This invention relates to what are commonly called "grizzlies" and "rock crushers." Grizzlies that size the rock and rock crushers that reduce it. The object of my invention is to combine the two functions in one machine and to also provide a crusher system that will break to any required fineness. These things cannot easily be done with existing machinery. There are existing today what is known as the cone crusher. These machines receive quite large rock and deliver a product as small as one inch in general dimensions, but they are not to be used for crushing very hard material on previous types. However, they are large and heavy for their capacity and cannot crush near as fine as is desired.

My invention introduces a novel principle in crushing. My method of sizing in advance of crushing is also new and effective. I can apply this new principle to the existing type of "jaw crusher," taking a crusher that receives say 8" and reduces it down to 3". I can so modify the crusher that its final product will be ½" in general dimensions. I do this by introducing supplementary breakers, made of suitable material, into the pinching space formed by the jaws of the crusher. Thus, supposing that the jaw crusher closes to a 3" clearance or pinching space and that I occupy two inches of this space with a free to move crusher plate made of suitable material, and that it remains in about the center, then all material that is crushed by the crusher must be reduced to ½" or less to get by the now narrowed and divided pinching space. This reduction is effected by the jaws of the rock crusher and the intermediate breaker plate. By using several supplementary or intermediate breaking or crushing plates, a stationary back or frame, and one power operated moving jaw, a rock breaker of great practical value is arrived at. Each crushing plate transmits the crushing force to the next plate by means of the material being crushed, the power operated jaw supplying the force for all the crushing. The fineness of the crushed product depends on the number of supplementary crushing plates and their spacing. When the plates are a considerable distance apart I have a coarse crusher of great capacity. When the plates are closer the product coming thru is smaller. When the plates are still closer spaced I arrive at fine crushing and still may have great capacity. The material to be crushed is introduced at the top of the machine and falls down between the stationary frame, between each plate, and the power supplying jaw. To prevent by-passing of oversize, each plate is provided with distance maintaining lugs. The lower part of the plates can be made thicker than the upper part, in this way the pinching space at the bottom is a little less than at the top, this arrangement also helps to prevent by-passing. The distance lugs permit the free crushing movement of the system but otherwise maintain the proper spacing of the plates. To prevent breakage that might be caused by the entrance of tramp iron, the operating jaw and plates are protected with cushioning springs that have ample resistance to crush the material intended to be reduced but will spring back rather than break the machine. To understand this spring action the stationary jaw can be considered as the front of the machine and the movable jaw as its proper operating mechanism can be considered the back part of the machine. If the front part and the back part are all one solid frame as is usual in jaw type crushers, then there can be no yieldling, if the piece between the jaws is too hard to be crushed, the crusher stops or breaks. In my crusher the frame is divided or articulated into a front part carrying the stationary jaw and a back part carrying the movable jaw and its mechanism. The front part and the back part of the frame are held together by powerful springs which are rigid under ordinary conditions of operation but yield when the crusher encounters a piece that it cannot break. The division of the frame is a matter of design and can be made near the stationary jaw or preferably right back of the operating jaw. An almost identical arrangement is now in use on crushing rolls.

Having now described the crusher I will proceed to explain the sizer or grizzly. By giving a slope sufficient for gravity to act, to the top part of the supplementary crushing plates I can use the crusher as a grizzly. If I slope both ways the material can be fed on the highest part. The crusher being in operation, the plates will be in movement and will assist the flow of the material. The coarse rock that cannot enter between the plates will pass over their top to a grizzly and crusher that can accommodate it. The finer rock will fall between the plates and be immediately crushed. As before mentioned the larger rock has passed to a second combined grizzly and crusher. Material that cannot enter this second cruiser can pass to a third. In this manner I provide a sizing and crushing system that more or less instantly takes care of the material to be reduced. Moving grizzlies are known to be the most effective, a crushe such as I have explained has a great capacity on all sizes. Sizing efficiently means a minimum of power for crushing. Below the strictly grizzly types of crusher can be placed those adapted to merely reduce the feed they receive from above. In this manner a very fine final product can be quickly arrived at.

The whole mechanism is a free running machine, the crusher and grizzly are one and are in rapid movement, between one plate and another...
is a free vertical space, it follows that neither the grizzly or crusher are subject to clogging.

Referencing to the drawing:

Figure 1 is a partial elevation and cross-section of an ordinary jaw crusher modified by my invention.

Figure 2 is a cross-section of the combined grizzly plate crusher.

Figure 3 is a longitudinal part section of the same.

Figure 4 is a cross-section of the non-grizzly type of plate crusher.

Figure 5 is an elevation and side view showing diagrammatically a sizing and crushing arrangement.

Figure 6 is a front view of the same.

