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GYRATORY CRUSHER

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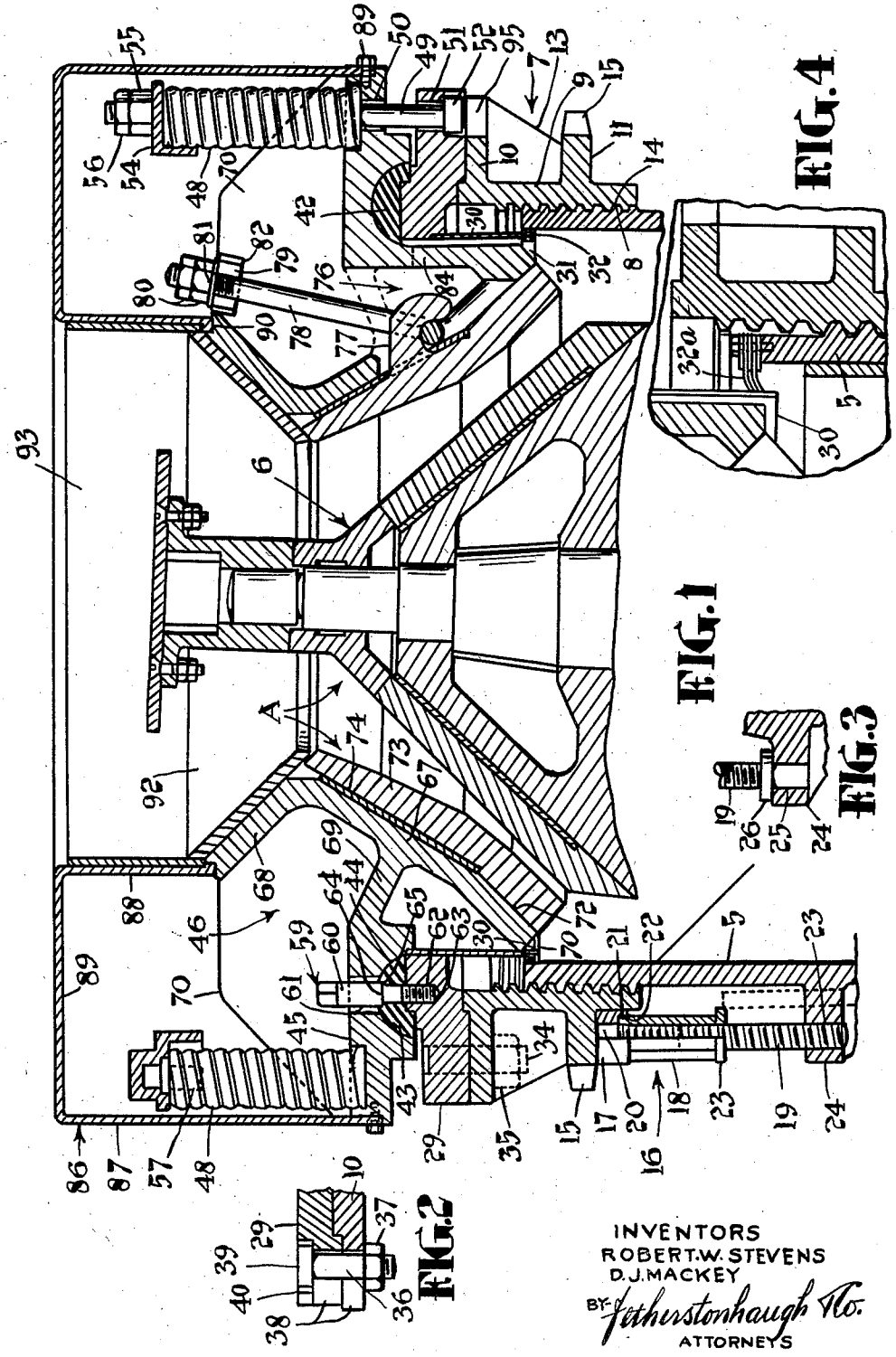


FIG. 1

FIG. 4

FIG. 3

FIG. 2

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GYRATORY CRUSHER

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4 Claims. (Cl. 241—286)

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This invention relates to improvements in gyratory crushers and the object is to provide an improved frame and mantle assembly which, while capable of general application, is particularly useful in connection with gyratory crushers of the type set forth in the co-pending applications of Robert W. Stevens, Serial No. 712,841 filed November 29, 1946 and Serial No. 726,495, filed February 5, 1947.

