

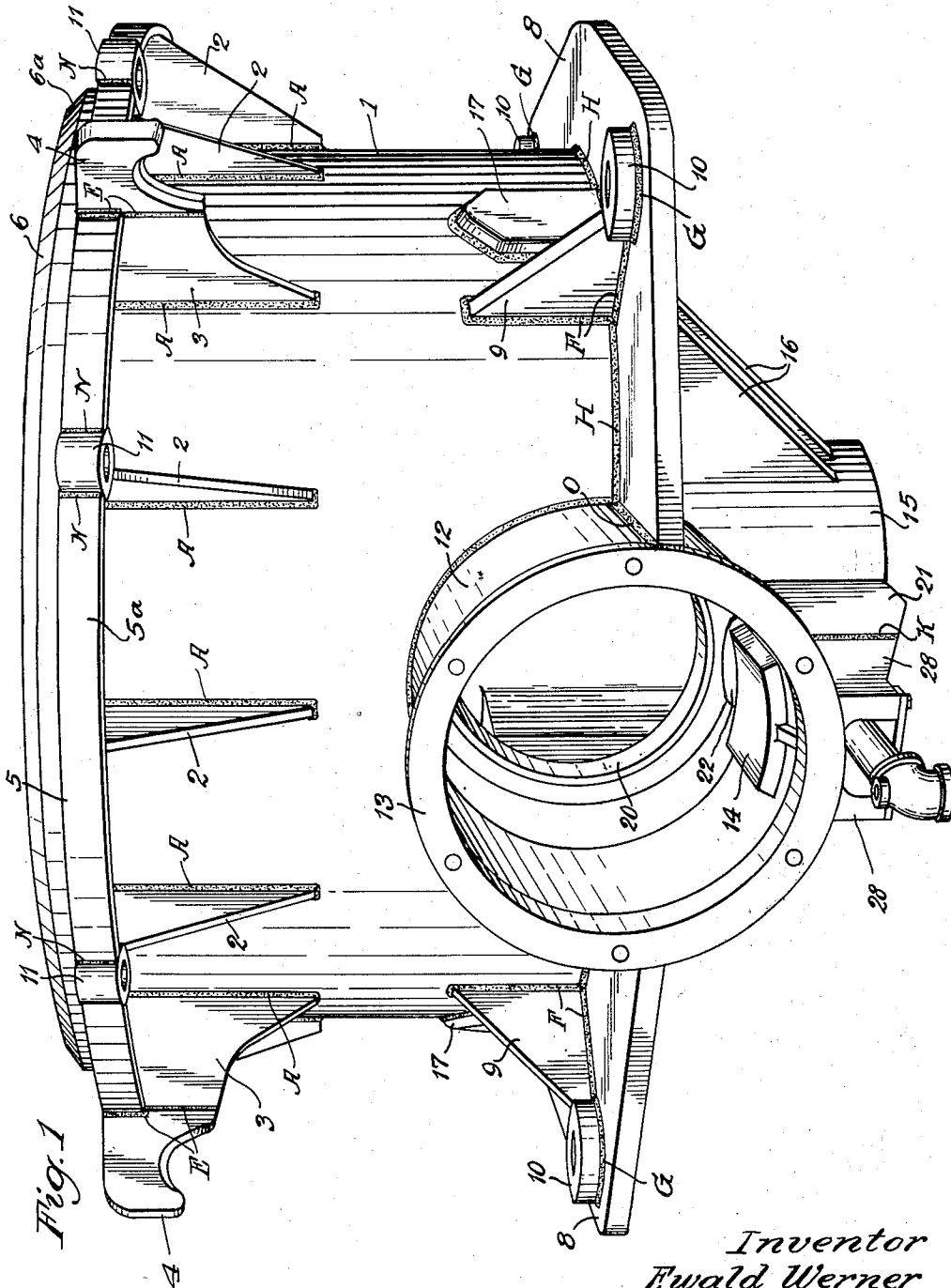
Nov. 18, 1958

E. WERNER
CRUSHER MAIN FRAME

2,860,837

Filed Aug. 11, 1953

6 Sheets-Sheet 1



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