In Figure 1; the frame is represented by I; 2, is the fixed jaw; 3, the movable jaw; 4, one of the toggles; 5, a supplementary crushing plate; 6, the pinching space between the fixed jaw and the movable jaw; 7, shows the crushed material leaving the crusher. In the other figures the numbers specify as follows:

3, represents the grizzly type of crusher; 9, the top of the grizzly; 10, the crushing plate; 11, the crushed material leaving the crusher; 12, the pinching space between the plates; 13, the movable jaw; 14, the eccentrics; 15, the shafts; 16, the pulley; 17, gears connecting the two shafts;

20, the toggles driving the movable jaw; 19, the chute plates; 20, the crusher plate carrying bolt; 21, spacing lugs on the plates; 22, rubber cushions between the plates; 23, the protecting hood over the plate holding bolt and the rubber cushions;

24, safety spring bolts; 25, safety springs that operate should tram pin enter the system; 26, second crusher in Figure 5; 27, second grizzly in Figure 6; 28, third crusher in Figure 5; 29, third grizzly in Figure 6; 30, frame of crusher.

In Figure 4; 31, entrance hopper for material; 32, suspension lugs for plates 10 of Figure 4.

The operation of the machine as shown in Figure 1 is as follows:

Rock to be crushed is dumped into the top of the crusher 1, between the fixed head 2 and the movable jaw 3. As it is passed down it gets smaller and finally arrives above the supplementary crushing plate 5, in the pinching space.

6, entering between the jaw, the crushing plate, and the back head, it is crushed to relative fineness and passes out at 7.

Figures 2 and 3, illustrate the construction of the combined grizzly and plate crusher. Figures 5 and 6, show diagrammatically one arrangement for sizing and crushing. Referencing jointly to Figures 2—3—5 and 6, rock to be sized and crushed is allowed to fall on top of the crusher 8, and onto the grizzly 9. It slides down on the top edges of the crushing plates 10, some of it enters between the plates and is crushed, passing out at 11, having been subjected to the action of the pinching spaces 12. The plates being in rapid movement, caused by the primary motion of the jaw 13, the toggles 16, eccentrics 14, shafts 15, gears 17, and pulley 16, not only crush the rock which gets in between them but size the material on the grizzly with 100% efficiency and pass the rock too big for this particular crusher over the chute plates 19, to a second machine 26, with its wider spaced grizzly 27, and plates 10, thence to a third machine 28, with its still wider spaced grizzly 29, and plates 10. This last grizzly and crusher completes the sizing operation as shown on the drawing but of course it can be modified to suit conditions.

The products, 11, of these crushers can be more or less combined and be fed for further reduction to plate crushers of the upper end of Figure 4, where material can be reduced to any required fineness, passing out at 11. In this crusher 31, is the feed hopper; 32, suspension lugs for the plates, placed well above the crushing part of the plate. In this type of machine there are two plate suspension bolts 20, therefore the feed hopper necessarily comes between them. The bolts carrying the powerful safety springs are shown at 24.

What I claim is:

1. In a rock crushing machine of the jaw type, including a movable jaw and a stationary frame, a pinching space between said jaw and the frame, supplementary crushing plates within the pinching space, said stationary frame having generally two parts, a front part carrying a stationary jaw and a back part upon which is mounted the movable jaw and its power operating mechanism, means consisting of powerful springs for maintaining a highly resistant yet yielding connection between the stationary jaw and the power end of the frame.

2. In a rock crushing machine of the jaw type, an oscillating crushing jaw, a stationary frame, a pinching space between said jaw and the frame, supplementary crushing plates interposed within the pinching space, the uppermost edges of said plates operating as a grizzly that rejects, conveys, and directs the oversize through ports in said frame, the undersize passing between said plates to be crushed, the whole cooperating to reject the oversize and crush the undersize of the material received.

3. In a grizzly adapted for sizing material, a stationary frame, an oscillating crushing jaw, oscillating plates between the frame and the jaw, the uppermost edges of said plates operating as a grizzly that rejects, conveys, and directs the oversize through ports in said frame, the undersize passing between said plates and that subjected to the cooperative crushing action of said stationary frame, crushing jaw, and oscillating plates.

4. A series of substantially equally constructed grizzly and crushing units adapted to receive, classify, and crush the material received, by means of a differently spaced crushing adjustment for each unit, the first and usually the highest unit of the series having the closest adjustment, the second a wider, the third still wider, other units, if required, with wider spacing; each unit is substantially a jaw crusher having an oscillating crushing jaw, a stationary frame, a pinching space between said jaw and the frame, supplementary crushing plates interposed within the pinching space, the uppermost edges of said plates operating as a grizzly that rejects, conveys, and directs the oversize through ports in said frame, the undersize passing between said plates to be crushed, the whole cooperating to crush the undersize and reject the oversize thru said ports, thence by gravity to the upper edges of another grizzly and crushing unit of wider spacing, there to be again sized, crushed, and in part transmitted to another unit and the necessary succeeding units in order to complete the desired crushing and classification.

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