Oct. 23, 1956 W. W. WEST 2,767,929

REVERSIBLE HAMMERMILL WITH ADJUSTABLE UPPER BREAKER BLOCKS

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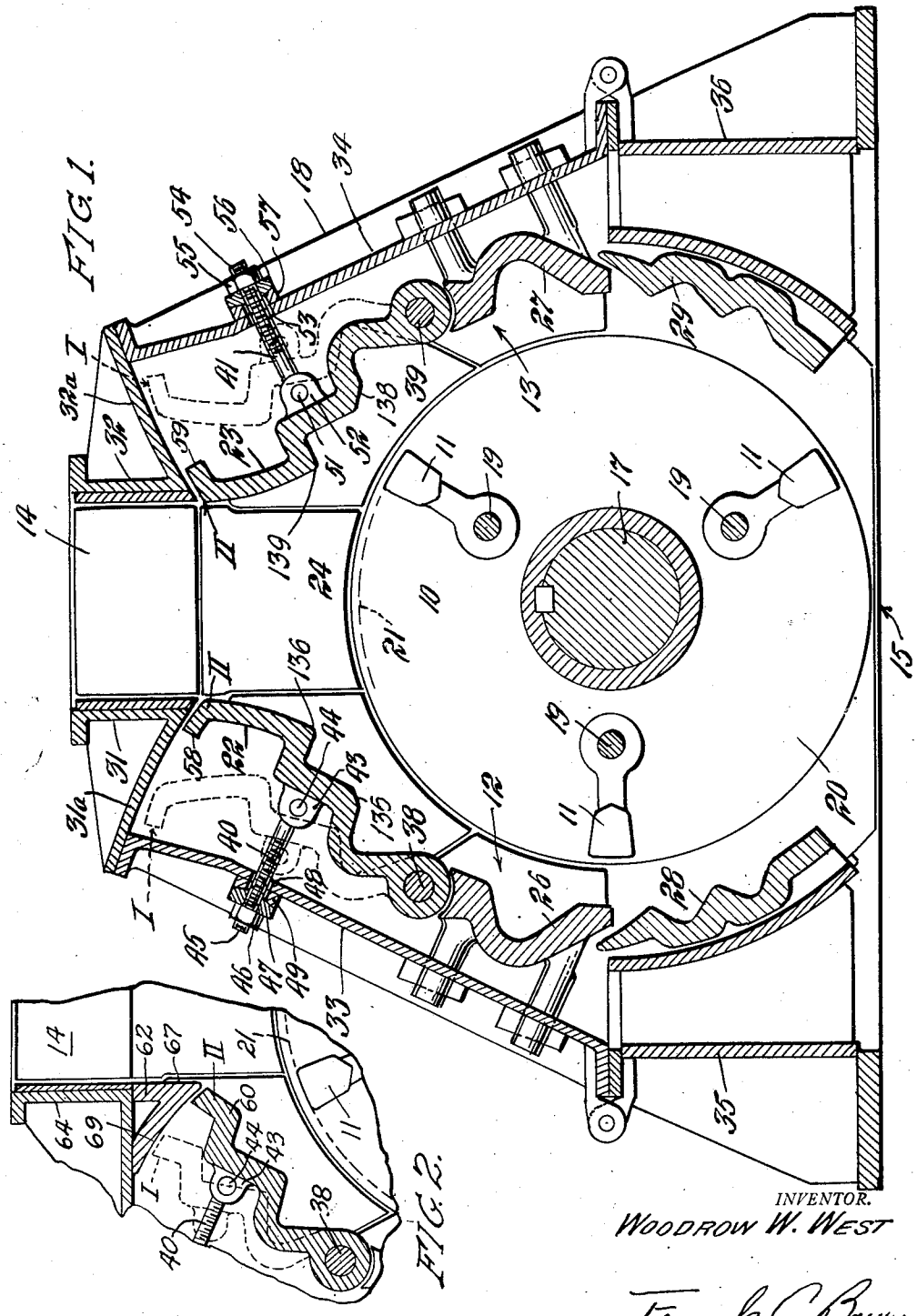


FIG. 1.

