June 19, 1945. O. C. GRUENDER ET AL 2,378,475

LINER FOR IMPACT MEMBERS

Filed April 2, 1943 3 Sheets-Sheet 1

Fig. 1.

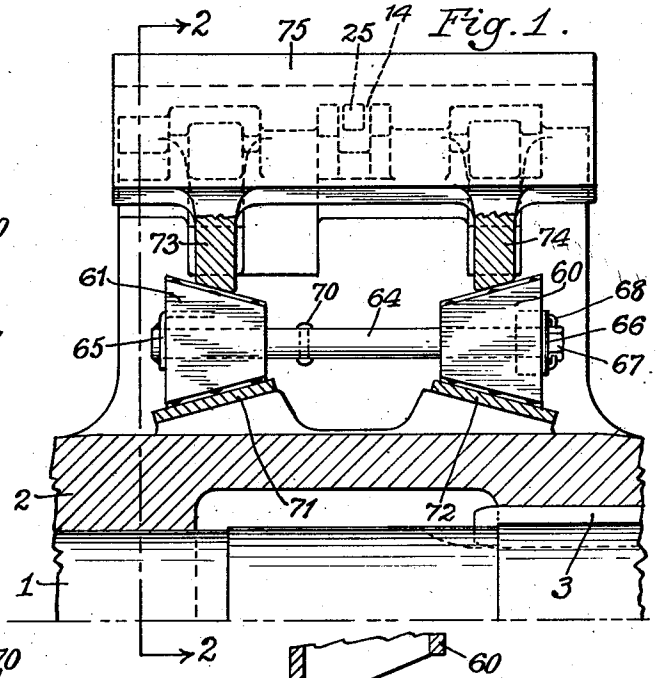


Fig. 5.

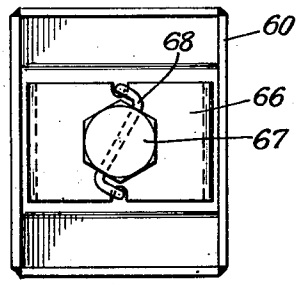


Fig. 3.

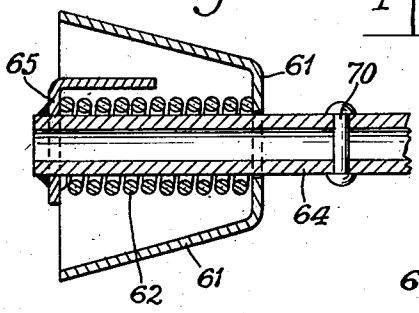


Fig. 4.

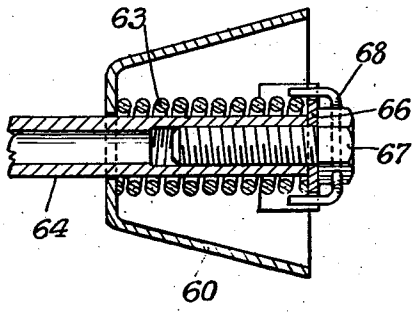
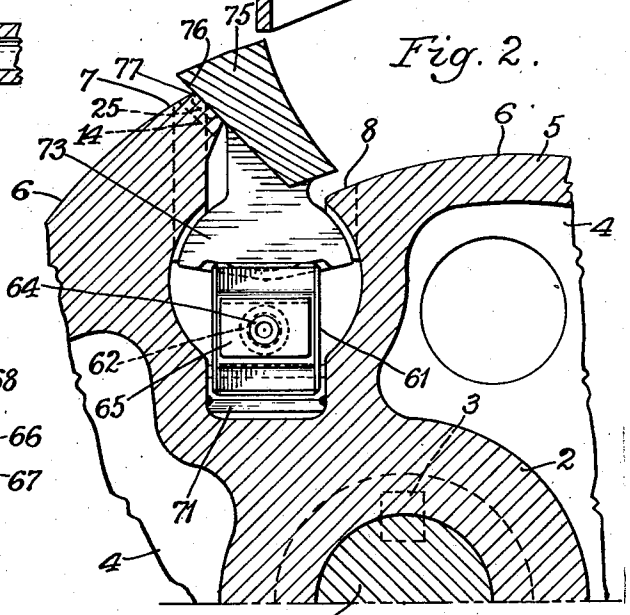


Fig. 2.



