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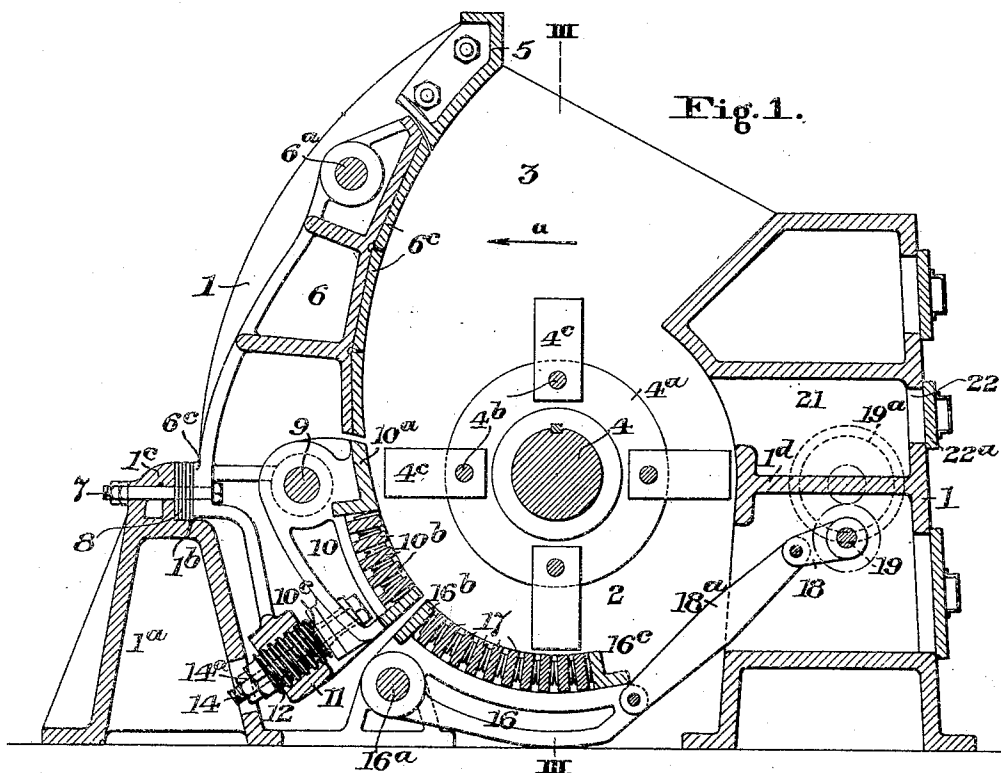
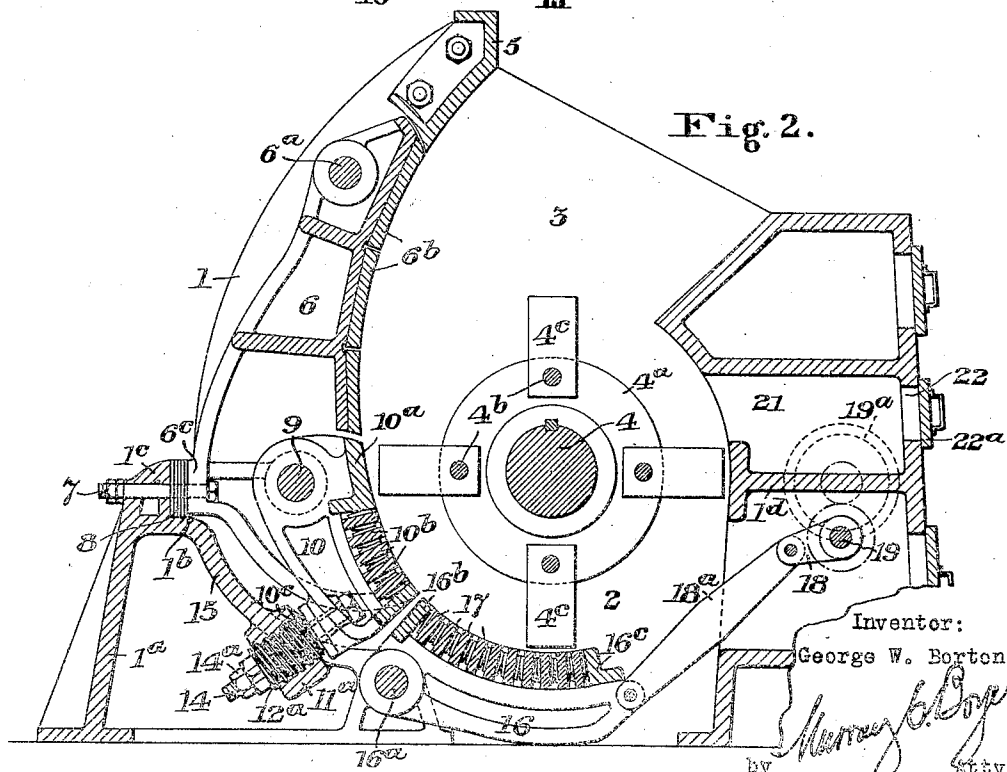
G. W. BORTON