FIG. 2.

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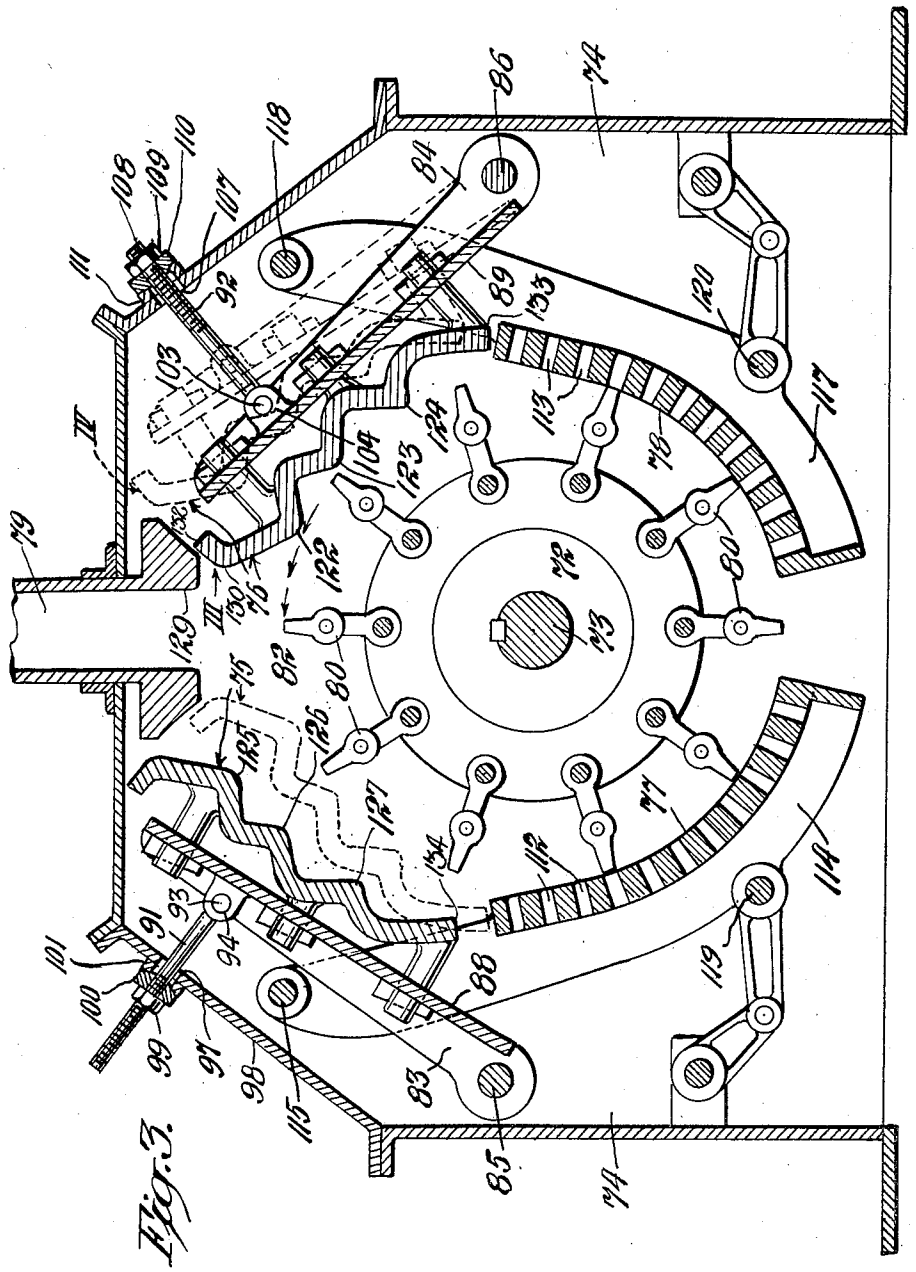


Fig. 3.