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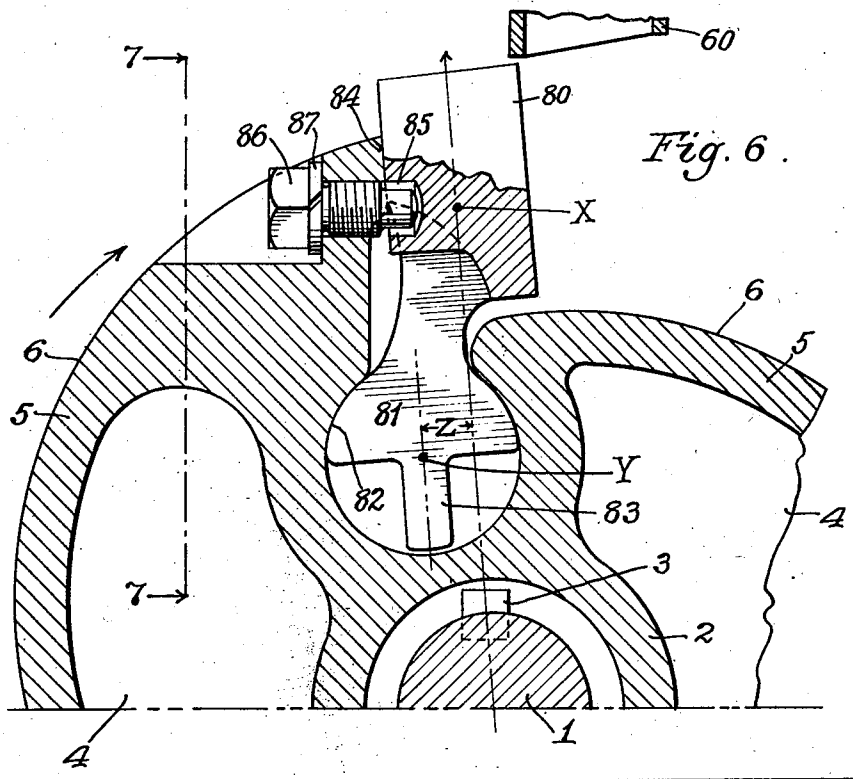


Fig. 6.

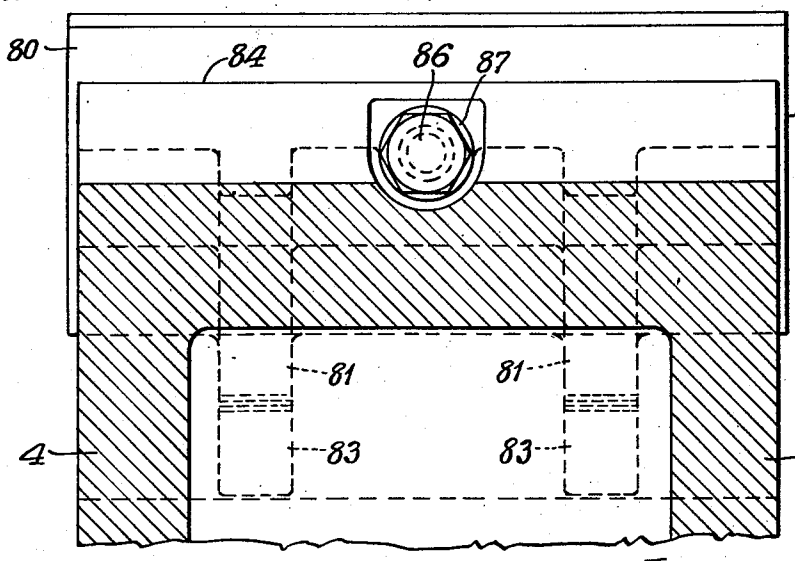


Fig. 7.

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Fig. 8.

