

March 16, 1948.

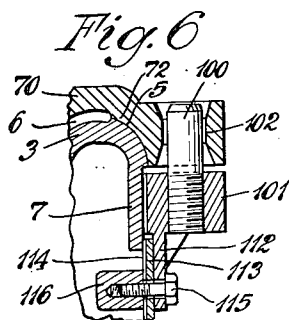
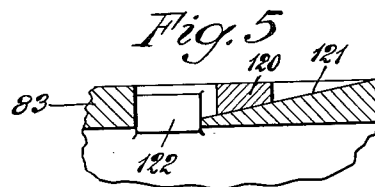
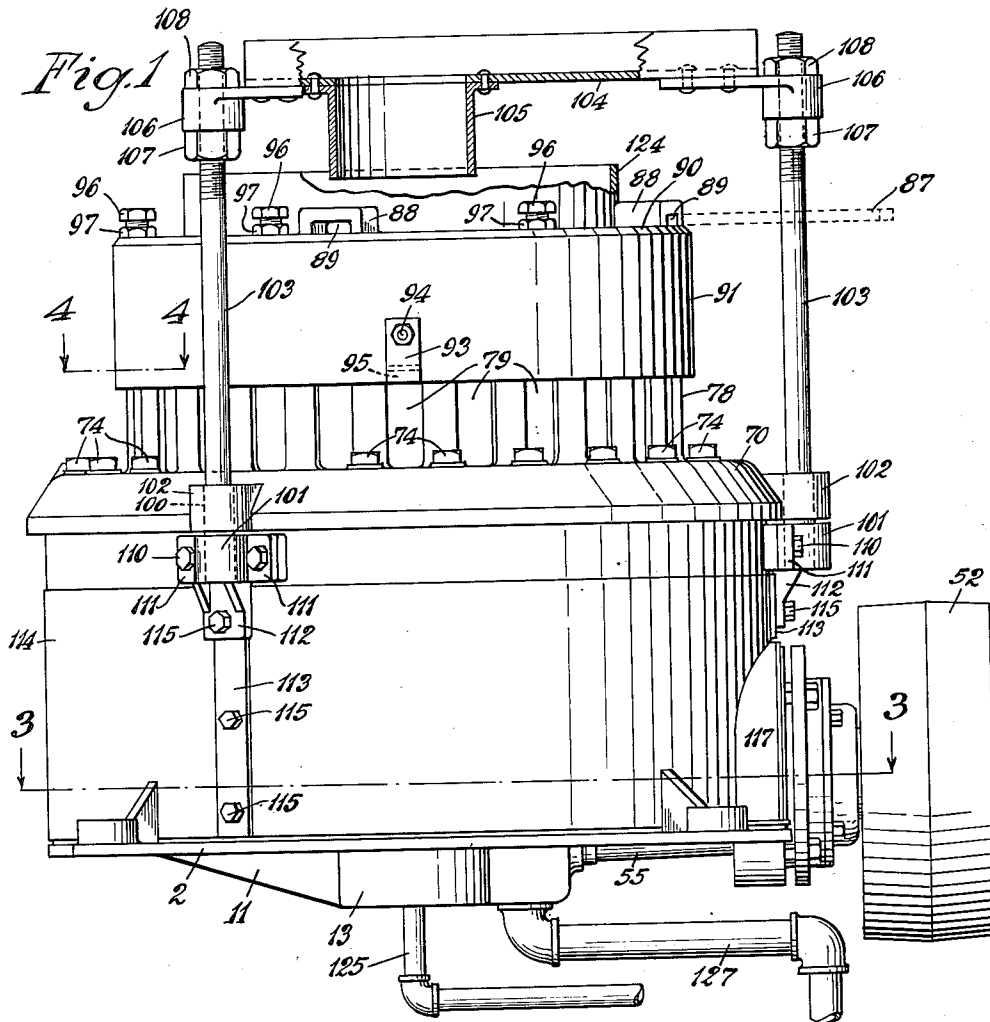
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2,438,049