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REVERSIBLE HAMMERMILL WITH ADJUSTABLE UPPER BREAKER BLOCKS

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5 Claims. (Cl. 241—189)

This invention relates to a hammermill type crusher and is directed particularly to the relationship of the rotating hammers and the upper breaker surfaces.

The object of this invention is to provide a hammermill type crusher that is more versatile in the type and size of rock that it can crush.

Another object of this invention is to provide a hammermill type crusher that is readily adapted to crush different types of material.

Another object of this invention is to provide a hammermill type crusher that can crush material of different types and sizes and produce a uniformly sized output material.

Another object of the invention is to provide a universal hammermill type crusher that provides a uniform output with variation of the type and size of material delivered to the hammermill.

Another object of the invention is to provide a hammermill type crusher with a central feed chute that reduces the dust escaping out through the feed chute.

Other and further objects will be apparent from the following description taken in connection with the accompanying drawings in which

Fig. 1 is a cross section of a hammermill showing one embodiment of the invention;

Fig. 2 is a fragmentary sectional view of the upper portion of a hammermill showing another embodiment of the invention; and

Fig. 3 is a cross section of a hammermill showing still another embodiment of the invention.

Referring to Fig. 1 the hammermill comprises a rotor 10 with hammers 11 and breaker walls 12 and 13 on each side of the rotor. The rotor and walls are within a casing and extend longitudinally from one end of the casing to the other. The material to be crushed is dropped through a feed chute 14 into the top center portion of the rotating hammers. The material is reduced by hitting the material against the breaker walls. The material is carried down between one of the breaker walls and the rotor and further reduced by the multiple hitting of the material between the breaker wall and the rotating hammers. The crushed material is discharged from the crusher through the opening 15 in the bottom thereof and extending the full length of the rotor.

The rotor 10 is mounted on and keyed to a drive shaft 17. The drive shaft 17 is journaled in the casing walls or structure 18 at each end of the hammermill. The hammers 11 extend in rows along the shaft and are connected to the shaft by the rods 19 extending through the plates 20. The hammers, as shown, indicate three rows of hammers. When the hammers are rotating their outer ends subscribe a hammer circle 21. The rotor may be rotated in either direction. The feed chute 14 is spaced above the rotor and is preferably positioned symmetrically on both sides of the vertical plane through the center of the rotor. Material dropping from the chute falls into the top center portion of the hammercircle 21.

The breaker walls 12 and 13 extend down from opposite sides of the feed chute 14 and around opposite sides of the rotor to opposite sides of the opening 15. The walls are symmetrically constructed on opposite sides of the vertical plane through the center of the rotor. The upper breaker plates 22, 23 extend from above the rotor downwardly to the side of the rotor and form a breaker chamber 24 below the feed chute 14. The hammers 11 pass through the breaker chamber and hit the material from the feed chute against either breaker plate 22 or breaker plate 23 depending on the direction of rotation. The material rebounds from the upper breaker plate and is rehit by the hammers against the breaker wall and carried down for successive fracturing against intermediate plate 26 or 27 and lower breaker plate 28 or 29 depending on the direction of rotation and then passes out through the opening 15.

The outer casing comprises end walls 18, one of which is only shown in the lateral sectional view of Fig. 1, and side walls extending longitudinally between the end walls 18. The side walls comprise top or chute wall plates 31, 32, hinged walls 33, 34, and base walls 35, 36. The upper breaker plates 22, 23 and intermediate breaker plates 26, 27 are detachably secured to the hinged walls 33, 34 respectively and the lower breaker plates 28, 29 are fastened to the base walls 35, 36 respectively. The breaker plates extend along the full length of the rotor and are preferably secured to the casing at uniformly spaced points.

