

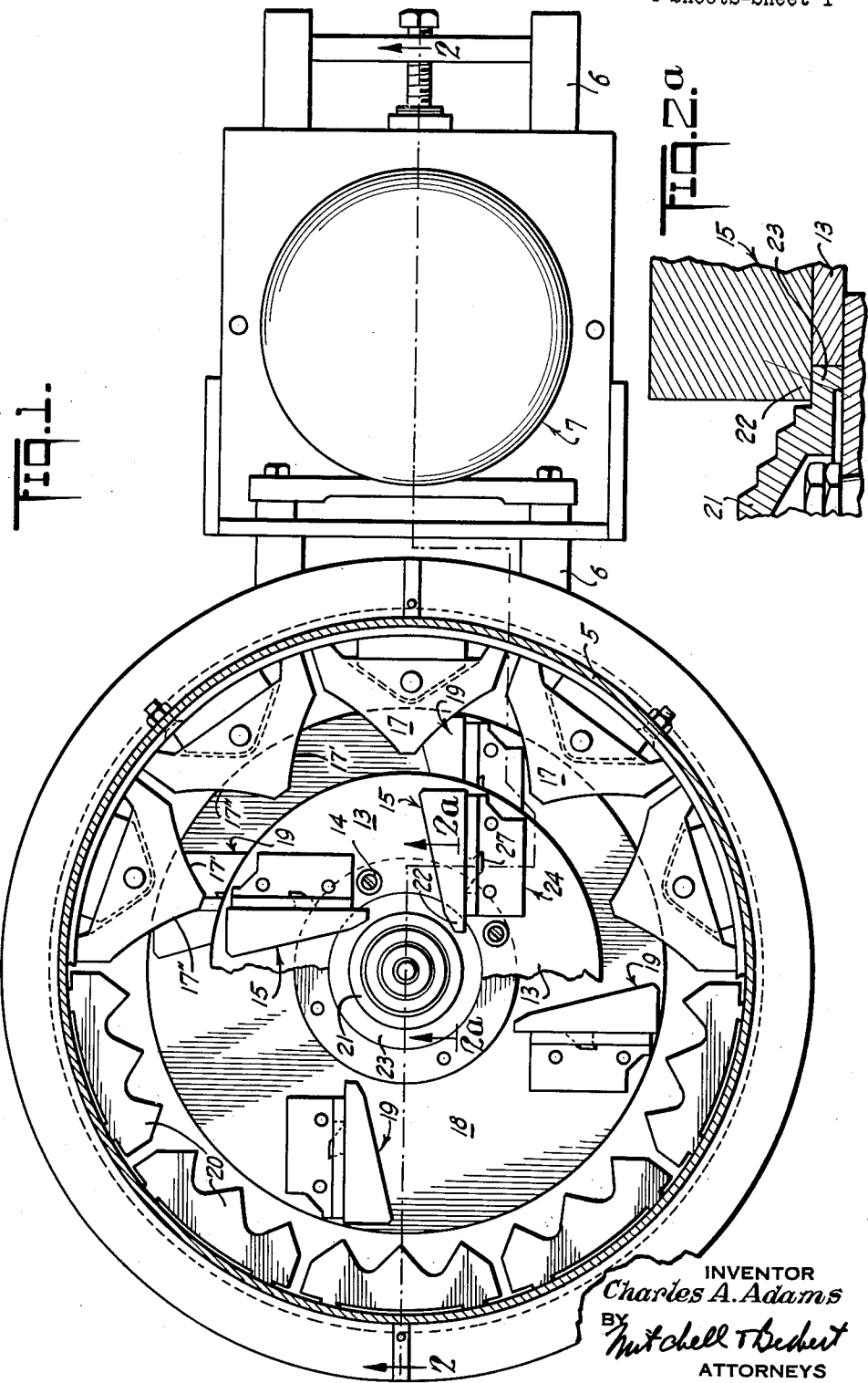
Oct. 16, 1962

C. A. ADAMS
IMPACT CRUSHER

3,058,679

Filed April 4, 1958