1,872,233

HAMMER CRUSHER

Filed March 21, 1930

2 Sheets-Sheet 1



Inventor:
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by

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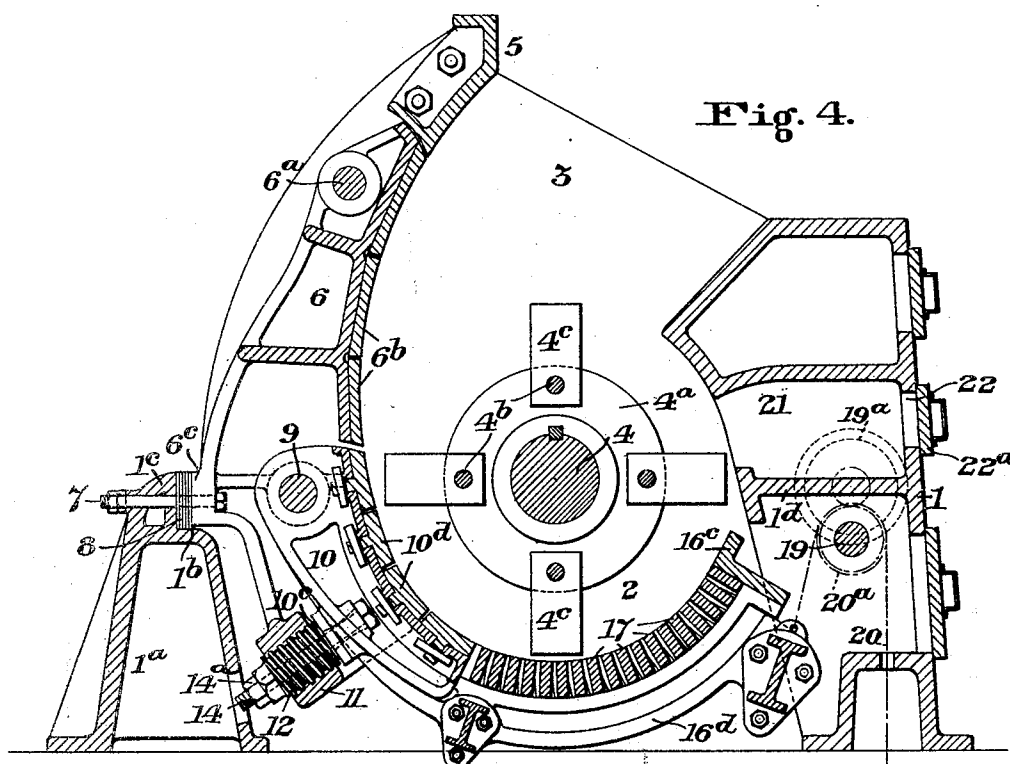
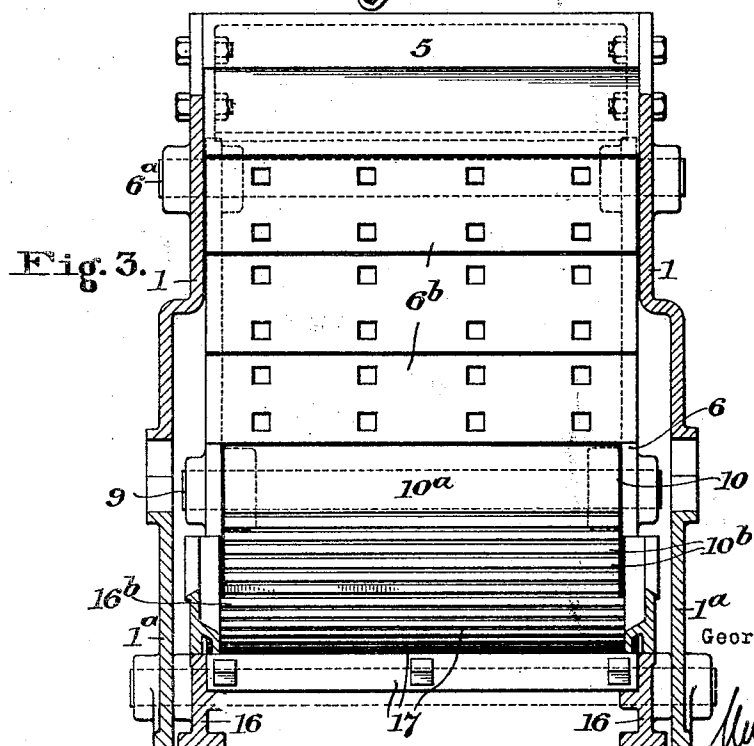
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HAMMER CRUSHER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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HAMMER CRUSHER