The upper breaker plates 22, 23 are pivotally mounted at their lower ends on the longitudinal rods 38, 39, which are mounted at each end in the end walls 18. The breaker plates rotate on the rods 38, 39 and are adjustably secured at an intermediate point by the rods 40, 41 at uniformly spaced points along the casing wall. Each rod 40 is pivotally attached to the plate 22 by the eye 43 and the stub 44 perpendicular to the rod 40. The other end of the rod is adjustably seated in the hinged wall 33. The rod extends through the opening 48 in the hinged wall and has a threaded portion 45 on the outer end with a nut 46 threaded thereon. The nut 46 bears against a collar 47 seated in a concave boss 49 around the opening 48. The weight of the movable breaker plates 22 pulls the rod and nut against the collar and boss. The position of the breaker plate is adjusted by turning the nut 46. As the rod is moved the stub 44 turns in the eye 43. Thus breaker plate 22 may be adjusted in relation to the hammers 11.

The rods 41 of the plate 23 are similarly attached to the plate 23 and the hinged wall 34. The perpendicular stub 51 is pivotally mounted in the eyes 52 which are part of the plate 23. The other end extends through the openings 53 and has a threaded portion 54 with a nut 55. A collar 56 is seated in the concave surface of the boss 57. When the nut is turned in one direction or the other the plate 23 is moved to or from the rotor.

The rods 40 and 41 are of such length as to move the respective breaker plates between a raised position I near the casing to a lowered position II near the hammercircle. The breaker plate does not extend into the path of the entering material so its inward position is limited to the position shown. The outward position is determined by the casing and the characteristics of the type of crushing action desired.

The breaker plates 22 and 23 have an irregular surface to present a plurality of breaker surfaces at different angles to the rotating hammers. The upper or chute ends have turned edges 58, 59 extending away from the feed chute and parallel to the casing walls 31*a*, 32*a* to prevent material from falling behind the upper breaker plate. The walls 31*a*, 32*a* are preferably curved to cor-

respond to the arc subscribed by the edges **58, 59**. These wall portions may be flat and set at an angle to accommodate the movement of the breaker plates.

By adjusting the position of the breaker plate against which the material is being initially hit the character of the output product may be altered and still have a uniformly sized output.

In Fig. 2 another form of the invention is shown with slightly different movable breaker plates. In as much as the breaker plates are identical only one such plate has been shown in Figure 2. The plate **60** is shorter than plate **22** and the triangular member **62** is positioned below the chute wall member **64** and has a portion **67** extending parallel to the chute wall and providing an extension of the feed chute toward the rotor. A curved or angular section or portion **69** is preferably contoured to correspond to the arc subscribed by the end of plate **60**. This member prevents material from falling behind the breaker plate **60**.

In Fig. 3 a hammermill with screen bars is shown and embodies another form of the invention. A rotor **72** is mounted on a shaft **73** supported at each end by the end wall or structure **74**. Symmetrically positioned on opposite sides of the crusher are upper breaker plates **75, 76** and screen bars **77, 78**. A feed chute **79** is centrally positioned above the rotor and between the breaker plates **75, 76** to feed material into the top center portions of the hammercircle of the hammers **80** on the rotor. A breaker chamber **82** is formed between the breaker plates **75, 76** into which entering material drops and is hit by the hammers **80**. The breaker plates **75, 76** are detachably secured to the plates **88, 89** respectively.

The plates extend longitudinally substantially the full length of the crusher. Plate **88** is supported at each end by arms **83** pivotally mounted on the shaft **85**. The shaft **85** is secured in the end walls **74** and carries the weight of the movable plate structure in cooperation with the rods **91**. Plate **89** on the other side of the crusher also extends substantially the full length of the crusher and is supported at each end by the arms **84**. The arms **84** are pivotally mounted on the shaft **86**. The shaft **86** is secured in the end walls **74** and carries the weight of the movable plate structure in cooperation with the adjusting rods **92**. The arms **83, 84**, plates **88, 89** and breaker plates **75, 76** form a breaker plate structure movable to and from the rotor to adjust the spacing of breaker plates **75, 76** from the rotor **72**. The rods **91** are uniformly spaced along the crusher to support the breaker plate structure. Each rod **91** has a stub **93** passing through the eye **94** on the plate **88** to pivotally connect the rod and the mounting plate so the angle between them can change with the different positions of the breaker plate. The other end of the rod **91** extends through opening **97** in the wall casing **98** and is threaded to receive the nut **99**. A collar **100** is around the shaft and has a curved surface to bear against the concave surface of the bosses **101**.