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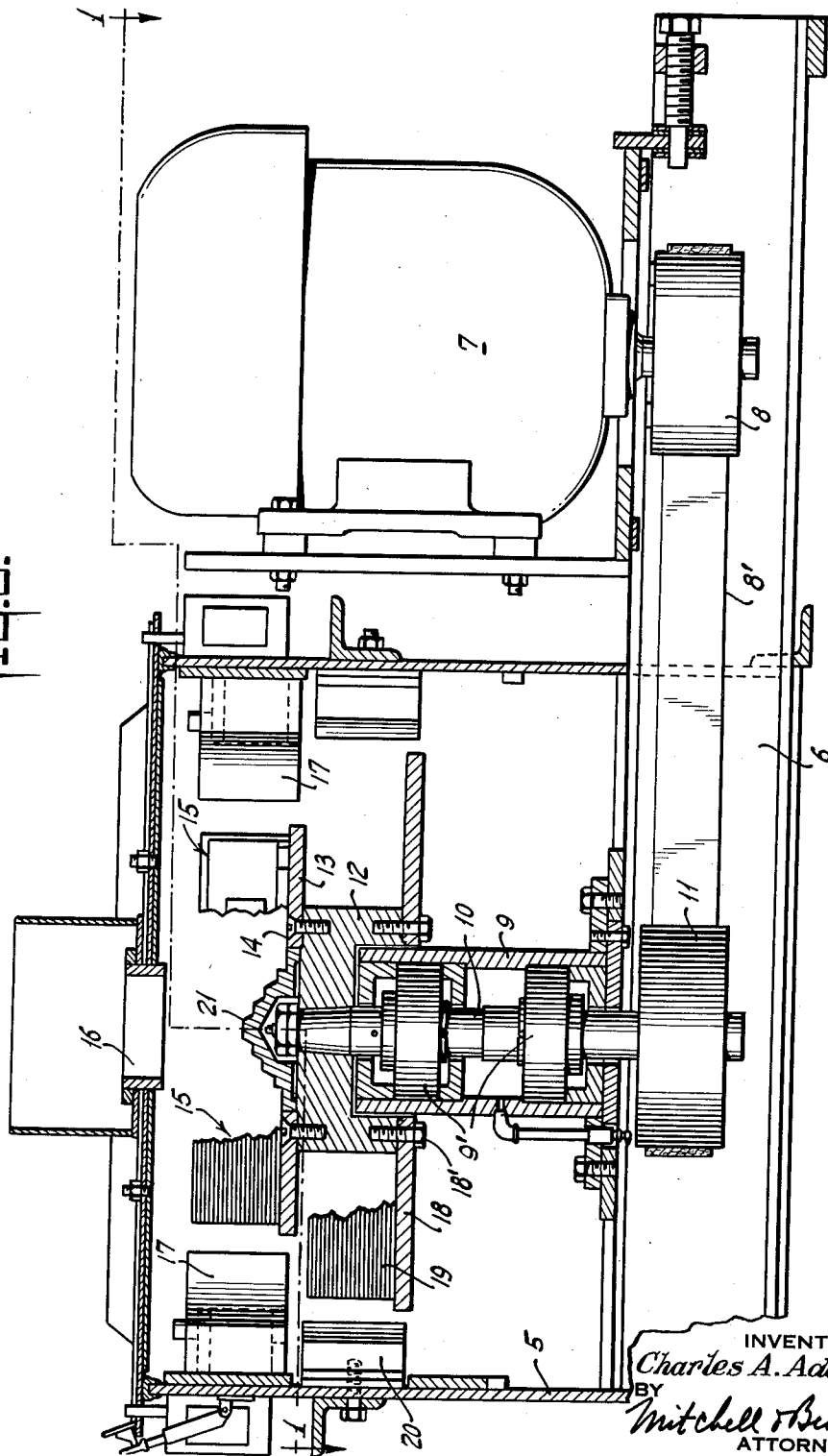
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FIG. 2.



