Jan. 18, 1944. J. T. FOWLER 2,339,390

CRUSHER

Filed May 2, 1941

Fig. 1

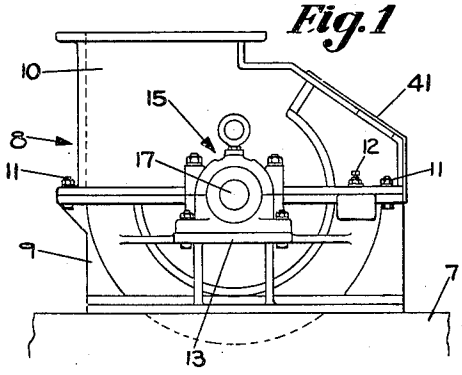


Fig. 2

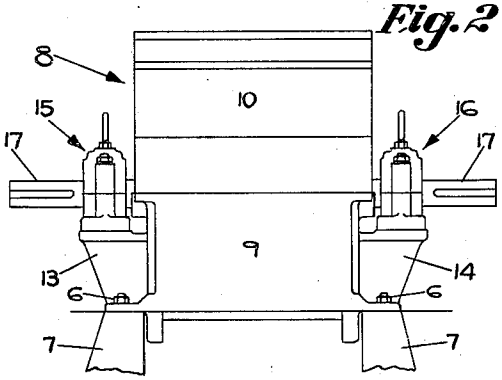
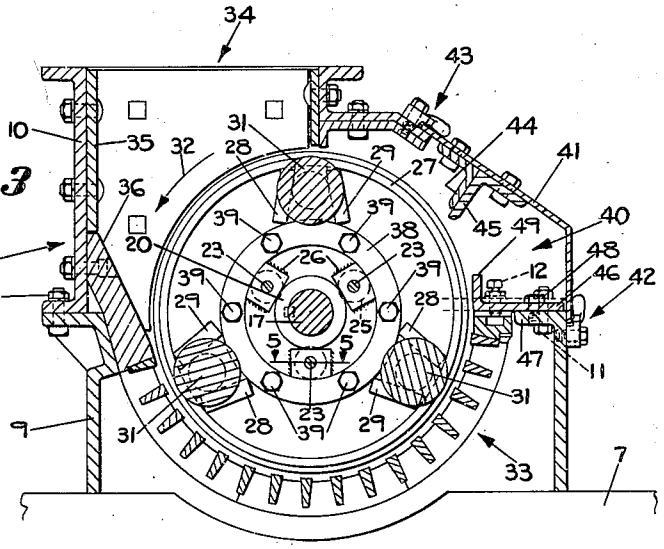


Fig. 3



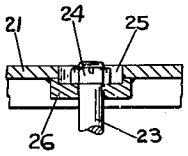


Fig. 5

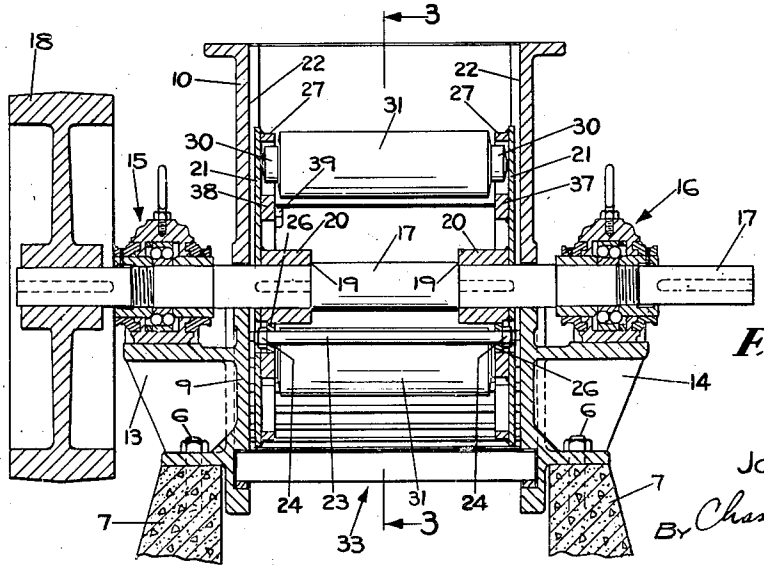


Fig. 4

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CRUSHER

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6 Claims. (Cl. 83—11)

My invention relates to rotary crushers, and one of the objects is the provision of a simple and improved crusher, the cost of construction of which is reduced to a minimum, and although the apparatus is particularly adapted for crushing coal, it may have a general application.

Another object of the invention is the provision of means for clamping together spaced-apart end plates of a rotary carrier in a crusher in such a manner as to permit such plates to be located closely adjacent inner opposite walls of the casing.

A further object of the invention is the provision of bearings for the end trunnions of crusher rollers mounted on spaced-apart plates of a carrier to converge radially outward relative to the axis of rotation of the carrier.