Application filed March 21, 1930. Serial No. 437,921.

My invention relates to crushing apparatus of the hammer mill type, comprising a frame enclosing a hopper and a crushing chamber disposed below the same; a hammer-carrying rotor movable within said crushing chamber, and a cage including screen bars through which the crushed material is discharged.

One object of my invention is to provide a structure of this type with a breaker plate pivotally hung from a point near the top of the hopper receiving the material to be crushed.

A further object of my invention is to provide a resilient backing or cushion for the high hung breaker plate designed to take the shock of the crushing operation and serving to prevent damage should uncrushable material in the form of "tramp iron" or the like be encountered.

A further object of my invention is to associate a sub-breaker plate with the main high hung breaker plate; such sub-breaker plate being pivotally connected to or hung from the main breaker plate at a point below the pivotal connection of the latter with the frame of the crusher. The support for the sub-breaker plate may be substantially opposite the axis of the rotor structure and in the same plane.

A further object of my invention is to provide means whereby the high hung breaker plate with the sub-breaker plate may be adjusted toward and from the path of the hammers carried by the rotor structure.

A further object of my invention is to provide means, which in some instances may be carried by the frame of the high hung breaker plate, whereby the sub-breaker plate may be independently adjusted toward and from the hammer circle and with respect to the high hung breaker plate which normally occupies a substantially fixed position.

A further object of my invention is to provide a short cage for supporting the screen bars through which the crushed material may be discharged; such cage being pivotally mounted whereby the cooperating screen bars may be adjusted with respect to the path of the hammers carried by the rotor structure.

A further object of my invention is to provide a construction whereby the cage supporting the screen bars may be hung from the rod or shaft supporting the sub-breaker plate.

And a still further object is to provide a structure of massive proportions, simple in design and mode of operation, and capable of performing its work; such structure being at the same time of a character that may be readily assembled and dismantled and/or adjusted when repairs or changes in the position of the working parts are desired.

These and other features of my invention are more fully described hereinafter; reference being had to the accompanying drawings, more or less diagrammatic in character, in which:

Figure 1 is a sectional elevation of one form of hammer crusher within the scope of my present invention.