PEDESTAL TYPE GYRATORY CRUSHER

Filed Nov. 13, 1943

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

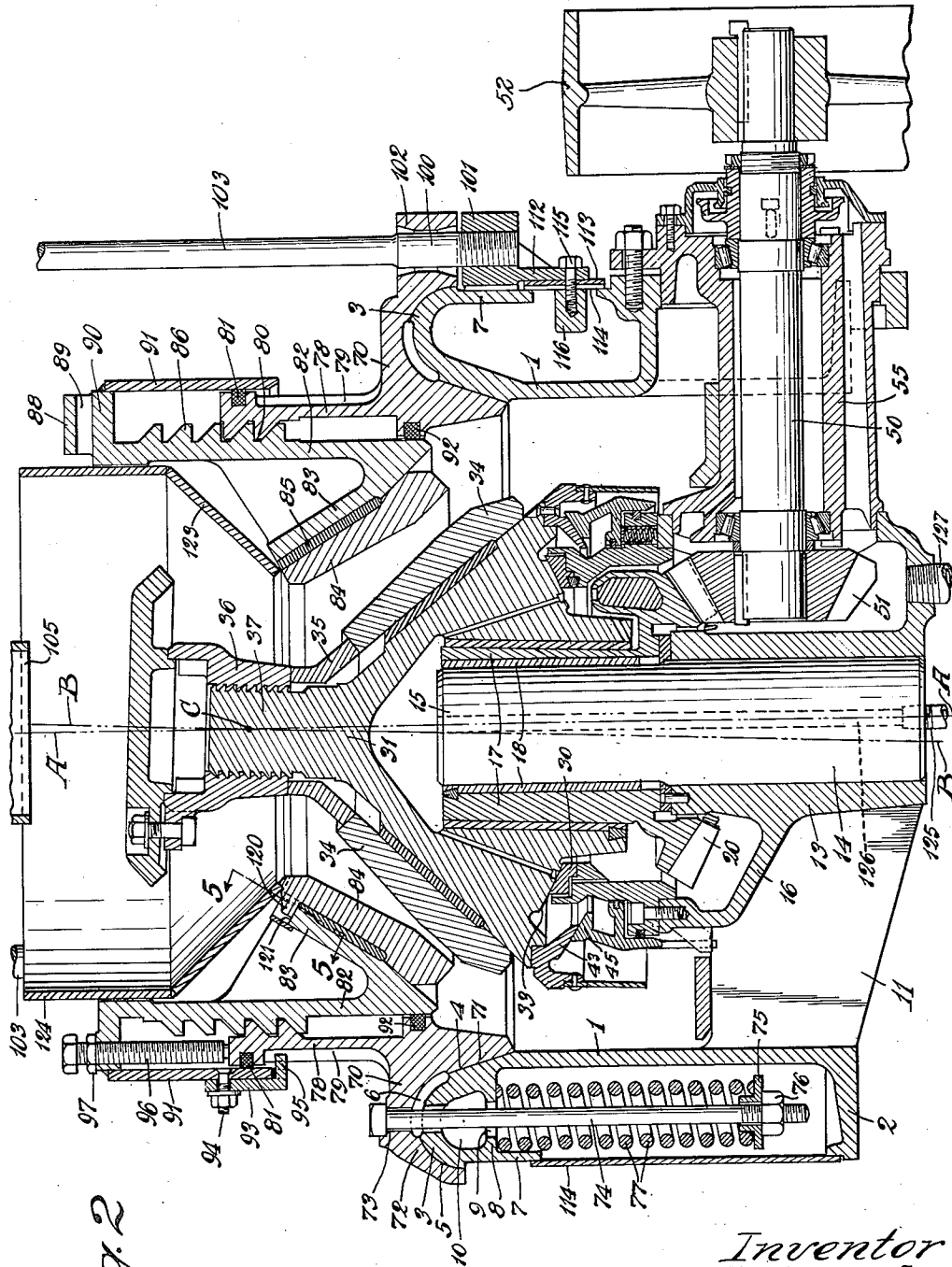


Fig. 2

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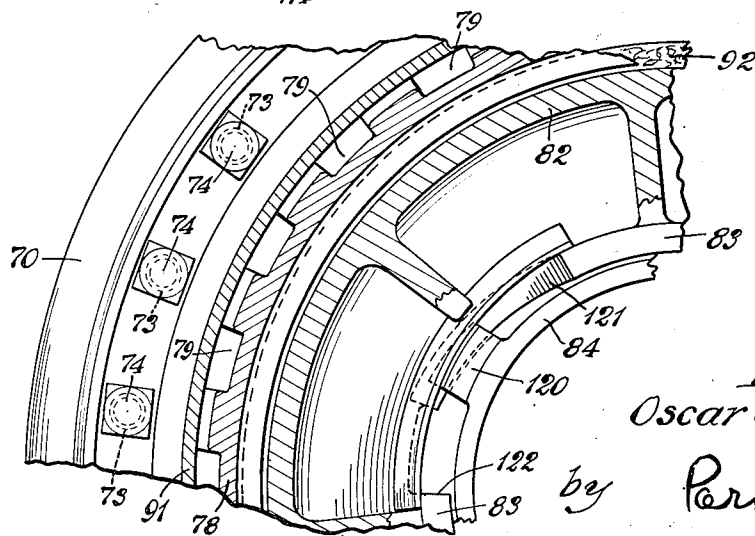