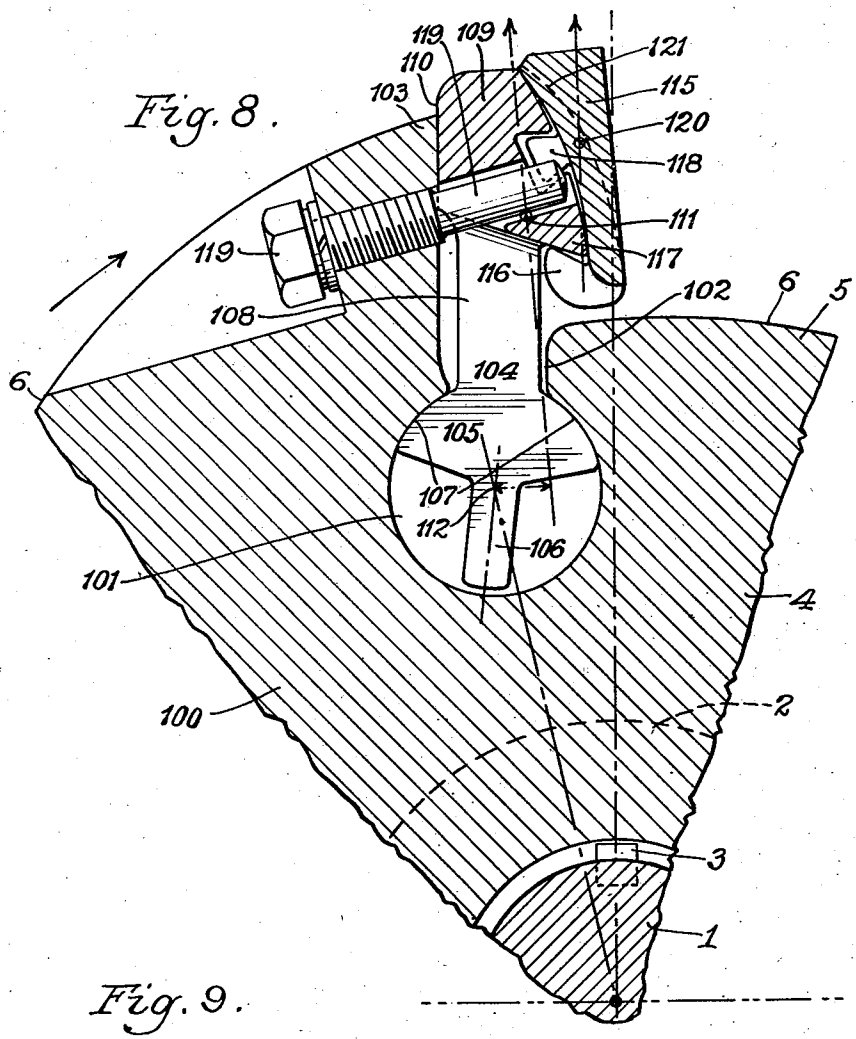
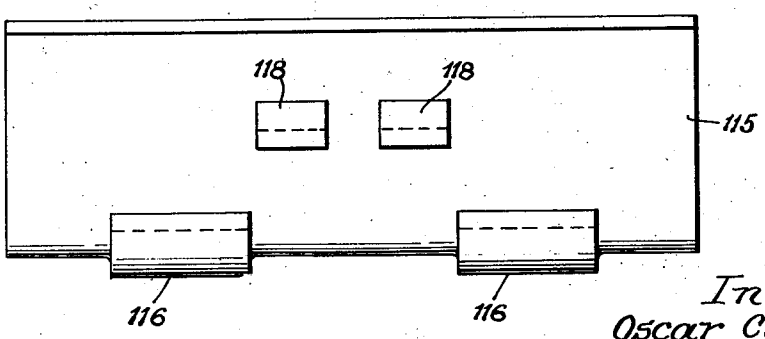


Fig. 9.



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UNITED STATES PATENT OFFICE

2,378,475

LINER FOR IMPACT MEMBERS

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Application April 2, 1943, Serial No. 481,544

13 Claims. (Cl. 241—191)

The invention relates to an improvement in impact crushers and has for one purpose the provision of an improved impact member for the impeller of an impact crusher.

Another purpose is the provision of a removable replaceable impeller member which can readily be applied.

Another purpose is the provision of such a member which is normally held against chattering or choking when the impeller is rotating at speeds insufficient to maintain the centrifugal locking action, as when the impeller is accelerating or decelerating.

Another purpose is the provision of such a member which is centrifugally locked in position.

Another purpose is the provision of chatter preventing means which can readily be released to permit the removal of the impact member from the impeller.

Another purpose is the provision of means for preventing unintended endwise movement of the impact member.

Another purpose is the provision of a combined impact member with a removable wearing part.

Another purpose is the provision of unitary means for securing such a wearing part to the impact member and for preventing unintended movement of the impact member in relation to the impeller.