Fig. 2 is a similar view illustrating modified details of construction within the scope of my invention.

Fig. 3 is a sectional elevation taken on the line III—III, Fig. 1, looking in the direction of the arrow *a* but omitting the rotor structure, and

Fig. 4 is a view similar to Figs. 1 and 2 illustrating further modifications within the scope of my invention.

In the drawings, 1 represents a portion of the frame of the crushing structure, having a suitable base 1^a. The frame and base include and provide a crushing chamber 2 and a hopper 3 initially receiving the material to be crushed. Within the crushing chamber a rotor structure of usual type may be mounted; substantially similar to structures found in a number of my pending applications. In the present instance the rotor structure may comprise a shaft 4, suitably journaled at the sides of the machine and carrying disks 4^a, supporting rods 4^b, from which hammers 4^c are hung.

The side portions of the frame at one end of the structure (to the left in the present drawings) may be connected by a cross member 5 which also constitutes the upper edge or rim of the hopper. Between the side mem-

bers of the frame and below the cross member 5, a breaker plate 6 is disposed; such breaker plate being preferably hung from a cross rod or shaft 6^a, whose ends may be
 5 mounted or journaled in said side members near the top of the same and preferably just below the connecting cross member 5. The breaker plate 6 may be faced with renewable wear members 6^b.

10 In the construction shown in Fig. 1, the breaker plate 6 is provided with a rear flange 6^c, which may rest upon a ledge 1^b of the base and be connected thereto by a bolt (or bolts) 7. In the present instance, this portion of
 15 the base is provided with a shoulder 1^c and cushioning means, which may be in the form of rubber plates 8, may be interposed between said shoulder 1^c and the back flange 6^c, and such rubber plates may be mounted upon and
 20 held in place by said bolt (or bolts) 7.

With the main or high hung breaker plate I have associated a sub-breaker plate which may be pivotally hung from a rod or shaft
 25 9, supported by the main breaker plate. This sub-breaker plate, indicated at 10, may include a wear surface 10^a adjacent the main breaker plate and substantially continuous with the wear members of the same and fol-
 30 lowing their curvature. It may also carry a series of removably mounted bars 10^b for co-operation with the hammers 4^c of the rotor structure. In some instances the bars 10^b may be omitted and imperforate liners substituted therefor.

35 This sub-breaker plate is mounted for adjustment with respect to the main or high hung breaker plate, and for this purpose I may provide the lower portion of the back flange 6^c of the main or high hung breaker
 40 plate with one or more enlarged portions 11, internally threaded and serving as nuts to receive screws 12; the ends of said screws being recessed and forming seats for the reception of rounded bosses 10^c carried by the
 45 sub-breaker plate. If desired the relation of these engaging parts may be reversed. In addition, the screw (or screws) 12 and the sub-breaker plate may be connected together; a bolt (or bolts) 14 being passed through
 50 these parts for such purpose.

The main or high hung breaker plate may be adjusted toward and from the hammer circle by employing a greater or less number of the rubber plates or shims 8, between
 55 the back flange 6^c and the shoulder 1^c of the base frame. The sub-breaker plate is adjustable toward and from the hammer circle by actuating the screw (or screws) 12. When this latter adjustment has been effected the
 60 parts may be maintained in their adjusted positions by locking the bolt (or bolts) 14 by the nuts 14^a.

In the arrangement illustrated in Fig. 2, which is substantially like that shown in Fig.
 65 1, the sub-breaker plate is also supported by

the main breaker plate, and is adjustable with respect thereto. In this arrangement, however, the threaded portions 11^a providing
 70 nuts receiving the adjusting screws 12^a are carried by a cross member 15 connecting the sides of the base frame. The sub-breaker plate shown in Fig. 2 may be adjusted independently of the main or high hung breaker
 75 plate, or the latter may be adjusted also at the same time; swinging on the cross shaft 6^a. If such adjustment of the main breaker plate is effected, it will necessitate the placement of additional elastic plates or shims 8
 80 between the back flange 6^c thereof and the shoulder 1^b of the base frame. In other respects, the construction illustrated in Fig. 2, is substantially like that illustrated in Fig. 1.