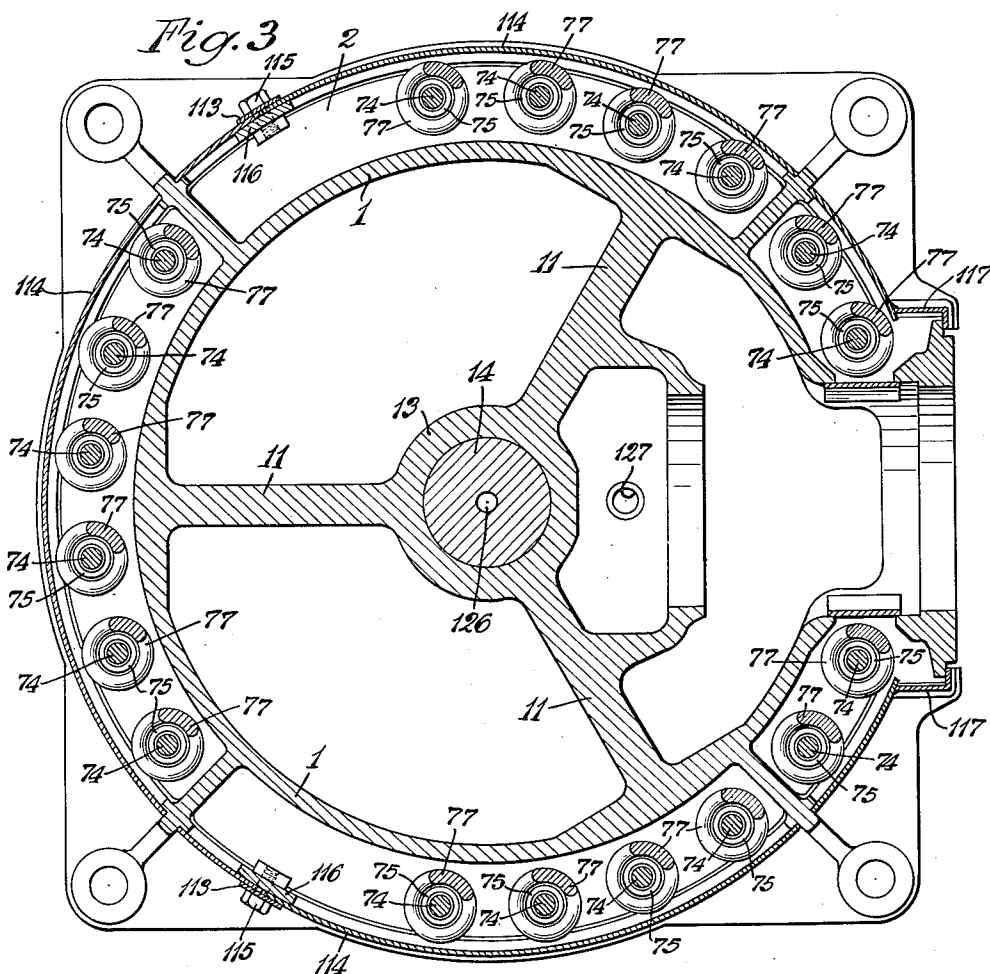
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5 Sheets-Sheet 3



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PEDESTAL TYPE GYRATORY CRUSHER