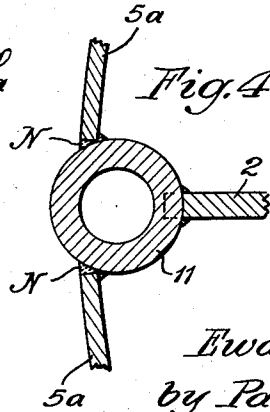
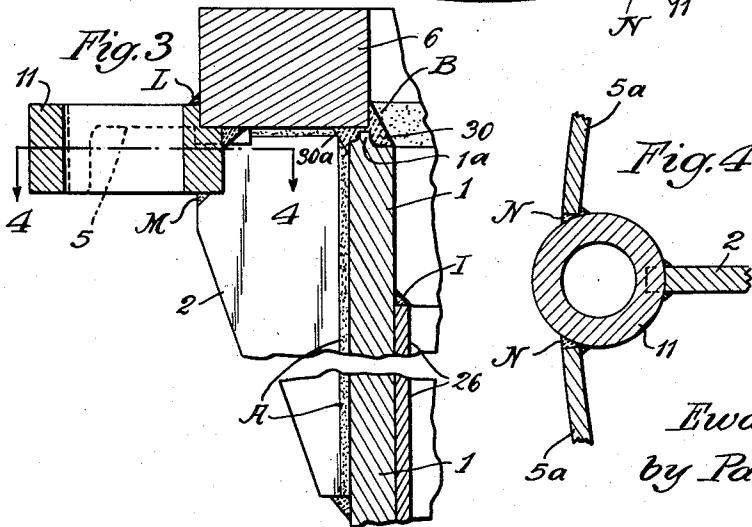
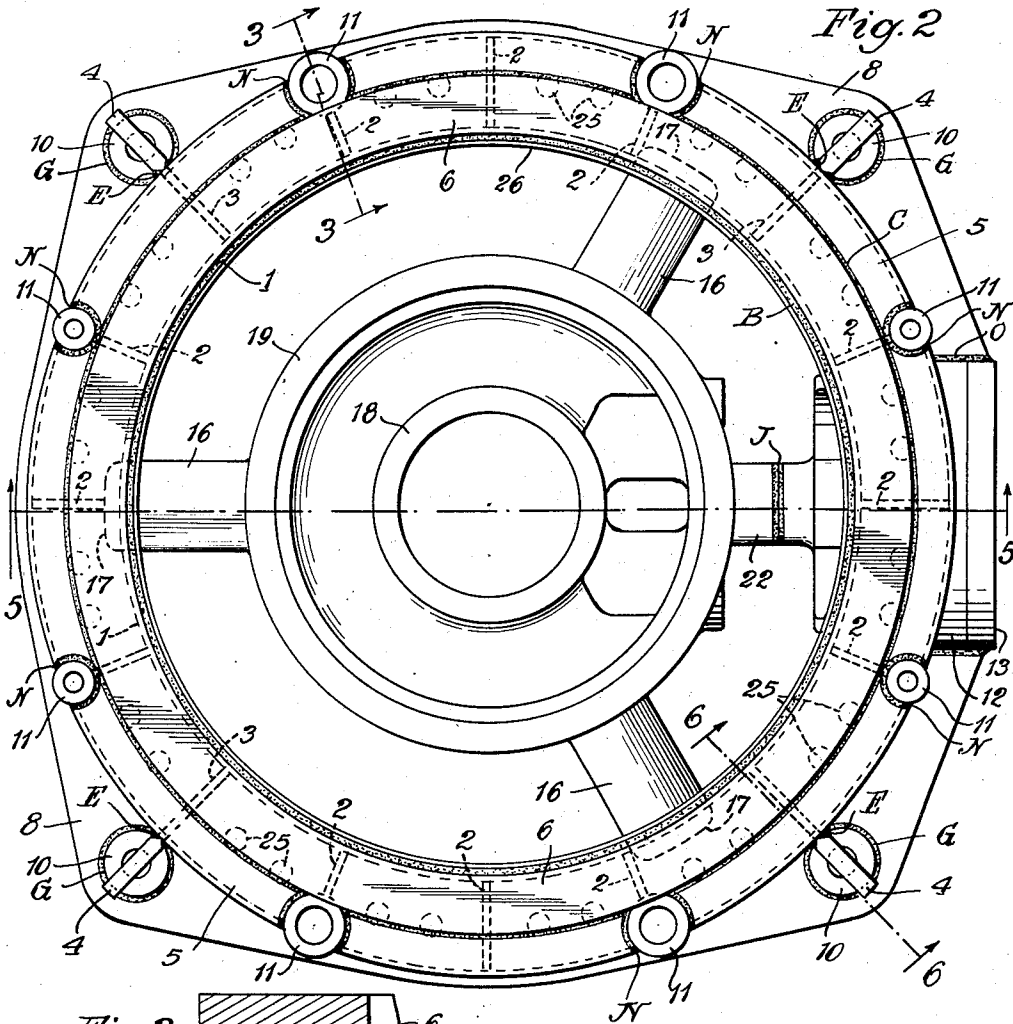
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6 Sheets-Sheet 2



