

Sept. 20, 1949.

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CHUTE AND BREAKER PLATES

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2 Sheets-Sheet 1

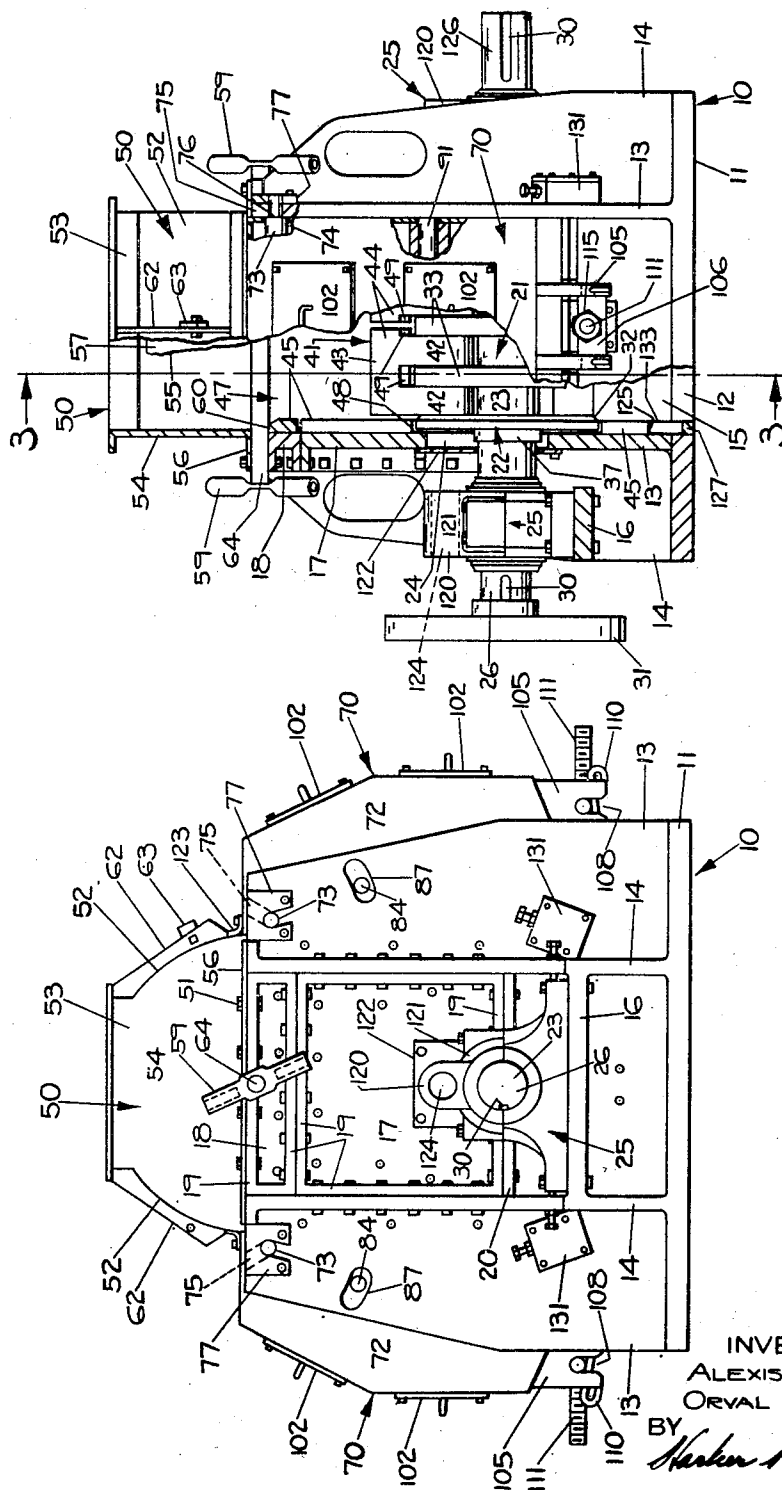


Fig. 2

Fig. 1

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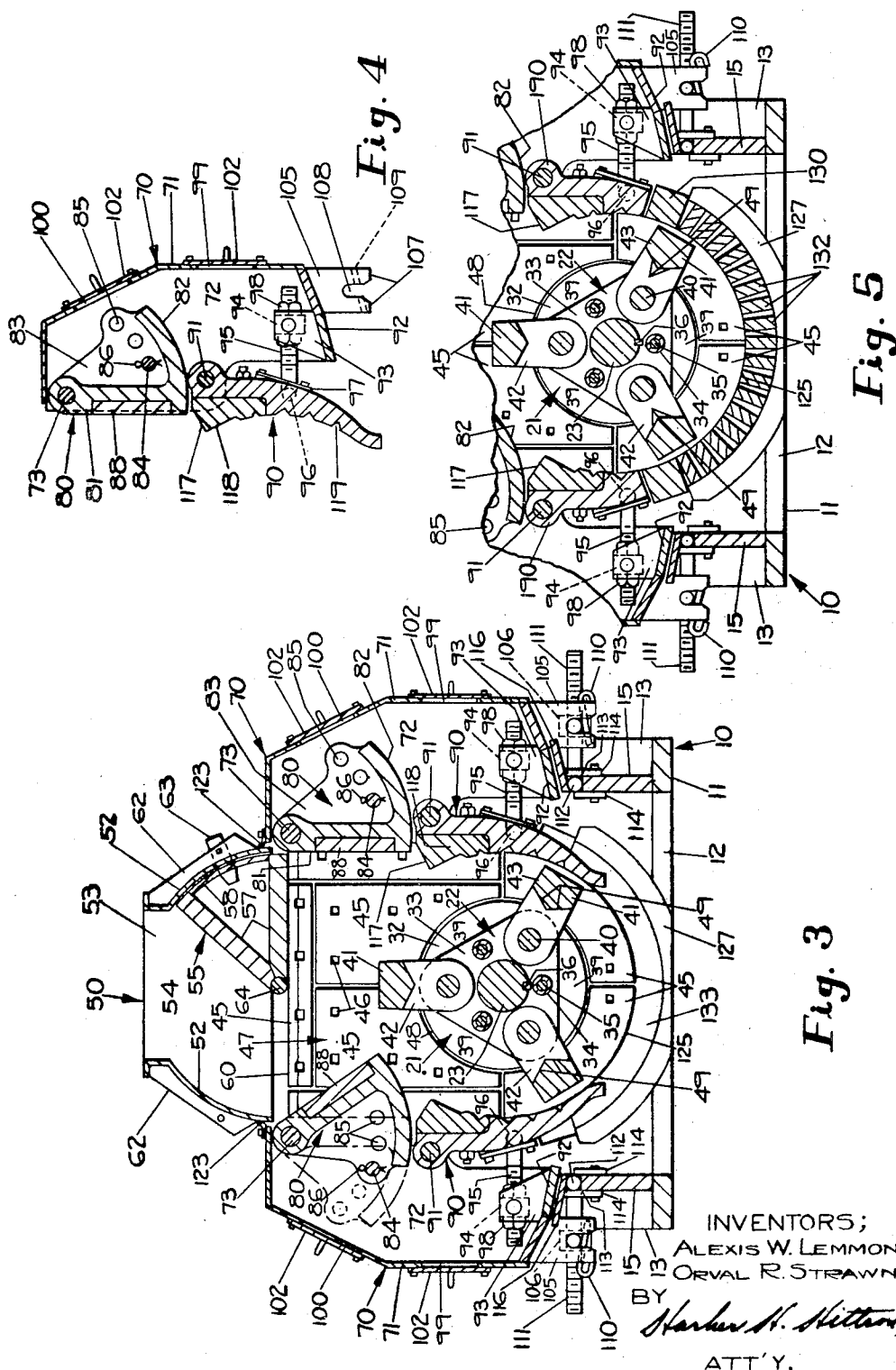
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## UNITED STATES PATENT OFFICE

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## REVERSIBLE CRUSHER WITH PIVOTALLY ADJUSTABLE CHUTE AND BREAKER PLATES

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3 Claims. (Cl. 241-186)

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This invention relates to material reducing or conditioning apparatus and more particularly to such apparatus that is preferably, but not necessarily, of the hammer mill type and which is particularly adapted for reducing friable material such, for example, as iron ore, stone, coal and the like.

An object of the invention is to provide an improved reversible material reducing or conditioning apparatus having a reducing chamber and a reducing rotor therein wherein the shape of the reducing chamber may be changed with facility to accommodate the apparatus for reducing various kinds of materials.