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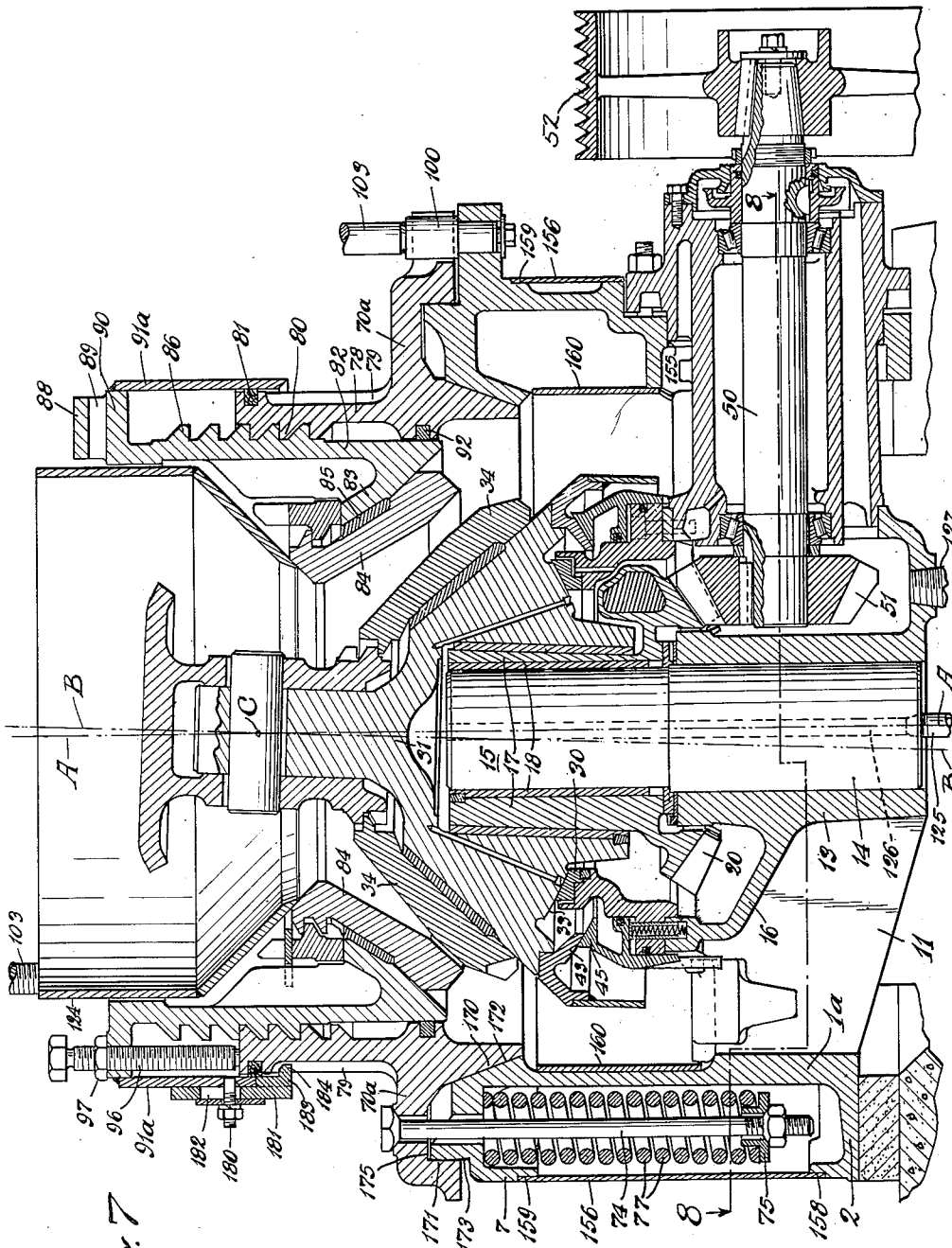


Fig. 7

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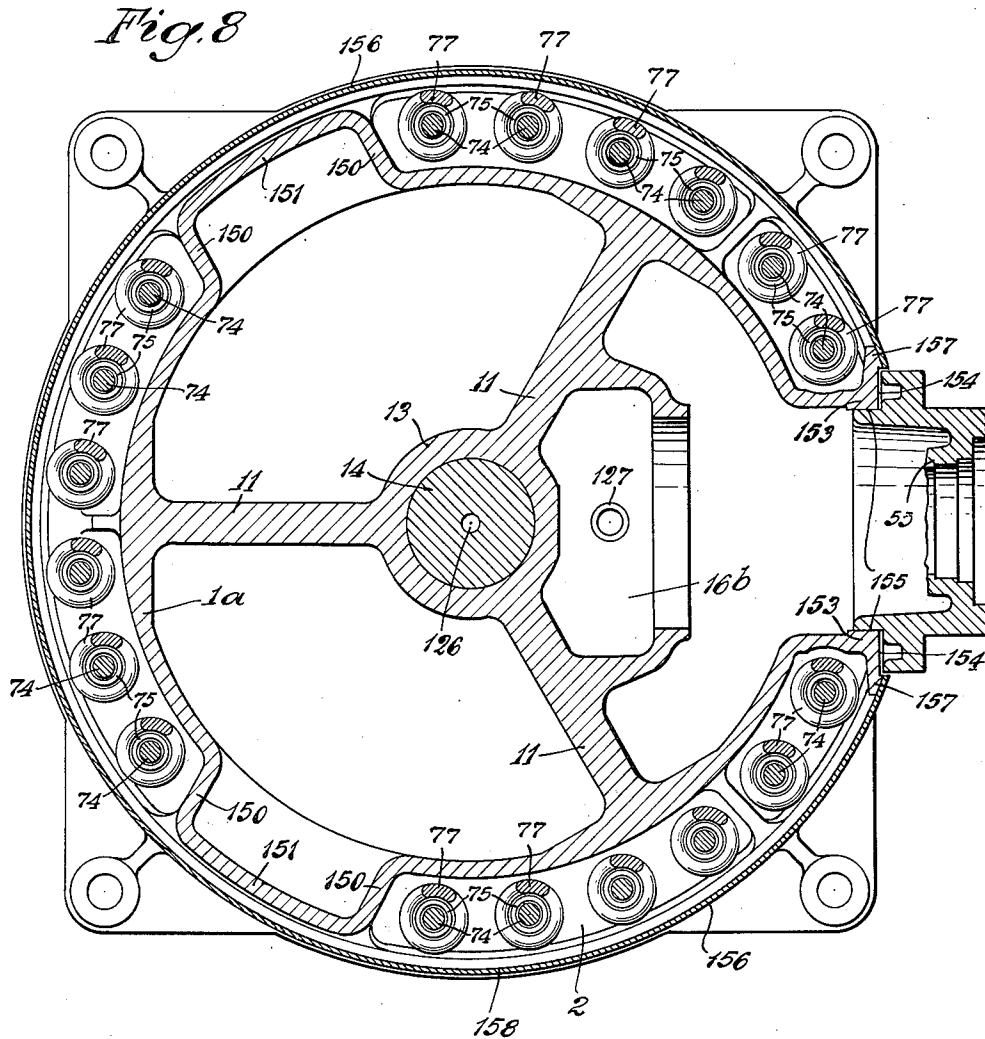
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,438,049