The breaker plates **76**, arms **84** and mounting plate **89** are similarly supported and adjusted by the rods **92** also uniformly spaced along the crusher. The stub shaft **103** extends through the eyes **95** on the mounting plate **89** to pivotally attach the rod to the plate **89** and permit the angle between the plate and the rod to vary with adjustments. The other end of the rod extends through an opening **107** and has a threaded portion **108** to receive the nut **109**. The nut **109** bears against the collar **110**. The collar has a curved surface to fit into the convex surface boss **111** on the casing.

The screen bars **77, 78** extend longitudinally with spaces **112, 113** between them. Bars **77** are supported at each end by the cradles **114** pivotally mounted on the shaft **115**. The shaft **115** is supported by the end walls **76**. Bars **78** are supported at each end by the cradles **117** pivotally mounted on the shaft **118**. The shaft **118** is also supported by the end walls **74**. Shafts **119, 120** are connected to the lower end of the respective cradles **115, 117** to adjust the spacing of the screen bars and hammers.

The arms **83, 84** are positioned between or within the respective cradles and the cradles are outside of the arms **83, 84** and the breaker plates **75, 76** adjacent the end wall **74** so there is no interference or conflict between the adjustment of the breaker plates and screen bars.

The breaker plates may be set in either a breaker position or a dust guard position. In the breaker position it receives the initial impact of the material hit by the hammers and may be set at any particular adjustment depending on the nature of the entering material and the desired output. Preferably for breaking purposes the breaker plate is set between positions III and IV. When the rotor is hitting the material against one breaker plate the other may be dropped to the dust guard position adjacent the hammercircle. The breaker plate then acts as a deflector to throw the dust back into the rotor and prevent it from escaping up through the feed chute.

In the case of clockwise rotation the longitudinal bulges or edges **122, 123, 124** are adjacent the rotor and direct the dust back into the rotor. In the case of counterclockwise rotation the bulges or edges **124, 126, 127** are adjacent the hammercircle.

In Fig. 3 the crusher is shown rotating in a counterclockwise direction. The bulges or edges **122, 123, 124** of the breaker plate **76** are adjacent to the hammercircle. The upper end **130** of the breaker means is positioned at the lower end **129** of the feed chute **79**. The end of the breaker plate is clear of the path of material discharged from the end of the chute so as not to deflect the material from entering into the top center portions of the hammercircle. The end **130** has a tip **132** to prevent any stray material from collecting behind the breaker structure. The lower ends **133, 134** swing clear of the upper screen bars so as not to conflict with the adjustment of the screen bars. When the rotor turns clockwise the plate **76** would be in a breaker position spaced from the hammercircle. The upper end **130** is moved away from the lower end **129** of the feed chute. With the reversal of the rotor the breaker plate **75** may be lowered to the dust guard position with the bulges **125, 126, 127** adjacent the hammercircle.

In the embodiments shown in Figs. 1 and 2 the breaker plates are set between the position I and II depending on the material being crushed and the desired output product. In the lowered position II of Fig. 1 the various breaker surfaces are spaced from the hammercircle substantially the same distance. Thus the edges **135, 136** are substantially the same distance from the hammercircle. The fixed breaker surfaces are positioned substantially the same distance so that the spacing is uniform between the breaker surfaces and the rotating hammers. Although the spacing is uniform the depth and angle of the breaker surfaces of a breaker plate are different from one another.