In carrying out the foregoing object it is another object of the invention to provide an improved material reducing apparatus having a reducing chamber the sides of which include adjustable breaker plates that may be adjusted individually to different positions, thereby rendering the apparatus highly versatile for reducing materials of various characteristics.

It is another object of the invention to provide an improved reversible material reducing apparatus having a reducing chamber and a reversible rotor therein wherein material entering the reducing chamber is deflected toward the center of the reducing chamber by combination deflector and breaker plates which are positioned to deflect material entering the reducing chamber in accordance with the direction in which the rotor is to be operated.

It is another object of the invention to provide an improved reversible material reducing apparatus having a reducing chamber and a reversible rotor therein wherein material entering the bination deflector walls which are adapted to act selectively as deflector walls of the chute or breaker walls of the reducing chamber.

It is another object of the invention to provide a reversible crusher with adjustable chute means adapted to reduce the tendency for choking of the feed opening when sticky or damp material is being treated.

It is another object of the invention to provide in a material reducing rotor having a material reducing element pivotally attached thereto, a pair of abutments one of which is formed by the rotor body and the other by the swingable elements, each of the abutments presenting a relatively large abutting area adapted to abut one another to limit the pivotal movement of the reducing element.

Other objects of the invention will appear hereinafter the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is an end view in elevation of our improved material reducing apparatus;

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Fig. 2 is a side sectional elevational view of the apparatus seen in Fig. 1;

Fig. 3 is a view in section, the section being taken on line 3-3 of Fig. 2;

Fig. 4 is a sectional view of one of the breaker plate assemblies seen in Fig. 3; and

Fig. 5 is a fragmentary sectional view showing a modified form of our invention.

Referring to the drawings, our improved reversible material reducing apparatus has a main frame 10 which in general takes the form of a symmetrical casing or housing having a central reducing chamber and top and bottom feed and discharge openings, respectively. The main frame 10 may be a casting, but we prefer to form it of welded plate construction.

Referring in detail to our preferred construction, the main frame 10 includes a flat rectangular base 11 that forms an outlet opening 12 through which material that has been reduced, ground, or pulverized in the apparatus is discharged. Rising upwardly from the ends of the opening 12 in the base 11 is a pair of end walls 13. Each end wall 13 is welded along its bottom to the base 11 and is supported by a pair of spaced gussets or ribs 14 that extend from the tops of the walls to the base and to which they are welded. Extending transversely between the inside faces of the end walls 13 and along the sides of the rectangular outlet opening 12 is a pair of relatively low upstanding plate members 15 that form the sides of the main frame 10. Preferably the side frame members 15 are welded at their ends to the inside faces of the end walls 13 and along their bottoms to the upper surface of the base 11. The gussets 14 in addition to bracing the end walls 13 support horizontally extending shelves 16 that are spaced outwardly from the walls 13, upwardly from the base 11 and the ends of which are welded to the inner faces of the gussets 14. The end walls 13 of the main frame between the gussets 14 and above the shelves 16 form yokes that receive removable wall closure plates 17 and 18, the side flanges 19 of which are bolted together and to the gussets 14. The bottom flanges 19 of the closure plates 17 are bolted to flanges 20 that extend between the gussets 14 and are welded to both the end walls 13 of the main frame and the gussets.

The material reducing apparatus includes a reversible material reducing rotor 21, the body 22 of which is positioned between the end walls 13 of the main frame 10 and within the reducing chamber thereof, and the shaft 23 of which extends through openings 24 in the end walls of the main frame 10 and are supported by bearing blocks 25 mounted upon the shelves 16. The ends of the rotor shaft 23 extend outwardly beyond the bearing blocks 25 and are provided with keyways 30. Preferably a fly wheel 31 is mounted

upon and keyed to one end 26 of the shaft and a suitable pulley or direct drive coupling (not shown) for driving the rotor is mounted upon and keyed to the opposite end 126 of the shaft.