PEDESTAL TYPE GYRATORY CRUSHER

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Application November 13, 1943, Serial No. 510,150

9 Claims. (Cl. 241-208)

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My invention relates to a gyratory crusher, and has for one purpose to provide improved means for adjusting the position of the bowl or concave of a gyratory crusher.

Another purpose is to provide improved sealing means for preventing the entry of dust into the adjusting structure.

Another purpose is to provide improved means for locking the parts when adjusted.

Another purpose is to provide an improved main frame.

Other purposes will appear from time to time in the course of the specification and claims.

This application is a continuation in part of my copending application Serial No. 378,850, filed February 14, 1941, which was issued October 10, 1944 as Patent No. 2,359,987.

I illustrate my invention more or less diagrammatically in the accompanying drawings, wherein—

Figure 1 is a side elevation with parts in vertical section;

Figure 2 is a vertical axial section on a slightly larger scale;

Figure 3 is a section on an enlarged scale along the line 3—3 of Figure 1;

Figure 4 is a section on the line 4—4 of Figure 1, on an enlarged scale;

Figure 5 is a section along the line 5—5 of Figure 2;

Figure 6 is a partial section of a variant form;

Figure 7 is a vertical axial section through a variant form of the device; and

Figure 8 is a section along the line 8—8 of Figure 7.

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

Referring to the drawings, I generally indicate any suitable circumferentially extending outer frame having a bottom outwardly extending flange 2 and an upper outwardly extending flange 3, having a conic inner surface portion 4, and a rounded upper and outer surface 5, the two being separated by a reduced or cut away portion 6. The rounded portion 5 extends downwardly in the form of a circumferential apron 1. The flange also includes a generally horizontal portion 8, having apertures 9, the purpose of which will later appear. If desired, the interior of the flange may be more or less cored out or enlarged, as at 10.

I indicate inwardly extending radial spider portions which support an inner sleeve 13, in which may be mounted the lower portion of a post 14. It may be secured in any suitable manner, by press fit, or otherwise. It includes an upward-

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ly extending portion 15, herein shown as of slightly less diameter. Extending upwardly and outwardly from the sleeve 13 is the housing portion 16.

I illustrate a crusher head and means for gyrating and supporting it, in substantial conformity to a similar structure in my earlier mentioned copending application Serial No. 378,850, now patent No. 2,359,987, granted October 10, 1944 of which the present application is a continuation in part. The structure includes the eccentrically apertured sleeve 17 with its anti-frictional bushing 18, and its integral gear 20 in mesh with a pinion 51 on a drive shaft 50 with its pulley 52. The gyrated head 37 supports a bowl 34 urged downwardly on the head by a thrust transmitting member 35 and a nut 36. Any suitable sealing means may be employed about the bottom of the head such as the opposed spherical surface members 43 and 45.

70 indicates a bowl support having a conic portion 71 conforming to the conic surface 4 of the main frame, and a portion 72 conforming to the surface 3 of the top of the main frame or its outward extending flange. The ring 70 is provided with apertures 73, to permit the penetration therethrough of any suitable bolts or tension members 74, which are provided with spring abutments 75, which may be adjusted as by nuts 76. The springs 77 are compressed between such abutments 75 and the horizontal portion 8.

As will appear from Figure 3, I illustrate three sets of the bolts 74 and the springs 77, in each of which six springs and bolts are shown. These are so spaced as to maintain an equalized downward thrust throughout about the circumference of the crusher.

The ring 70 has an upward generally cylindrical extension 78, having a plurality of vertical grooves 79 formed therein. It is inwardly screw threaded adjacent the top, as at 80. 81 indicates any suitable packing seated in the outer face of the upper portion thereof.

