

UNITED STATES PATENT OFFICE

GEORGE W. BORTON, OF NEW LISBON, NEW JERSEY, ASSIGNOR TO PENNSYLVANIA CRUSHER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

HAMMER CRUSHER

Original application filed August 25, 1928, Serial No. 302,080. Divided and this application filed June 6, 1929. Serial No. 368,820.

My invention relates to crushing structures of the character or type known as hammer mills, that is to say structures which involve a supporting base, a suitable housing or frame mounted thereon and enclosing a chamber receiving the material to be crushed and including a cage or screen made up of suitable grate bars, a breaker plate (or plates), and a rotor structure carrying a series of hammers designed to act upon the material to be crushed. The machine is of massive and rigid construction and is designed to receive what is known as "steam shovel feed" or the contents of a quarry car, which may be delivered directly into the hopper leading to the crushing zone.

My present improvements have been applied to a structure of the type set forth in my pending application filed August 25, 1928, Serial No. 302,080, wherein I have described a machine highly efficient for the crushing of material by what may be termed up-running hammers, that is to say, hammers which pass upwardly between grid bars located in the feed chute or hopper and which serve as temporary supporting means for the material operated upon. These hammers in their up-running action tend to lift the larger pieces of material in addition to the incremental breaking or crushing action imparted thereto; thereby agitating material of mixed sizes, avoiding packing of the feed and insuring proper reduction of the material temporarily supported by the grid bars for passage through the latter, substantially by gravity, into the path of the down-running hammers for further reduction in cooperation with the bars of the cage or screen.

An important feature of my improved crushing structure resides in the upper part of the chamber comprising the feed chute or hopper into which the material to be crushed is dumped; one wall of the same being in the form of a heavy, reinforced plate, preferably curved and partially overhanging the hopper, which wall or plate may be pivotally connected to the frame or housing.

One object of my invention is to provide means whereby the material to be crushed may be retarded in its movement through the

hopper and temporarily supported in a position to be engaged by the hammers of the rotor structure in their uprunning or overhead movement, and for this purpose I provide a series of grid bars projecting into the hopper space and which may extend part way or entirely across the path of the feed and lying over the rotor structure; the hammers of such rotor structure passing between said bars and initially engaging such material before it passes to the main crushing zone.

A further object of my invention is to provide the pivotally mounted breaker wall of the hopper with rounded projections carried by a wear plate member (or members) which may be pivotally mounted in said pivotally mounted wall for cooperative association with and arranged to be projected toward the grid bars, with means for holding said pivotally hung wear plate member (or members) in their adjusted positions.

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

Figure 1 is a sectional elevation more or less diagrammatic, illustrating a form of hammer crusher mechanism within the scope of my invention, and

Fig. 2 is a sectional plan view of a portion of the structure shown in Fig. 3 taken on the line II—II.

Like the structure of my pending application above referred to, my present structure comprises a base 1, supporting a frame or housing, indicated generally at 1^a, which may be made of structural metal and/or heavy cast parts suitably secured together and supporting the various elements making up the crushing structure, and more fully referred to hereinafter.

A screen or cage 2, which may be made up of arcuate side members 3, supporting a series of bars 4, is disposed in the base portion of the structure; such screen as a whole being pivotally supported on a shaft 5 disposed at one end of the machine, and adjustably supported at the opposite end; preferably by chains 6, passing over pinions 7,

carried by a shaft 8; which chains may be adjusted as desired to elevate or lower the right hand end of the cage or screen by imparting rotative movement to said shaft 8. The bars 4 may be of the type illustrated in my Patent No. 1,624,886, dated April 12, 1927, or like those shown in the co-pending application of Oscar Anderson, filed July 24, 1928, Serial No. 295,039. The shaft 5 supporting the left hand end of the cage or screen, as illustrated in the drawings, may be of the adjustable type, such as illustrated in the patent of Charles R. Rouse, No. 1,695,562, dated December 18, 1928.