The rotor body 21 includes end discs or plates 32 between which are sandwiched a plurality of generally triangularly shaped intermediate plates 33 that are spaced apart by tubular spacers 34. The end discs or plates 32 and intermediate plates 33 are provided with aligned openings for receiving the bolts 35 that extend through the aligned openings and the tubular spacers 34 and are suitably secured to the end discs or plates 32 thereby forming a multi-pieced rotor unit. The end discs 32 and intermediate plates 33 of the rotor body 22 are carried directly upon the shaft 23 and are keyed thereto by a key 36 that is received in a keyway in the shaft 23 (Fig. 3). Endwise movement of the rotor body 22 is prevented by a pair of internally threaded collars 37 that are threaded on the shaft 23 and abut the end discs 32. The collars 37 may be positively locked to the shaft.

The triangular intermediate plates 33 of the rotor body are pierced at their apices to receive through pivot pins 40 and the end discs 32 of the rotor body 22 are provided with openings which are aligned with the openings in the intermediate plates and through which the pins 40 are inserted and locked in the body. In the embodiment of the invention shown, each pin 40 pivotally carries a pair of material reducing swing hammer elements 41. The hammers 41 are each comprised of a pair of legs 42 connected by a cross head 43 that protrudes to one side of one of the legs. The underneath or inside faces of the cross heads are shaped to form abutments 49 presenting relatively large faces or abutting areas that are adapted to engage the bases or sides of the triangular intermediate plates 33 which form the periphery of the rotor body 22. The shape of the plates 33 and the abutments 49 of the cross heads 43 permit the hammers 41 to swing through an arc of approximately 90° either in a clockwise or a counter-clockwise direction from their normal operating positions seen in Figs. 3 and 5, this because the rotor may be driven either in a clockwise or counter-clockwise direction. The large amount of movement of the swing hammers 41 is particularly advantageous in preventing damage to the reducing apparatus in the event that a large piece of material should enter the reducing apparatus, for example, and not be fractured by hammer impacts. In such case the hammers 41 may swing and recede inwardly within pockets 39 provided in the rotor body by the shape of intermediate plates until their abutments 49 engage the abutments or outer faces of the intermediate plates 33 to limit their swinging movement and the hammers will pass the piece. The hammers in swinging from their normal radially extended positions into the pockets 39 materially decrease the overall diameter of the rotor 21. The cross heads 43 of the swing hammers 41 extend sidewardly, as seen at 44, from above one of the legs 42 and a pair of hammers 41 is secured on each pin 40 with their extended portions 44 adjacent one another and overlapping the center intermediate rotor plate 33. Thus in effect the cross heads 43 of each pair of hammers 41 form a continuous breaker bar but either half of said bar is capable of absorbing abnormal shocks by yielding from its normal operating position. While we have described each pin 40 as carrying a pair of swing hammer elements 41, it is to be understood that any number of such elements as

desired, depending upon the width of the rotor, may be used.

The end walls 13 of the main frame 10 and the closure plates 17 and 18 form end walls of a material reducing chamber 47 in the bottom of which the rotor 22 operates. Preferably the inner sides of these walls are protected by replaceable wear resistant plates or liners 45 that are fastened thereto by a plurality of bolts 46. The liners 45 cooperate to form recesses 48 in which the end discs 32 of the rotor body 22 are receded. Thus fine material moving through the apparatus adjacent the liners will not escape from the reducing chamber past the end discs 32 but will be directed downwardly through the bottom of the reducing chamber 47.

A feed chute 50 for properly directing material into the reducing chamber where it will be acted upon by the swing hammers 41 spans the tops of the end walls 13 and its end walls 54 are in vertical alignment with the inside surfaces of the end walls 13. The walls 54 are flanged at 56 and these flanges are received by the top flanges of the closure plates 18 to which they are secured by bolts 51. The top of the inlet chute 50 is also flanged outwardly to receive a suitable conduit or hopper, not shown, through which material is supplied to the chute.

Referring particularly to Fig. 3 of the drawings, the sheet metal walls 52 of the feed chute 50 form in cross section a segment of a cylinder, the top of which is opened to form a material inlet or throat 53. Pivoted within the chute and swingable from side to side therein is a gate or combination deflector and breaker plate member or unit 55 that is adapted to direct material entering the reducing apparatus selectively toward either side of the reducing chamber depending on the direction of rotation of the rotor 21 and to form a movable wall for the top of the reducing chamber 47 for each position of adjustment thereof. The gate or combination deflector and breaker plate member or unit 55 is generally triangular in cross-section and is of heavy welded plate construction including similar heavy side plates 57 that are welded to a shaft 64 and extend radially therefrom at an acute angle to each other. The outer ends of the plates 57 are welded to an arcuate base plate 58 that is curved to fit closely to the arc of the walls of the inlet chute. The closure plates 18 and end walls 54 of the chute cooperate to form aligned bearings through which the ends of the shaft 64 extend and in which the gate 55 is pivoted.