A cage or screen substantially of the type usually employed with hammer crushers of this general type is disposed at the bottom
 85 of the crushing chamber below the rotor structure. In the present instance it is shown as slightly shorter than usual and may comprise side members 13 supporting a series of
 90 grate bars 17 of suitable type. The side members may be pivotally hung from or supported by a shaft 16^a suitably mounted in the sides of the base frame 1^a and they may be connected together at their opposite ends
 95 by cross members 16^b and 16^c, between which the bars 17 are disposed. To effect adjustment of the cage made of such side members and the bars 17 with respect to the path of
 100 the hammers, the end of said cage adjacent the cross-bar 16^c may be connected to suitable motion imparting means, such as crank
 105 arms 18 carried by a shaft 19, by means of links 18^a; suitable gearing under the control of a hand wheel 19^a being operatively connected to said shaft 19. Such adjustment of
 110 the cage or screen is desirable to compensate for wear on the grate bars 17 and the ends of the hammers 4^c.

The construction illustrated in Fig. 4, is substantially like that shown in Fig. 1, in
 115 that the sub-breaker plate is supported by the main or high hung breaker plate and is adjustable with respect thereto. In this arrangement, however, the side members 16^d
 120 supporting the grate bars 17 are extended in length so as to be hung from the rod or shaft 9 supporting the sub-breaker plate. The opposite ends of these side members 16^d may be connected together by a cross member
 125 16^e. As the form of cage illustrated in Fig. 3 provides a greater number of grate bars than the form illustrated in Figs. 1 and 2; the sub-breaker plate may omit the bars 10^b and may be faced with wear members, as indicated at 10^d. In this construction the cage or screen may be adjusted by
 130 a chain 20, passing over a sprocket wheel 20^a, carried by the shaft 19; suitable gearing under the control of a hand wheel 19^a being operatively connected to said sprocket wheel.

It will be understood, of course, that while the main or high hung breaker plate is maintained substantially in a fixed position during the crushing operation, it is pivotally hung from the cross shaft 6^a and is capable of adjustment toward and from the hammer circle, either by adding to or removing the resilient plates or shims 8, and that in the form illustrated in Fig. 2, adjustment of said main breaker plate may be effected by movement of the screws 12^a in operative engagement with the sub-breaker plate structure 10. In all instances when the main breaker plate is adjusted toward the path of the hammers, it will be necessary to insert additional elastic or resilient plates or shims 8. These plates may be of rubber and they serve to materially reduce the shock of the crushing action.

When the hammers are unduly worn fresh hammers may be provided, and adjustment of the main and sub-breaker plates, as well as adjustment of the cage or screen is designed to take care of the initial wear on the hammer ends, as well as wear that may be occasioned upon the surface of said high hung breaker plate, or the bars of the sub-breaker plate, or those of the cage or screen.

The wear plates 6^b, which may be secured to the main breaker plate in any appropriate manner, as well as those shown at 10^a, Fig. 4, are renewable when worn and their surface contour is preferably curved to meet the arc of the cage or screen forming the lower portion of the crushing chamber.

A tramp iron pocket may be arranged at the side or end of the machine opposite the main breaker plate, just beyond the discharge end of the cage or screen; the frame being recessed at 21 for the purpose and a cross member 1^a of the frame providing a shelf upon which such tramp iron may be delivered. An opening 22 leading to the tramp iron pocket may be closed by a door 22^a.

In some instances it may be desirable to omit the bars 17 of the cage or screen and arrange a breaker plate at the far end of the crushing chamber, (to the right of the structures illustrated in Figs. 1, 2 and 4), against which the material being crushed may be hurled by the hammers; the force of such action continuing the breaking effect and insuring the reduction of the material being treated to the desired extent.