Other purposes will appear from time to time throughout the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a partial axial section through the impeller of an impact crusher;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 and Figure 4 are axial sections illustrating parts shown in Figures 1 and 2;

Figure 5 is an end view of the structure shown in Figure 4;

Figure 6 is a vertical section perpendicular to the axis of a variant form;

Figure 7 is a section on the line 7—7 of Figure 6;

Fig. 8 is a view similar to Fig. 6 through a further variation of the device.

Fig. 9 is a bottom view of the impact plate shown in Fig. 8.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, and first, to the form of Figures 1 to 5, 1 generally indicates the shaft of the impeller of an impact crusher. It will be realized that any suitable means may be employed for rotating the shaft, the details of which do not form part of the present invention and are not herein shown. 2 is any suitable impeller hub mounted on or keyed to the shaft 1, as by the key 3. 4 indicates any suitable webs extending from the hub 2 and supporting the outer shell or portion 5 of the impeller. It will be observed that the portion or portions 5 have outer more or less spiral surfaces 6, which extend from a portion of maximum diameter 7 to a portion of minimum diameter 8.

Any suitable number of impeller plates may be employed. Where two are employed, as in the present instance, there will be two spiral faces 6, the point of maximum diameter 7 of each being opposed to the point of minimum diameter 8 of the opposite, and being separated therefrom by a space sufficient to permit the endwise insertion of the impeller member.

60, 61 indicate a pair of wedge members which are yieldingly inwardly thrust by coil springs 62, 63, respectively, which extend about opposite ends of a hollow rod 64. 65, 66 are any suitable end abutments.

The abutment of U-shaped plate 66 is removed from the hollow rod 64, and is normally held in position by the headed screw 67, the head of which is prevented from rotating by any suitable means such as the wire or spring clip 68, the ends of which engage notches in the U-shaped plate 66 on the end of the rod 64 opposite to the fixed abutment 65. The plate cannot rotate, and the screw cannot rotate, as long as the clip or wire engages the notches. The bolt 70 prevents the wedge 61 from sliding off the rod 64 when the wedge 60 is removed.

It will be observed that the wedges 60, 61 are inwardly thrust along appropriate cam surfaces 71, 72, their upper faces engaging appropriately inclined surfaces of the lugs 73, 74. The device can readily be removed by releasing the screw 67 and the abutment 66, withdrawing the wedge 60 and moving the rest of the unit toward the left referring to the position of the parts as shown in Fig. 1. It will be observed also that an impact plate proper 75 includes an inclined rear surface 76, engaging one or more appropriately formed surfaces 77. A stop or lug 25 is employed, if desired, to prevent endwise movement of the parts, as in the form of Figs. 1 and following.

Referring to the form of Figs. 6 and 7, the

formation of the rotor is generally the same as in the other figures. However, the impact plate **80** is provided with inner or securing portions at **81**, having a generally semi-cylindrical face **82** and downwardly extending flanges **83**. The rear face of the plate **80** engages the rotor, as at **84**. The center of mass of the plate is indicated as at X in Fig. 6. The plate is rearwardly apertured, as at **85**, to receive the inwardly projecting end of the screw **86**. When the device is in use, with the plate in the position in which it is shown in Fig. 6, which it centrifugally takes, any undesired endwise movement of the plate is impossible. The inwardly projecting end of the screw **86** is within the aperture **85** and any endwise slippage is impossible.

It will be observed that the desired projections **83** have a perceptible clearance between their lower edges and the bottom of the cylindrical aperture in the rotor. Thus the plate can readily be moved laterally out of the cylindrical opening when desired. The plate unit can be slid in endwise into the cylindrical aperture. The cap screw **86** is then screwed down tightly against any suitable spring lock washer **87**, after the impact plate has been inserted and is in its normal position. As the impeller moves the impact plate is thrust outward by centrifugal force, owing to the location of the center of mass at X. This point is approximately on a radial line drawn through the axis of the impeller. The center of the cylindrical portion of the impact plate is located at Y, a point which lies at one side of the radial line at a distance Z therefrom. It is clear, therefore, that centrifugal force will tend to rotate the impact plate counterclockwise, referring to the position of the parts indicated in Fig. 6, thereby holding it in closed contact with the surface of the impeller and taking the shock of impact of the particles struck by the impact plate. It is impossible to move the impact plate laterally owing to the action of the cap screw **86**. The cap screw extends outwardly in the direction of rotation a sufficient distance so that the impact plate itself cannot be removed, even while the impeller is stationary.