Within the crushing chamber provided by such cage or screen and above the latter a hammer-carrying rotor structure is mounted, which may comprise a shaft 10, journaled in suitable bearings 11; end plates or disks 12; a series of disks 13 arranged between said end plates; rods 14 extending longitudinally of the rotor structure and passing through said intermediate disks and secured to said end disks or plates, and hammers 15 which are pivotally hung on said rods. Hammer-carrying rotor structures of this general type are well known in the art and the hammers may be of any suitable type; preferably of massive and heavy construction, which may have renewable tips in order that wear may be compensated for and fresh tips supplied without removing the shanks of the hammers from the suspension rods 14.

The chute or hopper into which the material to be crushed may be delivered is indicated generally at 20, and is partly overhung by a curved breaker wall or plate 21, forming one end of the crusher structure and which may comprise a reinforced frame or plate of heavy construction. This frame or plate may be pivotally mounted on the shaft 5 which supports the cage or screen and may have its inner and partially overhanging face provided with a series of renewable wear members 22, which may be secured to said frame or plate by suitable bolts, as indicated at 23.

In order that the delivery of material into the crushing zone may be retarded to a certain extent and the desired reduction by the hammers insured, I provide a series of grid bars 25 in the chute or hopper, which bars may extend part way across the lower portion of the chute or hopper; such grid bars being disposed in relatively fixed position. They lie in such position as to temporarily support the larger masses of material fed into the hopper while the latter are being acted upon by the up-running hammers 15, moving in the direction of the arrow *a*, until such larger masses have been reduced or broken to a size that will permit passage through the spaces between or beyond the grid bars for further action by the hammers 15, co-operating with the bars 4 of the cage or

screen, in the final crushing chamber of the machine. The short grid bars may terminate at a point just beyond the vertical axis of the rotor structure, or at any desired point where they will perform the desired function, and they may be of the type disclosed in the copending application of Charles A. Jamison, filed August 25, 1928, Serial No. 302,108, and may be vertically adjustable in the manner disclosed therein.

The wall 21 of the hopper or chute, which is curved and partially overhangs the grid bars, may be provided with a series of relatively fixed wear plates, indicated at 22. For the purpose of temporarily supporting the material to be crushed additional retarding means may be provided, and for this purpose the curved plate or frame 21 may be provided with a section (or sections) 35, pivotally mounted on a cross bar 36, carried by said frame 21 and having means whereby it may be moved toward and from the ends of the grid bars; its normal position being within a recess 21^c formed in the frame 21. Such operating means may be in the form of a rod (or rods) 37, pivotally connected at 37^a, to the section (or sections) 35, and passing through a rocking support (or supports) 38. The rod (or rods) 37 may be provided with apertures 39, for the passage of a retaining pin (or pins) 39^a, designed to hold the pivotally mounted section (or sections) 35 in adjusted positions. This section (or sections) 35 may carry a series of detachable bosses 40, of the type illustrated in the Jamison application referred to, whose cooperative position with respect to the grid bars 25 may be altered as conditions may require. The upper end of the section (or sections) 35 may be rounded as indicated at 35^a so that rock masses which may strike against the same will slide off without occasioning undue shock or breakage. When worn, the section (or sections) 35 may be renewed by first removing the cross bar 36. The bosses 40 may be renewed when worn by detaching the bolts 40^a holding them to the section (or sections) 35.

The cage or screen structure comprises the arcuate side members 3, connected together by suitable spacing cross member 3^a, 3^b, et seq.; such side members being hung on the shaft 5 at one end (which shaft may be of the type disclosed in the patent of Rouse, before referred to), and supported at the opposite end by chains 6, passing over the pinions 7, carried by the shaft 8.