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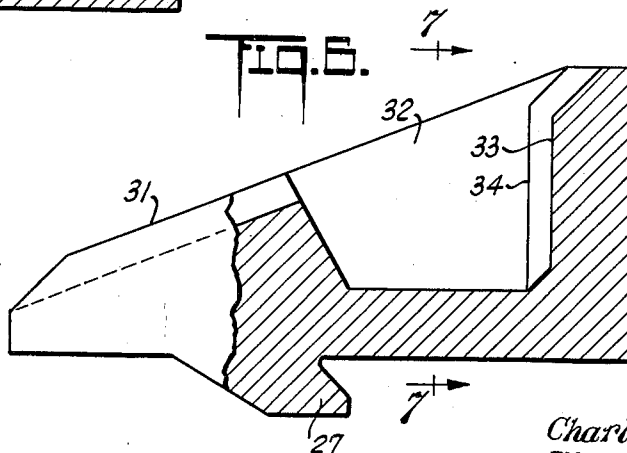
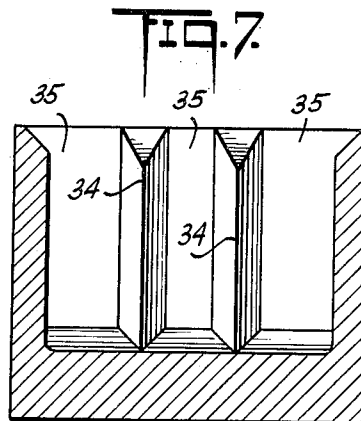
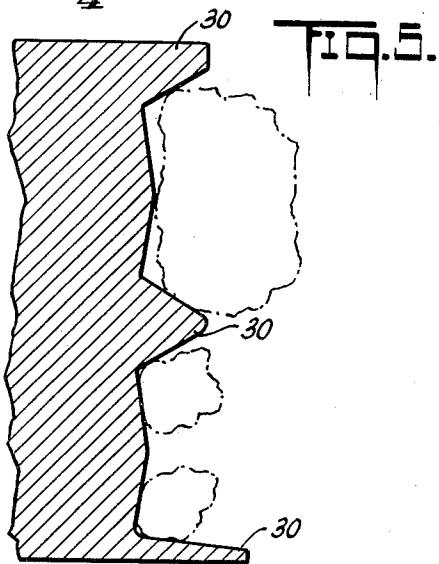
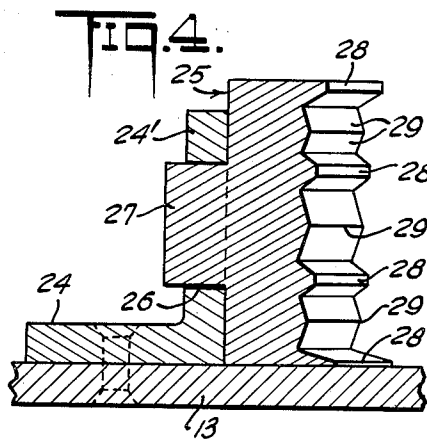
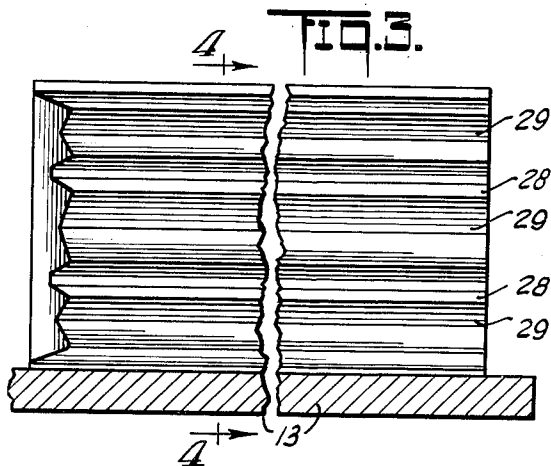
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4 Sheets-Sheet 3



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FIG. 8.

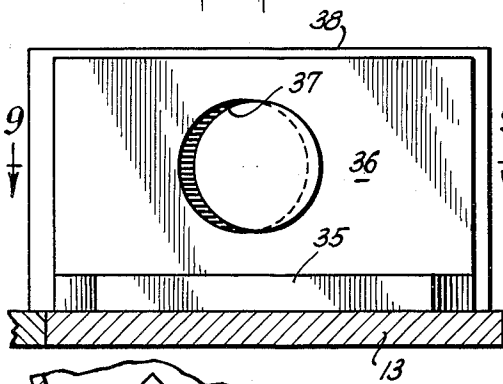


FIG. 9.