82 is an outer generally cylindrical member having an inner conic member 83, adapted to receive any suitable bowl liner 84. 85 is any suitable zinc or packing therebetween. The member 82 is outwardly threaded, as at 86, these threads being in mesh with the threads 80 of the portion 78. It will thus appear that the member 82, when rotated, as by means of any suitable lever 87, shown in dotted line in Figure 1, is raised or lowered, depending upon the direction of rotation. The lever or levers 87 shown in dotted line in Figure 1, may be received in any suitable pocket

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member or members 88, having a lever receiving aperture 89. Downwardly extending from the top ring 90 of the member 82 is a cylindrical shield 91, which may be welded or otherwise secured thereto, and which extends downwardly about and in wiping contact with the scaling ring 81, thus protecting the upper side of the screw threads from dust or grit. The lower side is protected, for example, by any suitable sealing ring 92, received in an inner portion of the member 70 and opposed to the outer wall of a lower portion of the member 82.

The member 82 may be locked against rotation for example by any suitable clamp or clamps 93, of which only one is illustrated. It may be secured to the cylindrical shield 91 as by any suitable bolt 94, and includes an inwardly extending portion 95 adapted to penetrate one of the vertical grooves or slots 79. The members 78 and 82 may further be locked together, and play may be prevented, as by the employment of bolts or thrust screws 96, with their appropriate lock-nuts 97, shown in Figure 2. The lower ends of these thrust screws abut against the top of the member 78.

The rotation of the ring 70 in relation to the main frame may be prevented by the employment of pins 100, mounted in lugs 101 on the main frame and penetrating apertured lugs 102 outwardly extending from the ring 70, as shown in Figure 6; or, if desired, supporting pins or shafts 103 may be employed, as shown in Figures 1 and 2, which constitute merely upper extensions of the pins 100 of Figure 6. These may be employed to perform the double function of preventing rotation of the ring 70 and of supporting any suitable feed platform or feed structure 104, with its inner spout 105. The feed platform 104 may be adjusted vertically along the pins 103 by any suitable sleeves 106 and nuts 107, 108, as shown in Figure 1.

The lugs 101 may be cast integral with the apron 7 of the main frame 1 or, as illustrated in Figures 1 and 2, may be secured to the apron 7 by means of bolts 110 which pass through flanges 111 on either side of the lugs 101. The lugs are further provided with a downwardly projecting flange 112 to which is welded a bar 113.

The springs 77 may be housed as by the employment of a circumferential cover 114, which may be formed in a plurality of sections. I illustrate, for example, the use of three sections, the sections being secured together by means of the bars 113 above described, which overlie the joints as illustrated in Figure 3. Bolts 115 passing through the bars 113 and the flange 112 of the lugs 101 are screw threaded into bars 116, or other suitable abutments integral with or secured, for example, by welding to the apron 7 and flange 2 of the outer frame 1. The two ends of the housing sections are provided with flanges 117 suitably formed to straddle the bearing sleeve 55.

The bowl 84 may be mounted in any suitable manner, but I illustrate a wedging connection between it and the conic bowl support 83. I illustrate, for example, a plurality of outwardly extending lugs 120, which rest upon the tapered ledges or faces 121 at the top of the member 83. The member 83 is cut away as at 122 to permit the lugs 120 to be pushed in place before the bowl liner 84 is rotated in order to lock it.

Positioned above the bowl liner is a conical feed spout 123 provided with a cylindrical upper portion 124, which is in alignment with the spout 105 of the feed structure 104. 125 generally in-

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dicates an oil feed line in communication with an oil duct 126 in the shaft 14, 15, and 127 is an oil return line which may be connected to any suitable oil reservoir and pump not illustrated in the drawings.

Referring to Figures 7 and 8, I illustrate a structure which varies in some respects from the form of the preceding figures. Different numerals are applied, however, only to differentiated parts. The main frame 1-a is provided with outwardly extending hollow ribs, each including spaced generally vertical outwardly extending wall portions 150, connected by an outer wall portion 151. These ribs are of sufficient circumferential extension to fill the vacant spaces shown for example at the top and the bottom of Figure 3, where springs are omitted. The aperture to admit the drive shaft assembly is surrounded by an annulus 153 having a flat outer surface 154 and a cylindrical surface 155. It will be observed that the housing or lagging member 156 may be formed as a single strip which extends entirely around the main frame and overlaps the surfaces 157. Thus there is a minimum outward projection of any part of the main frame. The lagging member or housing 156 may be held in position by any suitable clamps or screws not herein shown. It will be observed that the main frame flanges are recessed as at 158, 159 to receive the upper and lower edges of the lagging and to provide a smooth, flush outer surface.

It may be noted that Figure 7 includes such mantle fastening means as are disclosed in Patent No. 2,341,544 issued February 15, 1944, in the name of Oscar C. Gruender, the applicant in the present application and bowl liner fastening means such as disclosed in Patent No. 2,341,543 issued February 15, 1944, in the name of Oscar C. Gruender. Details from copending application Serial No. 455,062 now Patent 2,358,038, granted September 12, 1944 in the name of Edgar B. Symons and Ewald Werner, also appear.

The inner face of the main frame is protected by a circumferentially extending inner protective plate 160 which may be removed and replaced when worn.