Preferably both ends of the shaft 64 protrude outwardly beyond the flanges 19 of the closure plates 17 and 18 and are provided with socket type cross head handles 59 into or over which a bar or lever may be inserted for enabling an operator to swing the gate 55 from side to side in the chute. The gate rests upon the top edges 60 of the replaceable liner plates 45 that are attached to the inside of the closure plates 18.

The arcuate side walls 52 of the feed chute 50 are provided at their centers with outstanding reinforcing plates 62 that extend between the top flanges of the chute and the flanges 56 and are welded along their edges to the flanges and arcuate walls. In order to lock the gate or deflector member 55 in either of its operating positions a key 63 is provided that is bolted to either of the outstanding reinforcing plates 62 of the feed chute and projects inwardly through an opening in the arcuate wall 52 thereof and into an opening formed in the curved wall 53 of the gate,

From the description of the device thus far given it will be seen that the upright end members of the main frame are lined and form the ends of the material reducing chamber of the apparatus into which material to be reduced is fed through a chute that includes an adjustable deflector 55 for deflecting the material toward either side of the reducing chamber and for forming a movable top wall of the chamber which also acts as a breaker plate. The unit 55 will be swung counter-clockwise to a position on the other side of chute 50 similar to that shown in Fig. 3, upon reversal of the rotor 22. It will also be seen that the reducing rotor of the apparatus is contained below or in the bottom of the reducing chamber and that the sides of the chamber frame 10 are open above the side frame members 15.

The sides of the apparatus are closed by breaker plate assemblies 70 that are pivotally carried adjacent their tops by the end walls 13 of the main frame 10. Each breaker plate assembly 70 includes a cover, rack, or frame 71 the end walls 72 of which are adapted to telescope into the main frame 10 of the reducing apparatus between the end walls 13 thereof. The covers or frames 71 are carried by cross shafts 73 that extend through aligned openings 74 in the ends of the cover 71 and form trunnions that are received by sockets 75 formed by slots or notches in the tops of the end walls 13 of the main frame 10. The ends of the cross shaft are reduced in diameter to provide shoulders 76 (Fig. 2) that abut the inside faces of the walls 13 for preventing endwise movement of the cross shaft 73 relative to the main frame 10 and slotted locking members 77 secured to the outside of the main frame cover and slots or notches 75 in the end walls and prevent upward movement of the cross shafts 73 in the frame.

Referring to Fig. 4 wherein one of said breaker plate assemblies 70 is seen in section, the cross shaft 73 pivotally carries a primary combination deflector and breaker plate or combination feed chute and breaker plate unit 80. The primary breaker plate 80 may be a casting and it includes a recessed wall 81 which extends radially from the pivotal axis of breaker plate 80, which is the axis of cross shaft 73. Said breaker plate 80 also includes an integral arcuate wall 82 that extends peripherally from the base or outer end of the wall 81 into the cover or frame 71. Walls 81 and 82 are connected at their ends by integral walls 83 that include a series of arcuately aligned openings 85 in which a pin 84 is selectively fitted. Pin 84 extends through both of the end walls 83 into aligned openings in the end walls 72 of the frame, rack, or cover 71 and is secured in position by cotter keys 86 that abut the walls 83. Arcuate slots 87 (Fig. 1) are provided in the end walls 13 of the main frame to permit removal of the pins 84 in all positions of adjustment of the covers, frames, or racks 71.

Preferably the recessed face of the member 81 has a renewable wear plate 88 inserted therein. It may be pointed out here that the primary breaker plates 80 are mounted to both the main frame 10 and to the covers or frames 71 of the breaker plate assemblies 70 through the shafts 73 and pins 84 and that the breaker plates 80 cooperate to form portions of the side walls of the reducing chamber 47 of the apparatus. It may also be pointed out that the shafts 73 support the primary breaker plates 80 so that they cooperate with the feed chute 50 and depend below and to

each side of it. The functions and advantages of this structure will be discussed hereinafter.