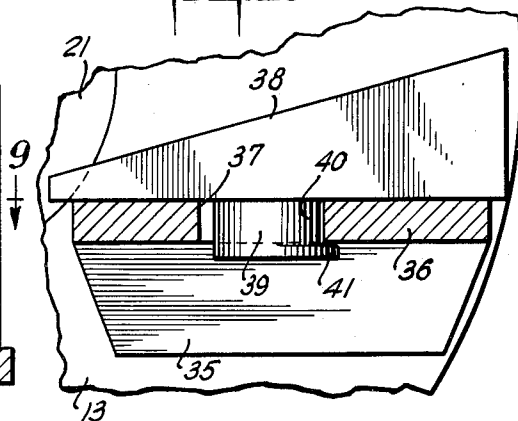


FIG. 10.

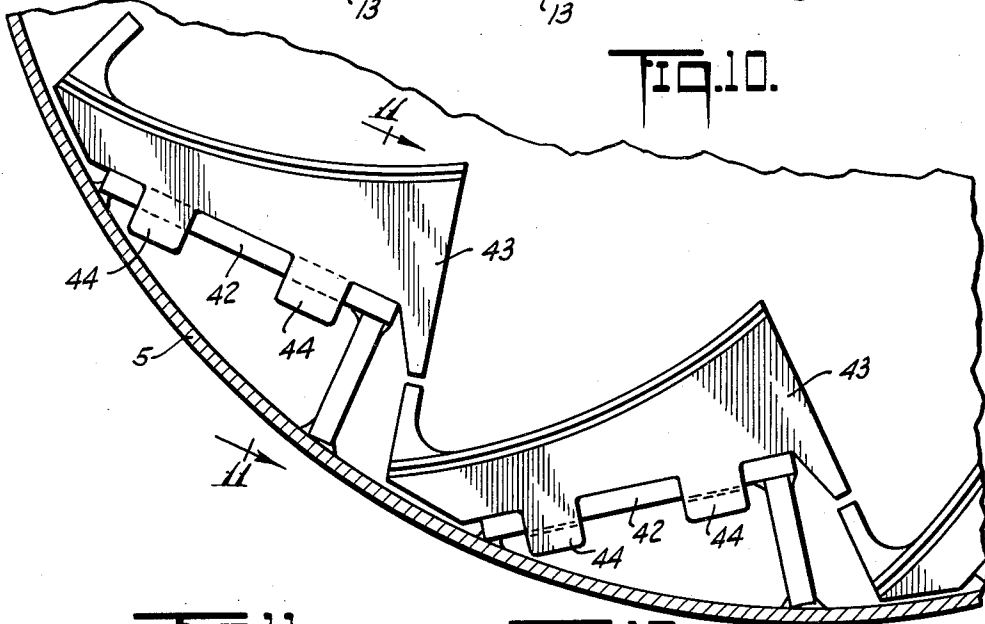


FIG. 11.

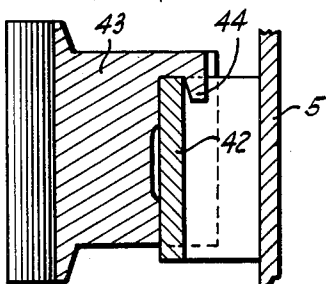
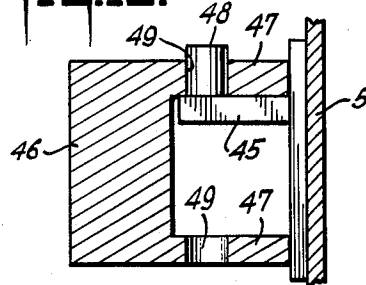


FIG. 12.



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IMPACT CRUSHER

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My invention relates to an impact crusher and more particularly to certain improvements and various features of an impact crusher, all making for greater ease of assembly and changing of worn or damaged parts and for generally increasing the efficiency of such a crusher.

It is a general object of the invention to provide an improved impact crusher with many features of novelty and improvement.

A more specific object is to provide an extremely simplified form of multistage crusher which may be readily converted from a single-stage crusher into a multiple-stage crusher.