As the breaker plate is moved towards position I the space between the breaker plate and the rotating hammers widens and the edge **135** is further from the hammercircle than the edge **136**. The space between the breaker surfaces and the hammercircle tapers or narrows in the direction of rotation along the movable breaker plates.

In position II the initial breaker surfaces is near the hammercircle so that the distance from the hammers at the point of initial impact is shorter and the distance of travel of the material is shorter. With the breaker surfaces closer the member impact is increased. Also the speed of rotor is adjusted to the type of material to be fed to the crusher and to the desired output size.

The other plate with edges **138, 139** are similarly posi-

tioned for clockwise rotation. Fig. 2 is of a similar construction and has the plates similarly positioned.

In the embodiment shown in Fig. 3 the breaker plates are set between positions III and IV in the breaker positions. Position IV would correspond to position II and position III would correspond to position I of the embodiments shown in Figs. 1 and 2. In position IV the edges **122**, **123**, **124** of plate **75** are substantially the same distance from the hammercircle. In the raised position IV, shown in dotted lines, the spacing narrows in the direction of rotation and the edge **122** is further from the hammercircle than edge **124**. With the breaker plate **75** pivoted on the shaft **85** the plate **75** opens a wider space with less narrowing than the embodiments in Figs. 1 and 2. The breaker plate **76** with edges **125**, **126**, **127** may be similarly adjusted when one breaker plate is in breaker position the other breaker plate may be in the dust guard position for clockwise rotation of the rotor **72**. In Fig. 3 the plate **76** is in a dust guard position with the edges **125**, **126**, **127** adjacent the hammercircle. The dust carried by the rotor is deflected back into the rotor and prevented from escaping up the feed chute. When breaker plate **76** is in a breaker position breaker plate **76** may be in the dust guard and deflect the dust into the rotor on clockwise rotation.

The breaker plates **22**, **23**, and **60**, of the hammermills shown in Figs. 1 and 2 may be positioned symmetrically and set for the particular material to be crushed. The crusher may then be reversed without regard to the adjustment of the position of the movable breaker plates.

When in the embodiment in Fig. 3 either of the breaker plates is in a dust guard position the plates have to be repositioned when the rotor is reversed. However both plates may be in breaker positions and then the rotor may be reversed without repositioning the plates.

The spacing of the breaker plates further from hammercircle alters the number of times the material is rehit by the rotor. The rotor may also set at different speed to alter the type of output material.

Various modifications may be made in the embodiments shown and described without departing from the scope of the invention.

I claim:

1. A hammermill type crusher comprising a rotor with hammers and adapted to rotate in either direction, a feed chute positioned above said rotor to form a chamber between said chute and said rotor and to feed material through said chamber into the top center of the rotor, fixed means on opposite sides of said feed chute extending downwardly from the bottom end of said feed chute for confining material in said chamber, a pair of adjustable impenetrable breaker means on opposite sides of said chamber and pivotally mounted at the lower ends between the center of the rotor and the top of the hammercircle described by said hammers, said breaker means having a plurality of angular breaker surfaces and extending from below the top of the hammercircle to above the top of the hammercircle to adjacent the fixed means with the upper portions of the breaker surfaces defining the side walls of the chamber to receive the impact of the material hit by the rotating hammers and adjustable through a distance with respect to said rotor than the lower portion of said breaker surfaces to control the size of the output material.

2. A hammermill type crusher as set forth in claim 1 wherein lower grating bars are provided on each side of said rotor and are pivotally mounted at the upper ends to vary the space relation with the rotating hammers.

3. A hammermill type crusher as set forth in claim 1 wherein said second breaker means are provided on each side of said rotor and extend downwardly from said adjustable breaker means.

4. A hammermill type crusher as set forth in claim 3 wherein said second breaker means are fixed.

5. A hammermill type crusher as set forth in claim 1 wherein lower breaker means are provided on each side of said rotor extending below the center of said rotor and pivotally mounted at the uper ends thereof.

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