Another object of the invention is the provision of improved and efficient retaining mechanism removably mounted on the carrier to permit detachment from the carrier of any one of a plurality of crushing rollers.

A further object of the invention is the provision on a carrier of means for frictionally holding beating rollers against rotation during operation but permitting such rollers to yield when engaging uncrushable material at the bar screen of the crusher.

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

In the accompanying drawing,

Fig. 1 represents an end elevation of a crusher casing adapted to contain my improvements;

Fig. 2 is a side elevation of the structure shown in Fig. 1;

Fig. 3 is a transverse sectional elevation taken on the line 3—3 of Fig. 4, looking in the direction of the arrows;

Fig. 4 is a longitudinal sectional elevation of the crusher embodying my improvement; and

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 3, looking in the directions of the arrows.

As shown in Figs. 2 and 4, the crusher may be bolted at 6, 6 to the concrete pedestals 7, 7. The casing 8 comprises a lower section 9 and an upper section 10. The upper section 10 is rigidly bolted at 11, 11 to the lower section 9. The lower section 9 is provided with brackets 13, 14 which are bolted at 6, 6 to the concrete pedestals 7, 7. The brackets 13, 14 are provided with platforms to which are bolted the journal bearings 15, 16 for the driving shaft 17. A fly-wheel 18 may be keyed to one end of the shaft 17 as shown in Fig. 4, and power applied to the other end thereof.

The central portion of the shaft 17 within the casing 8 is of enlarged diameter to provide the annular shoulders 19, 19 to serve as annular abutments for the inner ends of the hubs 20, 20 to which are welded the relatively large discs 21, 21. It will be seen by referring to Fig. 4 that these discs 21, 21 are closely adjacent the inner opposite vertical parallel walls 22, 22 within the casing 8 and form the end plates of a rotor or carrier adapted to reduce material as hereinafter described.

The discs 21, 21 are clamped together by means of a plurality of circumferentially spaced bolt rods 23, 23, the ends of which are screw-threaded to receive the nuts 24, 24. In order to provide countersunk recesses 25 in the plates 21, small rectangular plates 26, 26 may be welded to the inner surfaces of the plates 21, as illustrated in Fig. 5. Holes may then be bored to provide perforations for the rod 23. These holes are bored through both the plate 21 and the plate 26. After such holes are bored, the recesses 25 may be formed by counterboring which provides openings through the plates 21 and recesses in the plates 26 registering with such openings, such recesses and openings providing the complete recesses illustrated at 25 in Fig. 5. By means of this arrangement the plates 21 may be relatively thin and nevertheless the countersunk recesses 25 may be sufficiently deep to receive the nuts 24, thus preventing the ends of the rods 23 from contacting with the inner walls 22, 22 of the casing. In other words, the clamping mechanism is arranged to include the rods 23, the ends of which are kept spaced from the inner walls 22, 22 of the casing.

Adjacent the peripheries of the plates 21, 21 I have shown a pair of rings 27, 27 welded to the inner faces of these plates. Abutting against the inner peripheries of the rings 27, 27 are outwardly converging bearing bars 28, 29. Fig. 3 shows three pairs of such bearing bars but the number of pairs may be varied as desired.

The adjacent bearing bars 28, 29 may be welded to the inner faces of the plates 21, 21 in position to receive the trunnions 30, 30 of the rollers 31, 31, 31.

As shown in Fig. 4, the ends of the trunnions 30, 30 have the shape of a segment of a sphere and are adapted to have a sliding contact with the inner faces of the plates 21, 21. It will thus be seen that the length of each roller 31 includ-

ing the trunnions 30 thereof, is equal to the space between the inner faces of the plates 21, 21.

It should also be noted that when the carrier comprising the spaced plates 21 is rotated in the direction of the arrow 32, the trunnions 30 by engaging the adjacent faces of the bearing bars 28, 29 will limit the radial movement of the rollers 31 to positions spaced from the bar screen 33. The frictional engagement between the trunnions 30 and the bearing bars 28, 29 will also prevent rotation of the rollers 31 relatively to the roller carrier during normal operation when the rollers act as beaters to crush the material against the screen bars.

The circumferential space between each roller and the next adjacent roller is free and unobstructed. Centrifugal force holds the trunnions 30 in frictional engagement with the bearing bars, and the rollers are free to engage material introduced into the hopper 34 and throw such material against the vertical breaker plate 35 and the inclined breaker plate 36 which are shown in Fig. 3 securely bolted to the upper section 10 of the casing. The bar screen 33 may be held against the breaker plate 36 by means of a cross bar and cooperating screws 12, 12, which are threaded through the outer side flanges at the bottom of casing section 10. An enclosed cross plate 46 is secured to the inner flange 47 by means of the machine screws 48. The inner edge of the horizontal plate 46 is provided with an upwardly extending flange 49 to form the inner retaining wall of the pocket 40.