A further object is to provide an improved means for holding the center distributing cone in place on an impeller in a crusher of the character indicated.

Another specific object is to provide a much improved form of impeller shoe to inhibit excessive wear and to facilitate changing the impeller shoe when necessary.

It is also an object to provide an improved means for detachably holding in place the breaker plates of an impact crusher, thereby facilitating the changing of breaker plates when desired.

Other objects and various further features of invention will be hereinafter pointed out or will become apparent to those skilled in the art.

Briefly stated, in the preferred form of the invention, the impact crusher includes a generally cylindrical casing having a vertical shaft therein. The vertical shaft is designed to carry one or more impellers. In one form, a smaller impeller is carried at the top of the vertical shaft for coaction with its associated breaker plates (carried by the casing), and a larger impeller is carried on the shaft below the first impeller for receiving material crushed by the first impeller and its breaker plates. The breaker plates are so formed as to be securely held in place in the casing and yet are readily removable for replacement, repair or shipping. The impeller or impellers carry improved impeller shoes detachably secured to the impeller so as to be readily removable therefrom for replacement. One or more of these impeller shoes serves to detachably hold a center distributing cone on the impeller. The impeller shoes are provided with means for guiding the crushable material in its paths outwardly under the centrifugal force of the rotating impeller, and the guiding means are so arranged as to reduce wear to a minimum, and thus prolong the life of the impeller shoes.

In the drawings which show, for illustrative purposes only, preferred form of the invention:

FIG. 1 is a top view in partial plan and partial section, showing a vertical-axis impact crusher embodying my invention, the views being taken substantially in the plane of the line 1-1 of FIG. 2;

FIG. 2 is a vertical sectional view, taken through the axis of the crusher and associated parts shown in FIG. 1, and generally along the line 2-2 thereof;

FIG. 2a is an enlarged fragmentary sectional view in the plane 2a-2a of FIG. 1, and illustrating an impeller shoe detachably securing the distributor cone of the impeller;

FIG. 3 is an enlarged view in elevation showing an impeller plate and illustrating the working face of a detachable impeller shoe in place thereon;

FIG. 4 is a sectional view, taken substantially in the plane of the line 4-4 of FIG. 3;

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FIG. 5 is a further enlarged fragmentary view, similar to FIG. 4, illustrating a slightly modified form;

FIG. 6 is a horizontal sectional view through an impeller shoe of a modified form;

FIG. 7 is a sectional view, taken substantially in the plane of the line 7-7 of FIG. 6;

FIG. 8 is an enlarged view in elevation of the back or supported side of an impeller shoe and its support, parts of the impeller being shown in section;

FIG. 9 is a horizontal sectional view, taken substantially in the plane of the line 9-9 of FIG. 8;

FIG. 10 is a fragmentary horizontal sectional view of the casing and one form of breaker plate detachably secured therein;

FIG. 11 is a sectional view, taken substantially in the plane of the line 11-11 of FIG. 10;

FIG. 12 is a view similar to FIG. 11, but illustrating a modified breaker-plate construction and means for detachably holding the same in place.

In said drawings, the crusher consists of a generally vertical cylindrical case 5 supported on a suitable foundation, such as the beam foundation 6, which foundation also carries a driving motor 7 and its drive pulley 8. The casing 5 has a substantially vertical bearing support 9 therein which carries a vertical shaft 10 having a pulley 11 driven by a belt 8' from the pulley 8, as will be understood. The shaft is supported on spaced bearings 9' in the casing, substantially as shown.

In the form shown, the crusher is of a two-stage type, and in the particular illustrated form, there is a substantial hub 12 carried by the upper end of the shaft 10, and this hub at the upper side carries an upper or first-stage impeller plate or disc 13 secured as by means of screws 14. The impeller plate 13 carries impeller shoe means 15 of suitable type, as will be understood, for engaging and centrifugally throwing out crushable material, entering through the inlet 16. The crushable material thrown out by the shoe means 15 will strike against breaker plates 17 secured inside the casing in position to receive the crushable material thrown out by the impeller; the generally annular space or zone between the impeller 13 and the working surfaces of breaker plates 17 may be referred to as the first crushing stage or zone.