It will be understood that in the use of the device, any suitable means may be employed for feeding the material to be crushed into the path of movement of the impeller members. Illustrated, for example, is a vertical chute **60**, down which the material to be crushed may be dropped by gravity. It will be understood that the impeller is rotated at sufficient speed and is of sufficient size and mass to exercise a crushing impact against the particles dropped in the path of movement of the impeller **75**, **80** or **115**.

Referring to the form of Figs. 8 and 9, the rotor **100** is provided with cylindrical apertures **101** parallel with the rotor axis, with openings **102** to the exterior of the impeller. The impeller at one side of the aperture **102** is outwardly extended, as at **103**. **104** generally indicates an impact plate holder having a portion **105** penetrating the aperture **101**, and a lower radial fin or rib **106**. The portion **105** has cylindrical surfaces **107** opposed to the surface of the aperture **101**. The holder arm **108** terminates in a head **109**, having a rear face **110** abutting against the opposite face of the extension **103** of the impeller. It will be observed that the center of mass **111** of the holding element **109** and the impact plate secured thereto is so located in relation to the center **112** of the aperture **101** that centrifugal force will urge the head **109** against the extension **103** of the impeller at all times when the impeller is in rotation, and will hold the parts in the position shown in Fig. 8.

It is desirable to provide a removable wear plate or impact plate, such as is indicated as at **115**. It is shown with a pair of hooks or rearwardly and upwardly extending lugs **116**, located at the lower edge thereof. These hooks extend about a toe **117** along the lower front edge of the head **109**. Extending rearwardly from the plate **115** are a pair of lugs **118**, between which extends the ends of the securing screw **119**, which passes through the extension **103** of the impact member. It will be observed that the head **109** is apertured to permit its passage and that the screw **119** performs the double function of preventing endwise movement of the impact plate holder **109** in relation to the impeller, and of preventing endwise movement of the impact plate **115** in relation to the holder head **109**.

It will be realized that whereas a practical and operative device is described and illustrated, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of the invention. It is therefore wished that the description and drawings be taken as in a broad sense illustrative or diagrammatic rather than as a limitation to the precise showing.

The use and operation of the invention are as follows:

In impact crushers in which the articles are fed into the path of movement of the impact members of an impeller, there is a substantial and continuing wear. It is, therefore, important to be able to remove the worn impact member. It is also important to provide a member of such form as to provide a maximum period of wear before renewal becomes necessary.

An impact member is provided, including a substantial bar or mass of metal **75** or **80**. Manganese steel, for example, or any equivalent material may be employed. The wearing surface, which may initially, for example, be generally radial, is worn back progressively until finally so much of the bar is worn that replacement is necessary. It will be observed that the major part of the mass of the impact member herein shown is in the bar itself, and the attaching lugs **73**, **74**, **81**, **105** are relatively small in mass in relation to the mass of the bar as a whole. Also, no matter how far worn down the bar becomes, there is still sufficient mass and sufficient leverage so that the centrifugal effect of the rotation of the impeller keeps the impact member locked in position, with the locking lug **25** penetrating the aperture **14**.

In the form of Figs. 6 and 7, the cap screw **86** is always effective to prevent lateral movement or endwise removal of the impact plate even when the rotor is at rest.

The operation of the form of Figs. 8 and 9 differs in that a separate removable wear-taking member **115** is employed. Screw **119** forms a unitary securing means for preventing unintended transverse movement of the member **115** in relation to the member **109** and of the member **109** in relation to the impeller.

In the claims as a matter of convenience we refer to the portion of the socket which is closest to the axis of the impeller as the bottom of the socket, and the portion of the socket which is closest to the periphery of the impeller as the top of the socket; also the edge of the member

109 which is nearest the axis of the impeller is spoken of as the bottom edge.

Where the term upper or outer is employed in the claims, as opposed to inner, it will be understood that the factor involved is the relative radial distance from the axis of the impeller.

We claim:

1. In combination, in an impact crusher, an impeller, and means for rotating it, said impeller having an axially extending socket open at its ends and bounded by spaced overhanging walls which define a space which decreases outwardly in width between such walls, an impact member including an axially extending bar located exteriorly to the impeller, a plurality of lugs extending inwardly from the bar and having faces conforming to the opposed faces of said overhanging walls and normally centrifugally thrust into contact therewith, and additional means for urging said lugs against the opposed faces of the overhanging walls, including a pair of wedges having their ends of minimum diameter opposed, and means for thrusting said wedges inwardly toward each other between the bottom of said socket and the lower edges of said lugs.