When rotor 22 travels clockwise, left-hand primary breaker plate 80 will be swung inwardly to form a feed chute, while right-hand breaker plate 80 will be upright, as illustrated in Fig. 3 of the drawings. For reverse rotation of rotor 22, chute 55 will be reversed, left-hand primary breaker plate 80 will be adjusted to vertical position, and right-hand breaker plate 80 will be swung inwardly.

Curved secondary breaker or crusher plates 90 are mounted to the covers or frames 71 of the breaker plate assemblies 70. Each of these curved plates 90 is pivotally carried by a shaft 91 fixed at its ends to the end walls 72 of the assembly frames 71 below the primary breaker plates 80. The bottom wall 92 of the assembly frame has an upright bifurcated bracket 93 welded thereto carrying a trunnioned head or cross piece 94 that freely receives a bolt 95. Bolt 95 is formed to include a cross head 96 that is secured in a recess in the back or outside of the secondary breaker plate 90 and is secured therein by straps 97 that are bolted to the breaker plate. Each bolt 95 carries a pair of nuts 98 that adjustably lock it to a head or cross piece 94.

Referring to Fig. 4 it will be seen that the positions of the secondary breaker plates 90 can be readily shifted with respect to the assembly frames 71 by adjusting the positions of nuts 98. When the machine is assembled access may be had to the nuts 98 through openings 99 formed in the backs of the frames 71 and access to the cotter keys 86, which must be removed to change the position of the primary breaker plates 80, may be had through openings 100. Preferably openings 99 and 100 are closed by doors 102 that are bolted to the covers. Depending from the bottom wall 92 of each of the assembly frames 71 is a pair of spaced legs 105 that are notched in their lower ends at 108 for receiving cross pieces 106 that are similar to cross pieces 94. The tines 107 of the yokes or notches 108 are pierced at 109 (Fig. 4) for receiving removable pins 110 that secure the cross pieces 106 in the legs 105.

Referring now to Fig. 3 it will be seen that each of the cross pieces 106 carries a bolt 111 that is similar to bolts 95 through which the positions of secondary breaker plates 90 are adjusted by setting nuts 115. The head 112 of each bolt 111 is received in an opening 113 in the low frame wall 15 and is secured therein by lugs 114 that are bolted to the member 15. Extending across and rigidly connected to the tops of the cross frame members 15 are outwardly, upwardly sloping material directing cross shelf members 116 that form the tops of the openings 113. In operation a small amount of reduced material may find its way between the primary and secondary breaker plates and between the side walls of the assembly frames and the breaker plates. For this reason the telescoping walls 92 and the side shelves 116 are sloped outwardly and upwardly for directing said material through the outlet opening 12 in the main frame. Resilient sealing strips 123 are provided for sealing the top walls of the covers 71 to the feed chute 50.

In summary it may be pointed out that the frames 71 of the breaker plate assemblies 70 are pivoted to the main frame 10 and their positions are adjustable through the bolts 111 and nuts 115 with respect to the main frame 10 and the rotor 21 of the reducing apparatus, the primary and secondary breaker plates, of course, moving

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with the frames 71 as they are adjusted. The positions of both the primary and secondary plates 80 and 90, respectively, are adjustable independently of each other relative to the frames 71. Each breaker plate assembly 70 may be removed bodily from the main frame 10 by removing its associated locking members 77 and lifting the assembly upwardly and outwardly.

Since most of the top or breaking edges 117 of the secondary breaker plates 90 are exposed to a great amount of abuse by the impact of material being reduced we have found it desirable to form the secondary breakers to include renewable sections 118 that are bolted thereto. The secondary breaker or grinder plates 90 cooperate with the swing hammers 41 of the rotor to crush and grind material and to enhance their operation we have provided in their faces a series of horizontal serrations or grooves 119 which provide the plates with additional crushing surfaces.

Because the pins 40 cannot be withdrawn from the rotor 21 to permit removal of the swing hammers 41 without interfering with the rotor shaft bearing blocks 25 we have provided open upstanding reinforcing lugs 120 on the caps 121 of the bearing blocks 25. With such caps a repairman may remove the swing hammers by removing plates 122 that cover the openings 24 in the sides of the reducing chamber and after releasing the pins 40 from the rotor end discs 32 withdraw them sidewardly through the openings 124 in lugs 120 of the bearing block caps, the lugs 120 providing necessary strength in the bearing block caps 121.