In the form illustrated, as stated, a two-stage crusher has been illustrated, and the second stage consists of an impeller 18 carried by the hub 12 at the lower side and held as by means of screws 18'. The lower or second-stage impeller 18 is larger than the first-stage impeller 13 and is so positioned that the annular path swept by blades or shoes 19 of the impeller 18 is directly beneath the first crushing zone, so as to receive crushed material dropping from or thrown from the upper breaker plates 17. The second-stage impeller shoes 19 direct partially crushed material against further breaker plates 20 for further reduction on impact. The construction is very simple and makes for easy conversion of the machine from a one-stage to a two-stage crusher or from a two-stage crusher to a single-stage crusher.

Centrally of the upper impeller 13 there is a distributing cone 21 which distributes crushable material entering through the entrance opening 16, heretofore noted. The impeller is so constructed as to provide a seat for seating the lower flange 23 of the cone 21, as best appears in FIG. 2. The impeller shoe means 15 carried by the impeller 13 is adjustably arranged so that parts thereof at 22, overlap the bottom flange 23 of the distributor cone 21, as will be particularly clear in FIGS. 1 and 2a.

Normally, the impeller means 15 consists of an angle bracket or the like, carried by the impeller, and a detachable shoe carried by the impeller and supported by the angle bracket; in the form shown, this detachable shoe

engages over the flange 23 on the distributor cone. Thus, when the distributor cone wears out, it is an easy matter to remove the same simply by removing the detachable shoes from the impeller and lifting out the worn cone.

Specific detachable shoes and means for holding the same detachably on the impellers will now be described.

In the form shown in FIGS. 3 and 4, the impeller 13 carries a set of angularly spaced brackets, such as the angle bracket 24. Bracket 24 has an upstanding wall 24' which provides a substantial backing surface for a shoe 25 and which is apertured at 26 to receive an anchoring tongue or spur 27 (which may be of the type shown also in FIG. 6), said spur 27 forming part of the shoe 25. Thus, when spur 27 is passed through the aperture 26, and shoe 25 is moved outwardly (as by centrifugal force during impeller rotation), it is wedged tightly against the upstanding bracket wall 24' and held in that position. When it becomes necessary to change a shoe 25 (or the detachable shoe, for example, as shown in FIG. 6), said shoe would merely have to be tapped inwardly to dislodge the connection 26—27, after which the shoe may be readily removed and replaced.

In the form shown in FIGS. 3 and 4, the face of the shoe is provided with generally radially extending ribs 28 spaced apart from each other so as to define opposite sides of relatively wide grooves having bottom surfaces of substantial width extending transversely between spaced lower margins of adjacent ribs 29. The bottom surfaces 29 may be flattened out, in fact, may even be convexed, as shown. It is to be noted that the generally radially extending grooves in the face of the impeller shoe are not regular V-shaped grooves, but on the contrary, the grooves have the very wide bottoms mentioned above which are either flat or slightly convexed outwardly, for a purpose to be described.

In the slight modification shown in FIG. 5, the ribs 30 are spaced further apart than in FIG. 4, and in effect there are but two so-called grooves between the ribs on the face of the shoe.

In the form shown in FIGS. 6 and 7, the front face of the shoe may be provided with ribs, as heretofore described, but limited to the radially inner end as illustrated at 31, and the body of the shoe may be cored out so as to provide a substantial cavity 32 in the radially outer part of the face thereof; cavity 32 is located where conventional impeller shoes exhibit greatest wear. The outer wall 33 may be provided with ribs, as indicated at 34, so as to leave flat or convexed surfaces 35 between the ribs. This wall 33 is so positioned relatively to the radial line on the impeller that crushable material finding its way into the cavity 32 will be held therein and will not be thrown out centrifugally. Thus, substantially the entire cavity 32 will become filled with crushable material and other crushable material thrown outwardly by the impeller shoe will pass over the surface of crushable material held in the cavity 32; this means that substantially only this crushable material in the cavity is subjected to wear, with the result that wear of that particular part of the shoe is essentially eliminated, and the shoe will last much longer.