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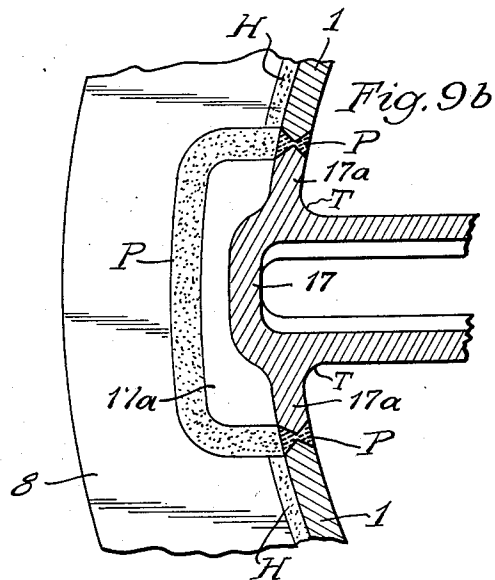
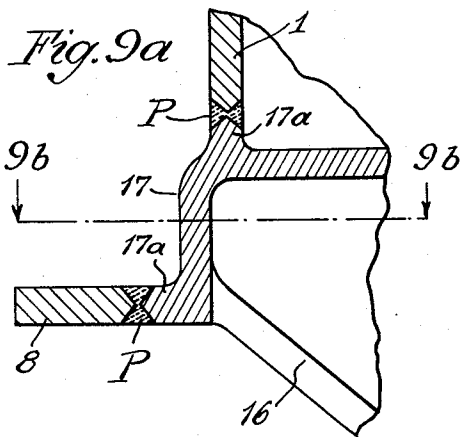
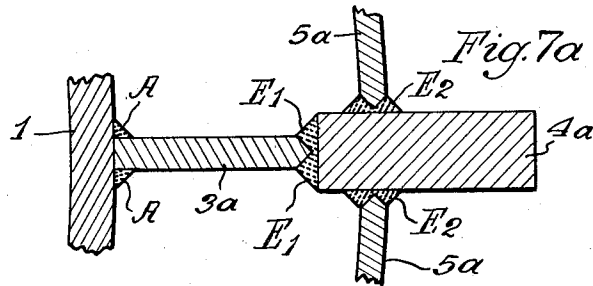
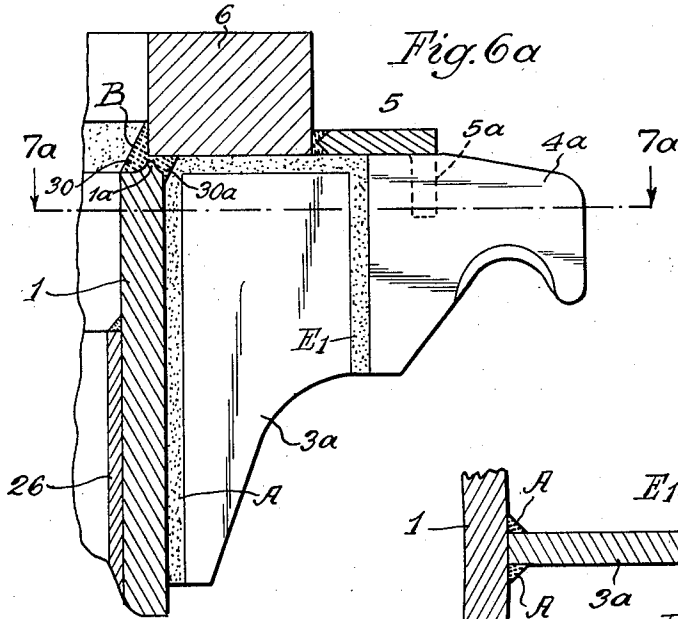
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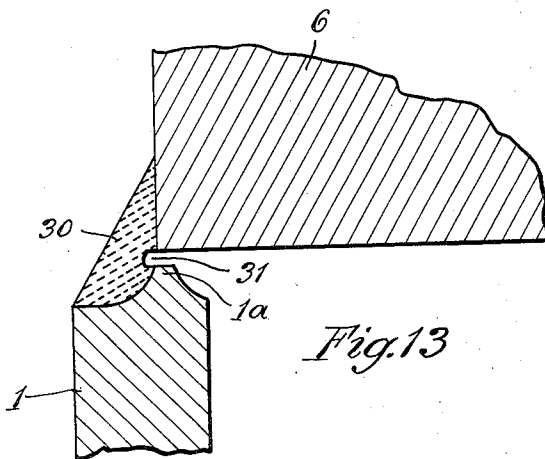