The bowl structure 70a includes a preferably integral ring having an annular downwardly concave recess defined in part by an inner conic surface 170 and an outer generally cylindrical surface 171. The main frame has an opposed conic surface 172 and an outer face 173 which is generally cylindrical but is slightly outwardly bulged. Preferably there is a clearance between the bowl ring and the top of the main frame as at 175.

With reference to the adjustment of the bowl proper in relation to the outer bowl ring 70a, the cylindrical shield 91a has secured thereto one or more outwardly extending studs 180 on each of which is mounted a locking plate 181 having an adjusting slot 182, an inward extension 183 seating in a notch in the lower edge of the member 91a and a further inward extension 184 which may extend into one of the vertical grooves or slots 79.

Thus after the bowl has been set at any desired adjustment in relation to the bowl ring and the main frame, the above locking structure is effective to prevent unintended rotation.

It will be realized that, whereas I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of

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parts without departing materially from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

The use and operation of my invention are as follows:

I find it advantageous to provide a gyratory crusher of relatively small vertical height. I therefore provide a fixed shaft 14, 15, the upper portion 15 of which penetrates within the head 31, and serves as a bearing for the upward extension of the eccentric 17 within the head. However, it is not desirable to support the head upon the eccentric 17, and I therefore provide a surrounding socket bearing including the upwardly concaved spherical surfaced supporting member 30, which is opposed to a correspondingly formed lower spherical portion 33 of the head. This particular construction permits the member 30 to take a portion of the horizontal or lateral crushing force, besides sustaining the entire vertical crushing force.

Rotation of the shaft 50 and the gears 51 and 20 results in rotation of the eccentric 17. The eccentric has a bore concentric with the axis A—A of the shaft 15, but its outer cylindrical bearing surface is inclined at an angle with respect to its bore, and is concentric with the axis B—B. These two axes intersect at point C, as illustrated in Figure 2, and it is around this point that the head gyrates, resulting in a larger movement at the bottom of the head than at its top.

In order to prevent breakage due to the passage of tramp iron or uncrushable material through the machine, I provide tension members, or rods 74, with their accompanying compression springs 77.

I have to provide space for the drive shaft 50 and its associated parts, and I therefore find it desirable, in order to maintain equal moment, to divide the springs into separate groups spaced apart as shown in Figure 3. I illustrate three groups of six springs each, but of course the number may be varied. I also find it desirable to provide a recess in the frame defined at the bottom by the flange 2 and at the top by the flange 3, which recess may be closed by plates 114, the springs thus being concealed and protected against water and other corrosive elements, with the consequent improvement in the appearance of the machine.

In order to protect the threads 80, 86 from dust, I provide in effect a telescopic housing, the inner portion of which is provided by the member 82 and the outer portion by the welded ring 91, the inner and outer portion moving as a unit. 92 is a dust seal between the inner portion and the bowl supporting ring 70 and 81 is a dust seal between the outer portion 91 and the outer face of the upward extension 78 from the ring 70. The result is a simple, efficient dust seal for both the top and bottom of the adjusting threads.

In order to lock the bowl when it is set, I may employ the set screws 96, which take up play between the opposed threads and the positive locking member 93, 95, the inner portion 95 of which seats in one of the vertical grooves 79. I may employ any desired number of the members 93, 95, but three are ample, and one may be enough. The enclosed spacing of the vertical slots or grooves 79 permits the device to be locked at any desired setting. I may prevent rotation of the bowl ring 70 on the frame either

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by the pins 106, screw threaded into sockets 101, or by the feed spout supports 103.

The main frame structure shown in Figures 7 and 8 varies somewhat from the structure of earlier views. It provides a clean smooth looking exterior appearance, with a minimum of projections. The rib portions 150, contribute substantially to strengthening the main frame.

I claim:

1. In a gyratory crusher, a main frame including a circumferentially extending outer wall, said outer wall having a bottom flange extending outwardly therefrom and a top flange extending outwardly therefrom, said flanges having outer vertically aligned outer faces, said main frame having outwardly offset ribs circumferentially spaced thereabout, said ribs being integral with said flanges and defining with said flanges, a plurality of outward recesses, and a removable outer housing shell surrounding said main frame member, said upper and lower main frame flanges being recessed in their outer faces, to receive the upper and lower edges of said housing shell, the exterior of said housing shell being flush with the outer faces of said flanges.

2. In a gyratory crusher, a main frame, including a circumferentially extending outer wall, said outer wall having a reinforcing bottom flange outwardly extending therefrom and extending circumferentially thereabout, a top flange extending outwardly therefrom and circumferentially thereabout, said bottom and top flanges having outer circumferential faces generally vertically aligned and having circumferentially opposed recesses, said main frame having outwardly offset ribs circumferentially spaced thereabout, said ribs being integral with said flanges and defining, with said flanges, a plurality of outward recesses, said recesses being inwardly closed by said outer main frame wall, and a radially removable outer housing shell surrounding said main frame member and engaging said upper and lower main frame flanges with its upper and lower edges seated in opposed recesses in said flanges, said shell masking said recesses and defining a closed and substantially dust-tight space.