2. In combination, in an impact crusher, an impeller, and means for rotating it, said impeller having an axially extending socket open at its ends and bounded by spaced overhanging walls which define a space which decreases outwardly in width between such walls, an impact member including an axially extending bar located exteriorly to the impeller, a plurality of lugs extending inwardly from the bar and having faces conforming to the opposed faces of said overhanging walls and normally centrifugally thrust into contact therewith, and additional means for urging said lugs against the opposed faces of the overhanging walls, including a pair of wedges having their ends of minimum diameter opposed, and means for thrusting said wedges inwardly toward each other between the bottom of said socket and the lower edges of said lugs, including a guiding element upon which both of said wedges are movably positioned, an abutment means at each end of said guiding element and yielding means interposed between each abutment means and one of said wedges.

3. In combination, in an impact crusher, an impeller, and means for rotating it, said impeller having an axially extending socket open at its ends and bounded by spaced overhanging walls which define a space which decreases outwardly in width between such walls, an impact member including an axially extending bar located exteriorly to the impeller, a plurality of lugs extending inwardly from the bar and having faces conforming to the opposed faces of said overhanging walls and normally centrifugally thrust into contact therewith, and additional means for urging said lugs against the opposed faces of the overhanging walls, including a pair of wedges having their ends of minimum diameter opposed, and means for thrusting said wedges inwardly toward each other between the bottom of said socket and the lower edges of said lugs, including a guiding element upon which both of said wedges are movably positioned, an abutment means at each end of said guiding element and yielding means interposed between each abutment means and one of said wedges, the abutment means at one end of said guiding means being removable.

4. In combination, in an impact crusher, an impeller, and means for rotating it, said impeller having an axially extending socket open at its ends and bounded by spaced overhanging walls which define a space which decreases outwardly in width between such walls, an impact member including an axially extending bar located exteriorly to the impeller, a plurality of lugs extending inwardly from the bar and having faces conforming to the opposed faces of said overhanging walls and normally centrifugally thrust into contact therewith, and additional means for urging said lugs against the opposed faces of the overhanging walls, including a pair of wedges interposed between the bottom of the socket and the outer edges of said lugs, and yielding means tending normally to urge said wedges inwardly toward each other, the bottom of said socket having portions opposed to said wedges and outwardly inclined toward the ends of the socket.

5. In combination, in an impact crusher, an impeller, and means for rotating it, said impeller having a plurality of axially extending sockets adjacent its periphery open at least at one end and bounded by spaced overhanging walls which define a longitudinally extending communicating aperture between said sockets and the exterior of the impeller, the outer edge of one of said walls being more distant radially from the axis of rotation of the impeller than the other, the sockets being formed with a generally cylindrical surface, and an impact member, including an axially extending bar having an impact face at one side and an impeller engaging portion at the other side, the latter being opposed to the wall of greater radial extension, the bar having a lug radially inwardly extending therefrom, the lug having partially cylindrical faces conforming to the opposed cylindrical face of the socket, said bar being normally centrifugally outwardly urged during the rotation of the impeller with said lug engaging outer portions of the socket, said bar having one or more inwardly extending portions adapted closely to approach the portion of the socket closest the axis of rotation of the impeller, whereby substantial gravital inward movement of the bars is prevented when the impeller is at rest.

6. In combination, in an impact crusher, an impeller and means for rotating it, said impeller having a plurality of sockets adjacent its periphery extending in parallelism with the axis of the impeller, each said socket being partially open at its outer side, a carrier for each socket including a portion extending through said open side of the socket and having an inner holding element of greater width than the width of the aperture connecting the side of the socket with the exterior of the impeller, the carrier having a face portion located exteriorly to the impeller, and having an undercut lower edge, an impact plate adapted to engage such face portion, and having one or more toes hooked outwardly about said undercut lower edge, and a locking connection with the plate, said locking connection including a flange extending rearwardly from the rear face of the impact plate, and unitary means for securing the carrier in relation to the impeller and for securing the plate in relation to the carrier, including a locking member removably mounted on the impeller and including a portion extending through the carrier and into alignment with said flange or flanges on the plate.