One object of the present invention is the provision of an improved mantle assembly designed so that the bowl assembly can be separated from the bowl adjusting ring without disturbing the pressure applying springs of the mantle assembly and without unscrewing the adjusting ring to separate it from the frame when removing the bowl assembly to replace the bowl liner.

Another object is the provision of an improved mantle assembly which enables the spring bolts of the spring assembly to be removed and replaced individually without removing a section of the springs and without separating the bowl support from the bowl adjusting ring.

Another object is the provision of an improved mantle assembly in which the wear ring on which the bowl is directly supported constitutes a low cost replacement part of improved contour designed to give long service and to reduce the tendency toward eccentricity of the crushing head and mantle when the wear ring is worn down.

Other objects, advantages and characteristic features, as well as the preferred details of construction, will be apparent from the following detailed description of the invention taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a portion of a crusher embodying our improved frame and mantle assembly.

Fig. 2 is a detail view showing a slight modification with reference to the mounting of the mantle support on the mantle adjusting ring; and

Fig. 3 is a detail view showing a slight modification of a thread locking arrangement provided for locking the mantle adjusting ring in adjusted position on the main frame of the crusher.

Fig. 4 is a detail view showing a slight modification with reference to excluding dust from the interior of the frame.

In these drawings the main frame and the crusher head assembly of our improved crusher are respectively indicated at 5 and 6. The crusher head assembly is not shown in all its details

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since the design and mounting of this assembly forms no part of the present invention and may conform to conventional practice. It is preferred, however, that the crusher head assembly be of the type described and claimed in the aforesaid co-pending applications.

An internally threaded bowl adjusting ring 7 is screwed onto an externally threaded upper portion 8 of frame 5. Ring 7 includes a cylindrical body portion 9 provided with upper and lower outwardly directed flanges 10 and 11 joined together by stiffening ribs 13. The cylindrical body portion of ring 7 is internally threaded as indicated at 14 for threaded engagement with the externally threaded portion 8 of frame 5.

The lower flange 11 of ring 7 is provided with a circular series of outwardly directed projections 15 adapted to be engaged by a ring turning lever (not shown). This ring turning lever may be fulcrumed on frame 5 in any suitable manner.

Ring 7 is locked in adjusted position by a suitable number of pressure applying locking arrangements generally indicated at 16. Each such arrangement comprises an anvil member 17, a sleeve nut 18 and a threaded stud 19. Anvil 17 is fitted to the underside of adjusting ring flange 11 and is provided with a vertical stud-receiving bore 20 enlarged at its lower end to provide an annular recess 21. Sleeve nut 18 is formed with a reduced anvil engaging upper end 22 which is fitted in recess 21. Nut 18 is externally hexagonal and is bored and threaded to receive the threaded stud 19. A washer 23 is welded to the lower end of nut 18.

In the arrangement shown in Fig. 1 the lower end of threaded stud 19 is screwed into a threaded hole 23 provided in a supporting flange 24 projecting outwardly from frame 5 below adjusting-ring flange 11. Alternately, the lower end of stud 19 may, as shown in Fig. 3, be slidably fitted in a non-threaded hole 25 provided in supporting flange 24. In the latter case the stud 19 is supported on the flange 24 by means of a washer 26 welded to the stud.

After adjusting ring 7 has been turned on the frame 5 to the desired position of adjustment, it is locked in place by turning the sleeve nut 18 on the threaded stud 19 to force the upper end of the sleeve nut against anvil 17 and thereby apply upward pressure to adjusting ring 7 to jam the threads 14 of said ring against the cooperating threads 8 of frame 5 so that the adjusting ring is thus locked in its adjusted position.

A ring-shaped bowl support 29 is mounted on the upper flange 10 of adjusting ring 7. The

inner edge of support 29 projects inwardly beyond the adjusting ring 7 and carries a depending dust guard tube 30. A cylindrical, channel-shaped packing retainer 31 is carried by the lower end of tube 30 and contains a packing strip 32 disposed in sliding sealing contact with the inner surface of the upper portion of frame 5. This provides a dust excluding seal between the interior of frame 5 and the inside threaded portion of ring 7.

In the modified arrangement shown in Figure 4 the packing retainer 31 and packing strip 32 are replaced by a packing strip 32*a* which is fastened to the upper edge of member 5 and engages the outer surface of tube 30.