3. The structure of claim 2 characterized by and including a shell formed in a single piece and extending substantially entirely about the main frame.

4. In a gyratory crusher having a bowl and adjusting means for the bowl, a circumferential main frame, a bowl support tiltably mounted on the main frame, and including an upwardly extending generally cylindrical supporting sleeve, said sleeve being inwardly screw threaded and having a plurality of circumferentially spaced depressions in its outer face, a bowl structure including an outer portion threaded to engage the inward screw threading of said supporting sleeve, an outer sealing sleeve mounted on said bowl structure and extending downwardly about the exterior of the supporting sleeve in telescopic relationship and means for locking the sleeves against relative rotation and for thereby preventing relative rotation of bowl structure and supporting sleeve including a locking member movably mounted on said sealing sleeve and adapted to penetrate said depressions.

5. In a gyratory crusher having a bowl and adjusting means for the bowl, a circumferential main frame, a bowl support tiltably mounted on the main frame, and including an upwardly extending generally cylindrical supporting sleeve,

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said sleeve being inwardly screw threaded and having a plurality of circumferentially spaced depressions in its outer face, a bowl structure including an outer portion threaded to engage the inward screw threading of said supporting sleeve, an outer sealing sleeve mounted on said bowl structure and extending downwardly about the exterior of the supporting sleeve in telescopic relationship and means for locking the sleeves against relative rotation and for thereby preventing relative rotation of bowl structure and supporting sleeve including a locking plate and means for movably securing it to the exterior of said sealing sleeve, said plate including an inward extension adapted to extend into said depressions.

6. In a gyratory crusher having a bowl and adjusting means for the bowl, a circumferential main frame, a bowl support tiltably mounted on the main frame, and including an upwardly extending generally cylindrical supporting sleeve, said sleeve being inwardly screw threaded and having a plurality of circumferentially spaced depressions in its outer face, a bowl structure including an outer portion threaded to engage the inward screw threading of said supporting sleeve, an outer sealing sleeve mounted on said bowl structure and extending downwardly about the exterior of the supporting sleeve in telescopic relationship and means for locking the sleeves against relative rotation and for thereby preventing relative rotation of bowl structure and supporting sleeve including a locking plate and means for movably securing it to the exterior of said sealing sleeve, said plate including an inward extension adapted to extend into said depressions, the lower edge of said sealing ring being notched to receive said inward extension.

7. In a gyratory crusher having a bowl and adjusting means for the bowl, a circumferential main frame, a bowl support tiltably mounted on the main frame, and including an upwardly extending generally cylindrical supporting sleeve, said sleeve being inwardly screw threaded and having a plurality of circumferentially spaced depressions in its outer face, a bowl structure including an outer portion threaded to engage the inward screw threading of said supporting sleeve, an outer sealing sleeve mounted on said bowl structure and extending downwardly about the exterior of the supporting sleeve in telescopic relationship and means for locking the sleeves against relative rotation and for thereby preventing relative rotation of bowl structure and supporting sleeve, including a bolt extending outwardly from said sealing ring, a locking plate having a vertical adjustment slot through which said bolt passes, a nut adapted to urge said locking plate against the outer face of said sealing sleeve and an inward projection on said locking plate adapted to enter said depressions.

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8. In a gyratory crusher, a main frame, a bowl support on said main frame, having an upstanding generally cylindrical portion with an internal thread thereon, a bowl adjustable within said bowl support and having a generally cylindrical inner sleeve with an external thread in mesh with said first-mentioned thread, an exterior sleeve extending downwardly about the exterior of the upstanding portion of the bowl support, said exterior sleeve being permanently connected to the interior sleeve, the two sleeves constituting a substantially closed housing, said upstanding cylindrical portion having a plurality of locking members formed in its exterior surface, and a locking element movably mounted on said downwardly extending exterior sleeve, adapted for locking interpenetration with said locking members.

9. In a gyratory crusher, a main frame, a bowl support on said main frame, having an upstanding generally cylindrical portion with an internal thread thereon, a bowl adjustable within said bowl support and having a generally cylindrical inner sleeve with an external thread in mesh with said first-mentioned thread, an exterior sleeve extending downwardly about the exterior of the upstanding portion of the bowl support, said exterior sleeve being permanently connected to the interior sleeve, the two sleeves constituting a substantially closed housing, said upstanding cylindrical portion having a plurality of locking members formed in its exterior surface, and a locking element movably mounted on said downwardly extending exterior sleeve, adapted for locking interpenetration with said locking members, said locking members being in the form of vertical grooves having a substantially vertical extension.

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