In Fig. 5 we have shown a modified form of our invention. In this embodiment the secondary breaker or crusher plates 190 terminate above rigid breaker bars 130 that extend across and are secured in the main frame 10 by mounting mechanisms 131 (Figs. 1 and 2) that are formed as a part of the end walls 13. Below the breaker bars 130 is positioned an arcuate screen 132 that encloses the bottom of the rotor and is carried in channels 133 formed by the bottom edges 125 of the lowermost liner plates 45 and arcuate liner plates 127 that are welded to the end walls 13 of the main frame 10.

The embodiment of the invention shown and described in Figs. 1 through 4 may be readily converted to the embodiment shown in Fig. 5 by substituting the secondary breaker plates 190 for the secondary breaker plates 90 and by inserting the breaker bars 130 and the arcuate screen 132 in the mounts 131 and channels 133, respectively. It will be seen that the positions of the secondary breaker plates 190 may be adjusted as desired to expose more or less of the breaker bars 130 which, of course, will change the reducing characteristics of the apparatus.

In operation with the parts of the machine positioned as seen in Fig. 3 and with the rotor turning in a clockwise direction, material flowing in the feed chute 50 is guided by the gate or deflector 55 and is deflected toward the left side of the reducing chamber 47 and against the left primary breaker or deflector feed plate 80 which is positioned to deflect or guide the material toward the center of the reducing chamber. The material slides or falls sidewardly from the primary breaker plate 80, which now is cooperating with the chute 50 to form a part thereof, into the path of the whirling rotor whereupon it is struck by the swing hammers 41. The material may be sufficiently or partly reduced by impact of the rotor and it will in any event be knocked, impelled or thrown to the right in the reducing chamber. The

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material thus thrown sidewardly in the reducing chamber 47 by the rotor will strike the right hand primary breaker 80 by which it will be further reduced by impact therewith. Some of the material will be deflected from right hand breaker plate 80 upwardly to strike the horizontal plate 57 of deflector 55 and be further reduced thereby. The material that has been sufficiently reduced, for the most part, will fall or pass downwardly and be discharged from the apparatus through the outlet opening 12 in the bottom of the main frame. That material which was not sufficiently reduced by the impacts of the hammers 41 or by collision with the walls of the reducing chamber will upon striking the walls glance therefrom and be thrown back into the path of the swing hammers. Less friable pieces of material will eventually find their way to positions between the rotor 21 and the secondary breaker or grinder plates 90 wherein the blows of the swing hammers become more effective for reducing or grinding the material. Should a piece of material that greatly resists reduction find its way between the secondary breaker plate and the rotor the swing hammers will shift from their normal operating positions to reduce or decrease temporarily the radius of the rotor where the swing hammers engage the resisting piece of material. Thus the material may pass through the reducing apparatus without damaging it. For reverse rotation of rotor 21, gate 55 will be swung to the opposite side of chute 50, left-hand primary breaker 80 will be adjusted to vertical position, and right-hand breaker 80 will swing inwardly. Their operation will be evident from the above description.

In the embodiment shown in Fig. 5 wherein the screen 132 is provided, a piece of material that resists reduction as above described will be carried by the rotor, breaker plates, breaker bars and the screen back to the reducing chamber to be further acted upon above the rotor.

In our improved material reducing apparatus the breaker plate assemblies may be adjusted to any of many and various angular positions which, of course, cause material being reduced to glance and bounce in substantially predetermined directions in the reducing chamber according to the setting of the breaker plates. For example, by adjusting the position of the assembly frames 71 outwardly with the primary breaker plate 80 in the position shown in Fig. 4 and then adjusting the heel or bottom portion of the secondary breaker or crusher plate to a position wherein it is closely adjacent the rotor, the side wall so adjusted bulges outwardly at its horizontal center. Such adjustment of the parts tends to throw more material between the secondary breaker or grinder plate and the swing hammers. It will be seen that since the positions of the primary and secondary breaker plates are independently adjustable, the wall above described may assume many various shape characteristics to affect the reducing functions of the apparatus. Another advantage of our material reducing apparatus resides in the adjustability of the grinder plates 90 and 190 to compensate for the gradual reduction in length of the swing hammers 41 caused by wear.