There are many friable materials of a particularly abrasive character; various siliceous rocks which fracture readily under impact but have a highly abradent effect upon the breaking surfaces of crushing apparatus, and require renewal of such breaking surfaces at more frequent intervals than material that is harder to crush. My improved apparatus is especially applicable to the crushing of material of this kind inasmuch

as the parts subject to wear may be readily adjusted to compensate for such wear and easily renewed when unduly worn.

It will be evident from the foregoing description that simple and efficient means have been provided for accomplishing the objects of the invention, and while the structures shown and described are well adapted to serve the purposes for which they are intended, it is to be understood that the invention is not limited to the precise construction set forth, but includes such changes and modifications as may be made within the scope of the appended claims.

I claim:

1. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a breaker plate forming one wall of the crushing chamber and pivotally supported in the upper portion of the frame well above the hammer circle, means for adjusting said breaker plate toward and from the same, and a resilient backing for said breaker plate comprising a plurality of rubber plates detachably supported behind said breaker plate.

2. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, and a sub-breaker plate pivotally hung from the main breaker plate.

3. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, and an adjustable sub-breaker plate pivotally hung from the main breaker plate on an axis substantially in the axial plane of the rotor structure.

4. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate, and means for adjusting said sub-breaker plate with respect to the main breaker plate.

5. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate and having an active face following the curve of the main breaker plate, and means for adjusting said sub-breaker

plate with respect to the main breaker plate.

6. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate, means for adjusting the main breaker plate, and independent means for adjusting said sub-breaker plate.

7. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate, and adjusting means carried by the main breaker plate for effecting movement of said sub-breaker plate with respect to the main breaker plate.

8. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, means for adjusting said main breaker plate toward and from the hammer circle, a sub-breaker plate pivotally hung from the main breaker plate, and means for effecting adjustment of the sub-breaker plate with respect to said main breaker plate.

9. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, means for adjusting said main breaker plate toward and from the hammer circle, a sub-breaker plate pivotally hung from the main breaker plate, and means carried by the main breaker plate for effecting adjustment of the sub-breaker plate with respect thereto.

10. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate, adjusting screws for effecting adjustment of said sub-breaker plate with respect to the main breaker plate, and means for locking such adjusting screws.

11. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a main breaker plate pivotally supported in the upper portion of the frame and forming one wall of the crushing chamber, a sub-breaker plate pivotally hung from the main breaker plate, adjusting screws carried

by the lower portion of the main breaker plate for effecting adjustment of said sub-breaker plate with respect to the main breaker plate, and means for locking such adjusting screws.

12. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a cage having cross bars disposed below the rotor structure, a main breaker plate pivotally supported in the upper part of the frame and extending below the axial plane of the rotor structure and forming one wall of the crushing chamber, and a sub-breaker plate pivotally connected to said main breaker plate and disposed between the same and the bars of said cage.

13. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a pivotally mounted cage having cross bars disposed below the rotor structure, a main breaker plate pivotally supported in the upper part of the frame and extending below the axial plane of the rotor structure and forming one wall of the crushing chamber, and a sub-breaker plate pivotally connected to said main breaker plate and disposed between the same and the bars of said cage.

14. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a cage having cross bars disposed below the rotor structure, a breaker plate pivotally supported in the upper part of the frame and forming one wall of the crushing chamber; said plate extending below the axial plane of the rotor structure, a sub-breaker plate pivotally connected to the main breaker plate and disposed between the same and the bars of said cage, and means carried by the main breaker plate for adjusting said sub-breaker plate with respect thereto.

15. In a hammer crusher, the combination of a frame providing a crushing chamber, a rotor structure carrying hammers mounted therein, a pivotally mounted cage having cross bars disposed below the rotor structure, a breaker plate pivotally supported in the upper part of the frame and forming one wall of the crushing chamber; said plate extending below the axial plane of the rotor structure, a sub-breaker plate pivotally connected to the main breaker plate and disposed between the same and the bars of said cage, and means carried by the main breaker plate for adjusting said sub-breaker plate with respect thereto.

In witness whereof I have signed this specification:

GEORGE W. BORTON.

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