7. In combination, in an impact crusher, an impeller and means for rotating it, said impeller having an axially extending aperture adjacent

the periphery thereof, and an opening extending radially therefrom to the exterior of the impeller, of substantially less breadth in a plane perpendicular to the axis of the impeller, an impact member including a portion of maximum size and a portion of lesser size extending outwardly through the said opening, said opening being bounded by walls, formed in the impeller, of unequal radial extension, said impact member including a portion adapted to abut against the wall of greater radial extension, and a securing member removably mounted on the impeller and extending through said wall into the impact member, the impact member being apertured to receive it, and a wear taking member removably mounted on the opposite face of the impact member, and having a portion in securing engagement with said securing member.

8. In combination, in an impact crusher, an impeller and means for rotating it, an impact member movably mounted on said impeller, a pivotal connection between said impact member and said impeller adapted to permit a limited relative rotation of the impact member in relation to the impeller about an axis generally parallel with but radially spaced from the axis of rotation of the impeller, said impeller and impact member having opposed abutting portions located radially outwardly from the axis of said pivotal connection and positioned forwardly thereof, in the direction of rotation of the impeller whereby in response to centrifugal force, the outer portion of the impact member is urged against the opposed outer portion of the impeller in response to centrifugal force, and a replaceable wear-taking member mounted on the impact member and means adapted to maintain it in contact with the forward face of the impact member in response to rotation of the impeller including opposed cam portions on the impact member and the wear taking member.

9. In combination, in an impact crusher, an impeller and means for rotating it, an impact member on said impeller, a pivotal connection between said impact member and said impeller adapted to permit a limited relative rotation of the impact member in relation to the impeller about an axis generally parallel with but radially spaced from the axis of rotation of the impeller, said impeller and impact member having opposed abutting portions located radially outwardly from the axis of said pivotal connection and positioned forwardly thereof, in the direction of rotation of the impeller whereby, in response to centrifugal force, the outer portion of the impact member is urged against the opposed outer portion of the impeller in response to centrifugal force, and a replaceable wear-taking taking member mounted on the impact member and means adapted to maintain it in contact with the forward face of the impact member in response to rotation of the impeller, including a pivotal connection between an inner portion of the replaceable wear-taking member and the impact member, the center of mass of the replaceable weak-taking member being located forwardly of said pivotal connection, in the direction of movement of the impeller.

10. In combination, in an impact crusher, a rotor having generally cylindrical apertures with wall portions generally parallel with the axis of the rotor, said apertures being outwardly broken away, and impact members, each including an impact plate holder having a partially cylindrical portion extending into one of said apertures and a portion extending outwardly through the outwardly broken away portion of the aperture, and in direct contact with the advancing face of said outwardly broken away portion, in relation to the direction of rotation of the rotor, and an impact plate removably secured to said holder, and unitary means for preventing unintended movement of the plate holder in relation to the rotor, and of the impact plate in relation to the holder, along directions parallel with the axis of rotation of the rotor.

11. In combination, in an impact crushes, a rotor having generally cylindrical apertures with wall portions generally parallel with the axis of the rotor, said apertures being outwardly broken away, and impact members, each including an impact plate holder having a partially cylindrical portion extending into one of said apertures and a portion extending outwardly through the outwardly broken away portion of the aperture, and in direct contact with the advancing face of said outwardly broken away portion, in relation to the direction of rotation of the rotor, and an impact plate removably secured to said holder, and unitary means for preventing unintended movement of the plate holder in relation to the rotor, and of the impact plate, in relation to the holder, along directions parallel with the axis of rotation of the rotor, including a locking member extending through a peripheral portion of the rotor and through the impact plate holder, and into alignment with a portion of the impact plate.

12. In combination, in an impact crusher, an impeller and means for rotating it, an impact carrier movably mounted on said impeller for limited rotation about an axis of rotation parallel with the axis of rotation of said impeller, an impact plate removably mounted on said carrier, and integral locking means on said impeller including portions penetrating said impeller, said carrier and said plate.

13. In combination, in an impact crusher, an impeller and means for rotating it, an impact carrier mounted on said impeller for limited rotation about an axis generally parallel with but radially spaced from the axis of rotation of said impeller, an impact plate removably mounted on said carrier, and integral locking means on said impeller including portions penetrating said impeller, said carrier and said plate, said locking means being adapted to prevent relative movement of the carrier in relation to the impeller and of the plate in relation to the carrier, along a direction parallel with the axis of the impeller.

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