The curved wall 82 of the primary breaker plate may function as a deflector for material that is carried over the screen 132 by the hammers 41. In such case the deflector wall 82 directs the material toward the opposite walls of the reducing chamber or directly into the path of the reducing hammers 41.

The direction of rotation of the rotor 21 may be reversed in which event it is generally, but not necessarily, desirable to reverse the positions of the right and left hand combination chute and breaker plates 80 and to shift the position of the combination deflector and breaker plate unit 55 in the feed chute by swinging it counter-clockwise to a reverse similar position. Should the direction of the rotor be reversed when the parts of the apparatus are adjusted as seen in Fig. 3, as it is under certain conditions, then material sliding or falling from the primary breaker or combination deflector and breaker plate 80 is knocked by the swing hammers 41 directly against the left hand secondary breaker or grinder plate 90 and crushed. One wall of the combination deflector and breaker unit 55 in the feed chute 50 forms the top reducing or breaker plate of the reducing chamber 47 when the unit is positioned in either the right or left hand side of the chute.

Another important feature of our invention is that for either position of adjustment of the chute means 55 and 80 the material being reduced is so delivered to be struck and impelled by the swing hammers 41 that substantially all of said impelled material will travel in a direction away from the effective feed opening to the reducing chamber. This is particularly important when damp or sticky material is being treated because it has been found that there is a great tendency for such material to choke up the feed opening, if any substantial part of it is impelled toward such feed opening or inlet to the feed chamber. This problem has been particularly difficult in connection with iron ore. This characteristic will be evident from a consideration of Fig. 3 because of the deflecting action afforded particularly by the combination breaker and deflector plate 80 which in part extends over the rotor 21 and guides material as it reaches the position where it is struck by a hammer 41 so as to impel it against the working top breaker plate 57 or the breaker plate 88 of the right-hand unit 80. A similar situation prevails for reverse rotation of rotor 21 with the chute means reversely adjusted as above described.

From the foregoing description of our improved material reducing apparatus and its functions it will be readily seen that we have provided a reducing apparatus that is reversible and highly versatile in reducing materials of various characteristics.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended and we wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of our invention, what we desire to secure by Letters Patent of the United States is:

1. A reversible reducing apparatus having a reducing chamber, a feed chute including a combination deflector and breaker plate pivotally mounted therein having similar walls extending radially from a pivoted axis at an angle to each other, said combination deflector and breaker plate being adjustable to bring the angular walls selectively into deflecting and breaker plate operating positions, similar combination deflector and breaker plate means forming opposite wall portions of said reducing chamber, and means for swinging either of said second named combination breaker plate means to a position to di-

rect material deflected by said first named combination deflector and breaker plate toward the center of the reducing chamber while the other acts as a breaker plate and vice versa depending upon the direction of operation of the reversible reducing apparatus.

2. A combination breaker and deflector unit for use with material reducing apparatus, said combination breaker and deflector unit including a pair of heavy plates extending radially from an axis at an acute angle to each other, a wall plate integral with and extending peripherally from the outer edges of said first named plates, and wall means for mounting the unit to swing about said axis, the outer surfaces of both said heavy plates acting selectively as guiding deflectors or breaker plate surfaces.

3. A reversible crusher having a main frame and including a material reducing chamber, a reversible reducing rotor in said chamber, a feed chute above said chamber, a combination deflector and breaker plate pivotally mounted in said feed chute having similar walls extending radially from a pivoted axis at an acute angle to each other, said combination deflector and breaker plate being adjustable to bring the angular walls selectively into material guiding, deflecting and breaker plate operating positions, breaker plate assemblies forming the sides of said reducing chamber, each breaker plate assembly including a frame movably mounted on said main frame and each carrying similar combination breaker plate and chute means and similar crusher plates, means for adjusting the positions of said assembly frames, means for independently adjusting the positions of said crusher plates, and means for individually swinging either of said combination breaker and chute means to a position to direct material toward the rotor while the other is in an upright position and acts as a breaker plate and vice versa, the positions of said combination deflector and breaker plates in the chute and the combination breaker plate and chute means in the reducing chamber depending upon the direction said rotor is to be driven.

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