The particular flattened or convexed construction between the ribs on the faces of the shoes, as shown in FIGS. 3, 4 and 5 is effective to reduce wear. It has been found that an ordinary V groove in the face of an impeller tends to wear deeper and deeper, the groove becoming so deep and of such shape as to tend to bind with the crushable material and impair proper functioning of the crusher. However, with the very wide bottom in the grooves or between the lips, as shown in FIGS. 3 to 5, there is little or no tendency for the grooves to wear into very deep V shape, for the convexed part may wear down and a hollow may be formed in the course of time; this is so whether the bottoms of the grooves be truly flat or convexed outwardly, as shown in the drawings. In any event, it has been found that the life of the impeller shoes

provided with ribs and bottoms or grooves, as shown, has greatly increased the effective life of the removable impeller shoes.

In FIGS. 8 and 9, I have shown a slightly different form of means for detachably holding the impeller shoe 38 in place. Here again, the impeller plate 13 is provided with an angle bracket 35 having an upstanding shoe-backing wall or plate 36. This upstanding plate has preferably a rounded aperture 37 therein to receive a rearwardly projecting anchoring pin 39 secured to and projecting from the rear of the shoe 38. This pin may be cut away, on the radially outwardly facing side, as indicated at 40, so as to leave an overhanging lip or flange 41. Thus, when the pin is projected through the aperture 37 and the shoe 38 moved radially outwardly, the flange or lip 41 will engage behind the plate 36 and securely hold the shoe 38 in place on plate 36 and consequently on the impeller. Here again, as in FIG. 5, the base of a shoe 38 is shown as slightly overlapping and holding in place the central distributing cone 21 heretofore described.

In FIGS. 10 and 11, I have shown improved means for detachably holding breaker plates in the casing. In this embodiment, the casing 5 is provided with a bracket, rod, or bar 42, extending horizontally in the casing. The breaker plate 43 is designed to fit against this bar 42, and the upper end of the body of plate 43 has one or more hooks 44 which engage over the top of the bar 42, so that when the breaker plate 43 is lowered into the casing, each hook 44 will fit the top of the bar 42 and securely hold the breaker plate in place, as will be clear in FIGS. 10 and 11. Removal of the breaker plate from the casing is a relatively easy matter involving a mere lifting operation.

FIG. 12 shows another method for holding a breaker plate in place in the casing. In the particular form shown, the casing 5 carries a bracket 45 projecting therefrom, and the breaker plate 46 has a pair of arms or plates 47—47 extending rearwardly therefrom. The bracket 45 and the arms 47 have coacting pin and aperture means for holding the breaker plate 46 in place. In the particular form illustrated, the bracket carries an upstanding pin 48, and the two arms 47 are apertured as at 49 so that, when the breaker plate 46 is dropped down to the position shown in FIG. 12, the pin 48 engages within the upper aperture 49, thus holding the breaker plate securely in the casing.

If the breaker plate is of the proper design, it may be reversed top over bottom, and what is now the lower hole or aperture 49 may be engaged over the pin 48 for holding the breaker plate in the inverted position. Thus, with a symmetrically formed breaker plate, the installed position may be reversed when wear becomes severe on one side. The breaker plates 17 of FIG. 1 will be seen to be of this general character, being formed with like but oppositely facing concave breaker surfaces 17'—17" to serve with equal efficacy in either of the selectively available mounting positions thereof, as will be understood.

It will be seen that I have provided an improved form of impact crusher having many features facilitating the assembly, replacement and repair of the crusher, and many parts are formed so as to inhibit excessive wear. The replaceable features of impeller shoes and breaker plates have been illustratively described in connection with the first crushing zone, but they will be seen to be equally applicable to corresponding parts of the second crushing zone, it being noted that with the upper breaker plates 17 removed, easy access is had to the lower breaker plates 20 and impeller blades 19, without removing the upper impeller disc 13.

While the invention has been described in considerable detail and preferred forms illustrated, it is to be understood that various changes and modifications may be

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made within the scope of the invention, as defined in the appended claims.

