a sizing device arranged intermediate said spaced pairs of crushing portions.

5. A crusher embodying therein a double

action jaw member mounted for swinging movement, spaced crushing portions thereon, spaced stationary crushing portions with which they coact, the crushing portions on the swinging jaw member and the stationary crushing portions forming spaced pairs of crushing portions, and a removable sizing device arranged intermediate said spaced pairs of crushing portions.

6. A crusher embodying therein an upper stationary jaw portion, a lower stationary jaw portion spaced from and offset with respect to the upper stationary jaw portion, swinging jaw portions arranged for coaction with said stationary jaw portions, and means for discharging the properly sized material from the upper stationary and coacting jaw portions from the crusher without entering the lower coacting jaws, said means including a sizing device arranged under said upper jaw portions and inclined at such an angle that the oversize material dropping thereon falls by gravity into the lower coacting jaw portions.

7. A crusher embodying therein an upper stationary jaw portion, a lower stationary jaw portion spaced from and offset with respect to and parallel to the upper stationary jaw portion, swinging jaw portions arranged for coaction with said stationary jaw portions, and means for discharging the properly sized material from the upper stationary and coacting jaw portions from the crusher without entering the lower coacting jaws, said means including an inclined screen arranged intermediate the upper and lower crushing jaws whereby material falling thereon is separated into different sizes by gravity.

In testimony whereof, I have hereunto set my hand, this 22nd day of April, A. D, 1920.

HERMAN P. ANDRESEN.