In Fig. 1 the bowl support 29 is shown secured to adjusting ring flange 10 by studs 34 and nuts 35. Alternately, the bowl support 29 may be secured to adjusting ring flange 10 by bolts 36 and nuts 37 as shown in Figure 2. In the latter case each bolt 36 is fitted in a radial slot 38 in bowl support 29 and flange 10 and is provided with a square head 39 which is clamped against the bottom of a recess 40 provided in the mantle support 29 above slots 38.

Bowl support 29 carries a bowl supporting wear ring 42 which may, if desired, be formed as an integral part of said bowl support. In the present instance, however, the wear ring 42 is shown as a separately formed element mounted on the inner top upper portion of bowl support 29 so that it lies inwardly of the fastening means securing the bowl support to the adjusting ring flange 10.

Wear ring 42 presents a convex torroidal bearing surface 43 engaging and supporting a complementary concave torroidal complementary bearing surface 44 of an outwardly directed flange 45 formed integral with bowl member 46.

Flange 45 of bowl member 46 is yieldingly held down on wear ring 42 by the lower ends of compression springs 48 arranged in groups of three each outwardly of the wear ring. The outer springs 48 of each group encircle bolts 49 which extend through holes 50 in bowl flange 45 and holes 51 in bowl support 29 and serve to detachably secure the bowl to said bowl support. The heads 52 at the lower ends of bolts 49 are countersunk in the lower surface of bowl support 29. The upper ends of the three springs 48 of each group bear against a pressure applying plate 54 which is slidably mounted on the bolts 49 beneath spring adjusting nuts 55 and locking nuts 56. The upper end of the central spring of each group is held in position by a downward projection 57 of plate 54 as shown at the left of Fig. 1. The openings 50 of bowl flange 45 are made large enough to permit the flange to have a certain degree of tilting or angular movement relative to spring bolts 49.

Wear ring 42 is held down on bowl support 29 by a plurality of bowl guiding dowels 59, one of which is shown at the left of Fig. 1. Each dowel 59 includes an upper bowl guiding portion 60 extending upwardly through a guide opening 61 in bowl flange 45 and a lower threaded-stud portion 62 extending downwardly through a hole in wear ring 42 into threaded engagement with a socket 63 provided in bowl support 29. The upper bowl guiding portion of each dowel is made larger than the stud portion 62 so that its lower end affords a downwardly facing wearing ring retaining shoulder 64 which bears against the bottom of a recess 65 formed by enlarging the upper end of the wear ring hole through which the stud 62 extends. It will thus be seen that the dowels 59 serve both as guides for bowl 46 and as hold down dowels for wear ring 42. Even when wear ring 42 is formed as an integral part of bowl support 29 the dowels 59 are provided to serve as guides for bowl 46.

Bowl 46 comprises three conical sections 67, 68 and 69 which are stiffened by a plurality of ribs 70 formed integral therewith. The bowl flange 45 is formed as a horizontal continuation of bowl section 69. The main bowl section 67 is a downwardly and outwardly flaring conical annulus having the lower portion of its inner surface machined to provide a seat 72 for the lower portion of the bowl liner 73. Bowl section 67 and liner 73 are designed to leave an intervening space which is filled with ductile metal 74 to provide a yieldable seat for the liner.

At each of a plurality of points around its circumference bowl 46 is cored out to provide a pocket 76 receiving therein a hooked-shaped lug 77 projecting outwardly from bowl liner 73. Each lug 77 is supported on the central portion of a U-bolt 78, the side legs of which extend upwardly through supporting bar 79 and are equipped with adjusting nuts 80 bearing on washer 81 carried by said bar. The ends of bars 79 rest on seats 82 provided at the upper edges of two ribs 70 between which the pocket 76 is formed. Each pocket 76 includes an outer dust-excluding wall 84 which prevents dust passing upwardly through the pocket into the spring housing hereinafter referred to.

A cover 86 is preferably secured to bowl member 46 to provide a spring housing enclosing the springs 48. This cover comprises an outer cylindrical portion 87 and an inner cylindrical portion 88 having their upper edges integrally joined to a horizontal connecting portion 89. The lower edge of the outer portion 87 of cover 86 is fastened to the outer periphery of bowl flange 45 by cap screws 89. The lower edge of the inner cylindrical portion 88 of cover 86 is supported on a seat 90 provided at the upper edge of bowl section 68.