I claim:

1. In an impeller shoe to be secured to an impeller, said shoe having ribs thereon relatively widely spaced apart, the face of said shoe intermediate said ribs presenting surfaces of substantial width extending between spaced apart lower margins of the ribs, said shoe outwardly of said ribs having a cavity therein, the outer wall of said cavity being at an angle so as to hold crushable material in the cavity during centrifugal rotation of the shoe with an impeller, whereby crushable material may flow centrifugally between said ribs on said shoe and over a mass of crushable material in said cavity, whereby only the material in said cavity will be worn by crushable material flowing over the same.

2. In an impact crusher, a casing, a vertical shaft therein, impeller plate means of predetermined diameter mounted on said shaft and rotatable thereby, said plate means having a centrally located recessed seat therein, a distributor member having sloping sides projecting above said plate means and having a lower end portion disposed within said recessed seat, and impeller blade means carried by said impeller plate means, a portion of said impeller blade means projecting laterally outwardly of said distributor member and another portion of said impeller blade means overlapping said distributor member and holding the same in said recessed seat.

3. In an impact crusher, a casing, a vertical shaft therein, an impeller mounted on said shaft and rotatable thereby, a distributor cone at the center of said impeller, said impeller and cone having coating seat means for seating said cone on said impeller, said cone including a peripheral radially extending flange portion, means for detachably securing an impeller shoe on said impeller for impelling crushable material centrifugally outwardly, said means comprising a bracket having an upstanding wall with an aperture therethrough fixed on said impeller in a generally radially extending position, an impeller shoe disposed against said wall and including a finger projecting through said aperture, said aperture being radially outwardly spaced a distance from said peripheral flange of the cone, said impeller shoe having a part extending generally radially inwardly from said finger a distance greater than said predetermined distance and overlapping said distributing cone for holding the latter in place on its seat.

4. In an impact crusher, a generally vertically disposed shaft, a rotatable impeller on said shaft for throwing crushable material centrifugally outwardly from the impeller, said impeller including removably mounted impeller shoes, each impeller shoe including an upstanding generally radially extending face which faces forwardly with respect to a direction of rotation of the impeller, each impeller shoe having generally radially outwardly

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extending grooves of predetermined maximum depth in said face thereof defined by bottom surfaces and generally radially extending ribs presenting side surfaces, opposing side surfaces of said ribs having junctions with a common bottom surface spaced substantially apart, and said bottom surfaces having a transverse width which is substantial as compared with said depth.

5. An impact crusher, as defined in claim 4, wherein said width of said bottom surfaces is greater than said depth.

6. An impeller shoe for assembly in an impeller of the type described, said shoe having an upstanding forward face and inner and outer ends, said shoe including a plurality of grooves of predetermined maximum depth in said face and extending generally between said inner and outer ends and defined by bottom surfaces and elongated ribs extending generally between said ends and presenting side surfaces, opposing side surfaces having junctions with a common bottom surface which are substantially spaced apart from each other, and each of said bottom surfaces having a transverse width substantially at least as great as said depth.

7. An impeller shoe for connection to an upstanding wall of an impeller of the type described, the wall having an aperture therethrough, said shoe including a generally rounded pin having a predetermined maximum diameter secured thereto and projecting substantially perpendicularly rearwardly from a rear surface thereof for extending through said aperture, an outer end portion of said pin having a rounded transverse cross-section having a diameter similar to said predetermined diameter, a portion of said pin inwardly of said outer end portion having a relieved side facing toward an outer end of the shoe, and said outer pin end portion presenting a flange extending laterally of said relieved side and toward the outer end of the shoe for engaging behind said wall when the pin is inserted through said aperture.

References Cited in the file of this patent

UNITED STATES PATENTS

1,636,033	Agnew	July 19, 1927
1,643,048	Bechgaard	Sept. 20, 1927
1,656,756	Payne	Jan. 17, 1928
1,793,097	Kramer	Feb. 17, 1931
1,800,705	Stine	Apr. 14, 1931
1,911,193	Hill	May 30, 1933
2,020,464	Gruender	Nov. 12, 1935
2,237,510	Tankersley	Apr. 8, 1941
2,357,843	Morrisy	Sept. 12, 1944
2,637,502	Bond	May 5, 1953
2,752,098	Adams	June 26, 1956
2,844,331	Adams	July 22, 1958