When uncrushable material finds its way between a roller and the bar screen 33, the trunnions 30 will be released from the bearing bars 28, 29 and therefore the rollers will yield by moving inwardly toward the axis of rotation of the carrier or of the shaft 17. When the rollers are thus released from the bearing bars 28, 29, they are free to roll and will therefore occupy a new position as soon as the trunnions 30, 30 reengage the bearing bars 28, 29. The rollers therefore act as beaters so long as they are held in frictional engagement with the bearing bars 28, 29 and when released from these bars, the rollers act by centrifugal force as rolling crushers with the advantage that the wear is distributed about the rollers by reason of their being reconnected to the bearing bars 28, 29 in different locations after the various releases.

In order to limit the radial movement inwardly of the rollers, I have provided abutment rings 37, 38 spaced from but concentric with the hubs 20, 20. The ring 37 may be welded to the inner face of one of the discs 21, as shown in Fig. 4. The other abutment ring 38 is removably secured to the left-hand disc 21, as viewed in Fig. 4, by means of the cap screws 39, 39, as shown in Fig. 3. The abutment rings 37, 38 are of the same size and both are concentric with the hubs 20, 20 each with its outer periphery at the same distance from the end trunnions 30, 30. When the screws 39 are removed, the abutment ring 38 may be moved toward the right as viewed in Fig. 4 to provide sufficient space for the left-hand ends of the rollers 31 to be tilted toward the shaft 17, and in this manner removed from the carrier for replacement by a new roller, if desired. It is evident that the rings 37 and 38 cooperate with the outer rings 27 and with the bearing bars 28 and 29 to provide elongated tapered radial bearings for the trunnions 30, 30 of rollers 31 to keep them attached to the plates 21, 21 while permitting limited radial movement thereof, the decreasing distances or spacing between the bars 28 and 29 along increasing radii providing opposed converging bearing surfaces which also provide for greater release and freedom of movement of the rollers 31 when they are struck or otherwise moved inwardly from their outermost positions.

Uncrushable pieces of material, such as those composed of metal, may be thrown into the tramp compartment 40 which is normally closed by the cover plate 41, the lower edge of which is clamped at 42 to the lower section 9 of the casing 8. The upper edge of the cover plate 41 may be clamped at 43 to the upper section 10 of the casing 8. Angle irons 44, 45 may be bolted to the under side of the cover plate 41 to provide an abutment for flying pieces of metal which are to be retained in the tramp compartment 40.

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 I therefore wish not to be restricted to the precise construction herein disclosed.

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

1. In a rotary crusher, the combination with a casing, of a rotary carrier in said casing including spaced-apart members, a plurality of crushing rollers, mechanism for mounting said rollers on said carrier members for limited radial yielding movement independently of said casing, said mechanism including a removable retaining ring connected to the inside surface of one of said members for confining said rollers to such limited radial movement but when released permitting any roller to be removed from the carrier.

2. In a rotary crusher, the combination with a casing, of a driving shaft, a rotary carrier within said casing and secured to said shaft to rotate therewith, a plurality of rollers, and bearings for said rollers comprising a plurality of pairs of straight bearing surfaces converging outwardly to limit the outward radial movement of said rollers relatively to said shaft.

3. In a rotary crusher, the combination with a casing, of a driving shaft, a rotary carrier on said shaft within said casing, a plurality of rollers, a plurality of pairs of straight bearings on said carrier for the ends of said rollers, each pair of straight bearings being outwardly converging to limit the radial outward movement of the rollers, and abutments on the carrier in position to limit the inward radial yielding movement of said rollers.

4. In a crusher, the combination with a casing having an arcuate screen at the bottom through which reduced material passes, of a rotor within said casing, said rotor including end plates, roller means having trunnions, mechanism providing bearings for receiving said trunnions and holding said rollers in place, said bearing mechanism being constructed and formed to provide for limited radial movement of said roller means outwardly while limiting the minimum distance between the roller means and said screen so said roller means is always spaced therefrom during operation and also being tapered outwardly radially to provide greater release of said roller means relative to said end plates whenever said roller means is forced radially inwardly during operation.

5. A rotor for a crusher including a shaft and a pair of spaced-apart end members mounted thereon, a crushing roller having end bearings, bearing means on said end members cooperating with said roller end bearings to hold said roller on said end members during rotation, at least one of said bearing means having radially outwardly converging bearing walls and having a radial bearing wall formed by a ring removably attached to the inside surface of one of said end members which upon removal provides for removal of said roller.

6. A rotor for a crusher including a shaft and a pair of spaced-apart end members mounted thereon, a crushing roller having end bearings, bearing means on said end members cooperating with said roller end bearings to hold said roller on said end members during rotation, at least one of said bearing means having a radial bearing wall formed by a ring removably attached to the inside surface of one of said end members which upon removal provides for removal of said roller.

JOHN T. FOWLER.