The conical section 68 of bowl 46 is an upwardly and outwardly flaring section which provides a hopper from which material to be crushed is fed into the crushing zone A between the bowl liner 73 and the crusher head assembly generally indicated at 6. A suitable one-piece lining 92 is preferably arranged on the upper surface of the hopper section 68 of bowl 46 so that the lower edge of hopper lining 92 overlies the upper edge of bowl lining 73. When cover 86 is used the inner cylindrical portion 88 thereof forms a cylindrical side wall extension of the hopper provided by bowl section 68 and is preferably equipped with a removable liner 93.

The upper flange 10 of adjusting ring 7 is provided at the outer edge with slots 95, each underlying the head 52 of one of the spring bolts 49 and being large enough to permit individual removal and replacement of the spring bolts to be accomplished without first separating the bowl support 29 from the adjusting ring 7. In this connection it will be understood that the arrangement of the springs 48 and the spring bolts 49 is such that subsequent to the removal of the nuts 55 and 56, the bolts may be individually withdrawn by moving the head ends 52 downwardly through the slots 95 of the adjusting ring flange 10. As previously stated, this arrangement whereby spring bolts 49 may be re-

moved and replaced individually without removing a section of the springs 48 and without separating the bowl support 29 from adjusting ring 7 constitutes one of the novel and advantageous features of the mantle assembly described herein.

By removing the nuts 35, the assembly comprising bowl support 29, bowl member 46, springs 48, and spring bolts 49 can be separated from the adjusting ring 7 without disturbing springs 48 and without taking the time necessary to unscrew adjusting ring 7 from frame 5. This enables removal of the bowl or mantle assembly, for replacement of the bowl liner, to be accomplished more conveniently and rapidly than heretofore. Since the adjusting ring 7 is not removed the weight to be handled in removing the bowl assembly for replacement of the liner is materially lessened.

Having thus described the essential characteristic features of our invention it will be understood that various modifications may be resorted to within the scope and spirit of the invention as defined by the appended claims.

We claim:

1. In a gyratory crusher, a frame structure having a screw threaded upper portion, a threaded bowl adjusting ring in threaded engagement with the screw threaded portion of said frame structure whereby said ring may be raised and lowered by turning the ring relative to the frame structure, and means for locking said ring in adjusted position comprising a vertically extending threaded stud supported by the frame structure in a position below said ring, a nut threaded on said stud and adapted to be forced upwardly toward the bowl adjusting ring to jam the threads of the ring against the engaging threads of the frame structure and thereby lock the ring in adjusted position and an anvil against which said nut bears, said anvil being fitted against a downwardy facing portion of the bowl adjusting ring.

2. In a gyratory crusher, a frame structure having a screw-threaded upper portion, a threaded bowl adjusting ring in threaded engagement with the screw threaded portion of said frame structure whereby said ring may be raised and lowered by turning the ring relative to the frame structure and means for locking said ring in adjusted position comprising a vertically extending threaded stud supported by the frame structure in a position below said ring, a nut threaded on said stud and adapted to be forced upwardly against the bowl adjusting ring to jam the threads of the ring against the engaging threads of the frame structure and thereby lock the ring in adjusted position, and an anvil fitted against a downwardly facing portion of the adjusting ring and provided with a bore enlarged at its lower end to provide a recess in which a reduced portion of the nut is received, the bore of the anvil above the recess being of a size to receive said stud.

3. In a gyratory crusher, a frame structure having a screw threaded upper portion, a threaded bowl adjusting ring in threaded engagement with the screw threaded portion of said frame structure whereby said ring may be raised and lowered by turning the ring relative to the frame structure and means for locking said ring in adjusted position comprising a supporting flange carried by said frame structure and positioned below said ring, a vertically extending threaded stud having its lower end screwed into said flange and a nut on said stud adapted to be forced upwardly against the bowl adjusting ring to jam the threads of the ring against the engaging threads of the frame structure and thereby lock the ring in adjusted position.

4. In a gyratory crusher, a frame structure having a screw-threaded upper portion, a threaded bowl adjusting ring in threaded engagement with the screw threaded portion of said frame structure whereby said ring may be raised and lowered by turning the ring relative to the frame structure, and means for locking said ring in adjusted position comprising a supporting flange formed on said frame structure and positioned below said ring, a vertically extending threaded stud having its lower end slidably fitted in an opening in said flange, a washer secured to said stud and resting on said flange and a nut threaded on said stud above said washer and adapted to be forced upwardly against the bowl adjusting ring to jam the threads of the ring against the engaging threads of the frame structure and thereby lock the ring in adjusted position.

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