A tramp iron pocket may be arranged at the right hand side of the machine, as illustrated in Fig. 1, just beyond the end of the cage or screen. At such part of the machine the cross portion 21^a of the frame which extends between the side walls of the structure and serves as a support for the grid bars 25 is arched, and receives a wear plate 71 which may extend part way into the crushing

chamber; being notched at 72 for the passage of the hammers. An opening 73 is provided between a lower cross member 21^b and said plate 71, and uncrushable material discharged through said opening 73 may drop onto the shelf provided by said cross-member 21^b. It will be seen therefore that any tramp iron in the form of spikes, bolts, nuts and/or the like or other uncrushable material in the path of the hammers will be forcibly thrown against this arched wear plate 71 and be discharged from the crushing zone.

It will be understood, of course, that the several walls of the machine, including the chute or hopper, will be provided with the usual wear plates, and that the side members 3 of the cage or screen will carry the usual shedding members designed to shed or direct material being crushed into the path of the hammers and through the spaces between the bars of the screen or cage.

As in the machine of my pending application above referred to, the bottom of the feed chute or hopper formed by the grid bars 25, cuts into the up-running hammer circle at a point below the high point of the same; in other words, the up-running hammers have an opportunity of impacting the stone on an up grade for a considerable portion of the arc of the hammer circle, before the center or highest part of the hammer circle is reached.

This is believed to be a distinctly advantageous feature of construction, as large pieces of stone or other material are retarded in going uphill and this additional time element gives the hammers better opportunity in the early stages, when the pieces of stone or other material are large, for the important and heavier preliminary breaking, so that when the uncrushed material gets up to the zenith or highest portion of the circle and starts downward at increased speed, it is better adapted, by reason of its size, to take the balance of the ride down hill to the left of the zenith, when its speed would be faster and where the lesser but no less important secondary crushing takes place. In other words, it seems distinctly better that the larger pieces of material particularly, which are the most difficult to reduce, are presented to the hammer circle on an upgrade and at slower speed, rather than at the top of the circle where they would be more rapidly carried into a down hill position. This condition would give the hammers less time to do the preliminary heavy crushing, which would mean that the material would enter the rapidly restricting zone between the hammers and the breaking surface of the wall or plate 21, in appreciably large sizes; thereby causing congestion of work in this restricted zone; reducing the chance for a complete and final reduction from the hammer action, with increased wear and shock to the ma-

chine, and the necessity of increased power because the total reduction period would be considerably increased.

I claim:

1. In a crushing machine, the combination with a frame having a hopper and a breaker wall structure pivotally connected to said frame and partly overhanging said hopper, a screen adjustably mounted in the lower portion of said frame and below said overhanging breaker wall structure, a rotor structure carrying hammers cooperating with said screen, and a series of grid bars in the lower portion of said hopper above the screen for temporarily retarding the passage of material to be crushed whereby said material may be subjected to the action of said hammers in their uprunning movement while temporarily retarded, of a wear member pivotally mounted in said breaker wall structure and arranged to be adjusted toward and from said grid bars.

2. In a structure such as set forth in claim 1, means for holding the pivotally mounted wear member carried by the breaker wall structure in adjusted positions to serve as additional retarding means temporarily supporting the material to be crushed.

3. In a structure such as set forth in claim 1, means for operating the pivotally mounted wear member carried by the breaker wall structure comprising a rod pivotally connected to said wear member, a rocking support for the same, and a pin for holding said rod in adjusted positions.

4. In a structure such as set forth in claim 1, a series of projections carried by the pivotally mounted wear member connected to the breaker wall structure.

5. In a structure such as set forth in claim 1, disposing the pivotal connection for the movable or swinging wear member adjacent the pivotal connection of the breaker wall structure.

6. In a structure such as set forth in claim 1, means for holding said pivotally mounted wear member in adjusted positions, and bosses carried thereby and projecting into the hopper space.

7. In a structure such as set forth in claim 1, providing the wear member pivotally connected to the breaker wall structure and adapted to swing toward and from the grid bars; with a rounded upper surface.

8. In a structure such as set forth in claim 1, providing a series of grid bars extending part way across the hopper and arranging the pivotally mounted wear plate in position for adjustment relatively to the ends of said grid bars.

In witness whereof I have signed this specification.

GEORGE W. BORTON.