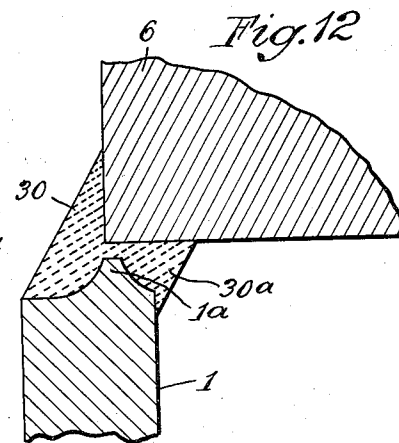
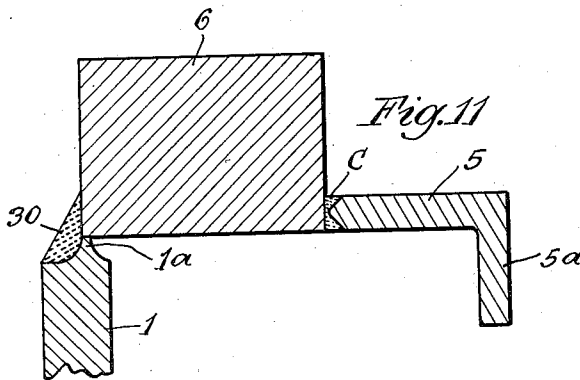
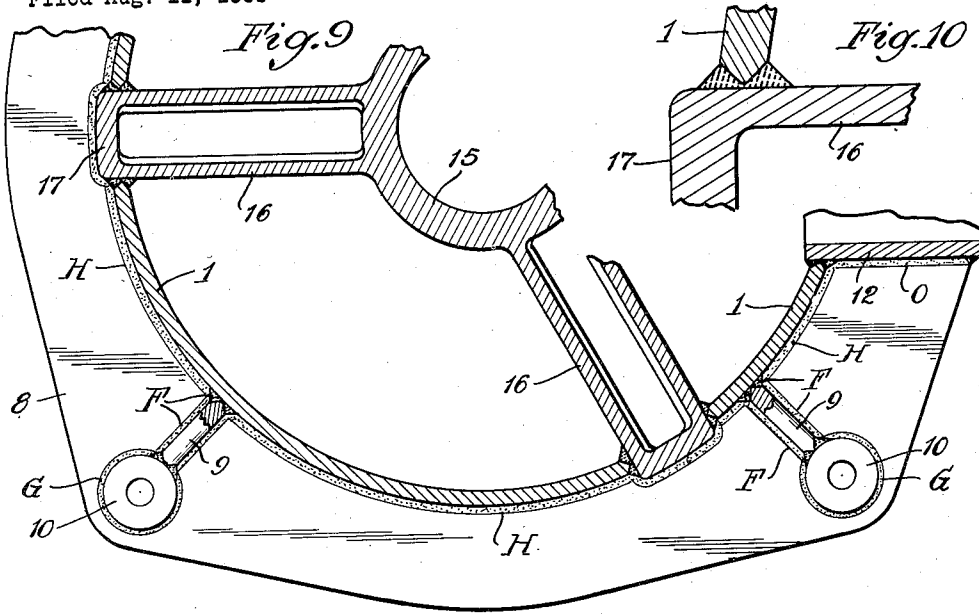
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6 Sheets-Sheet 5



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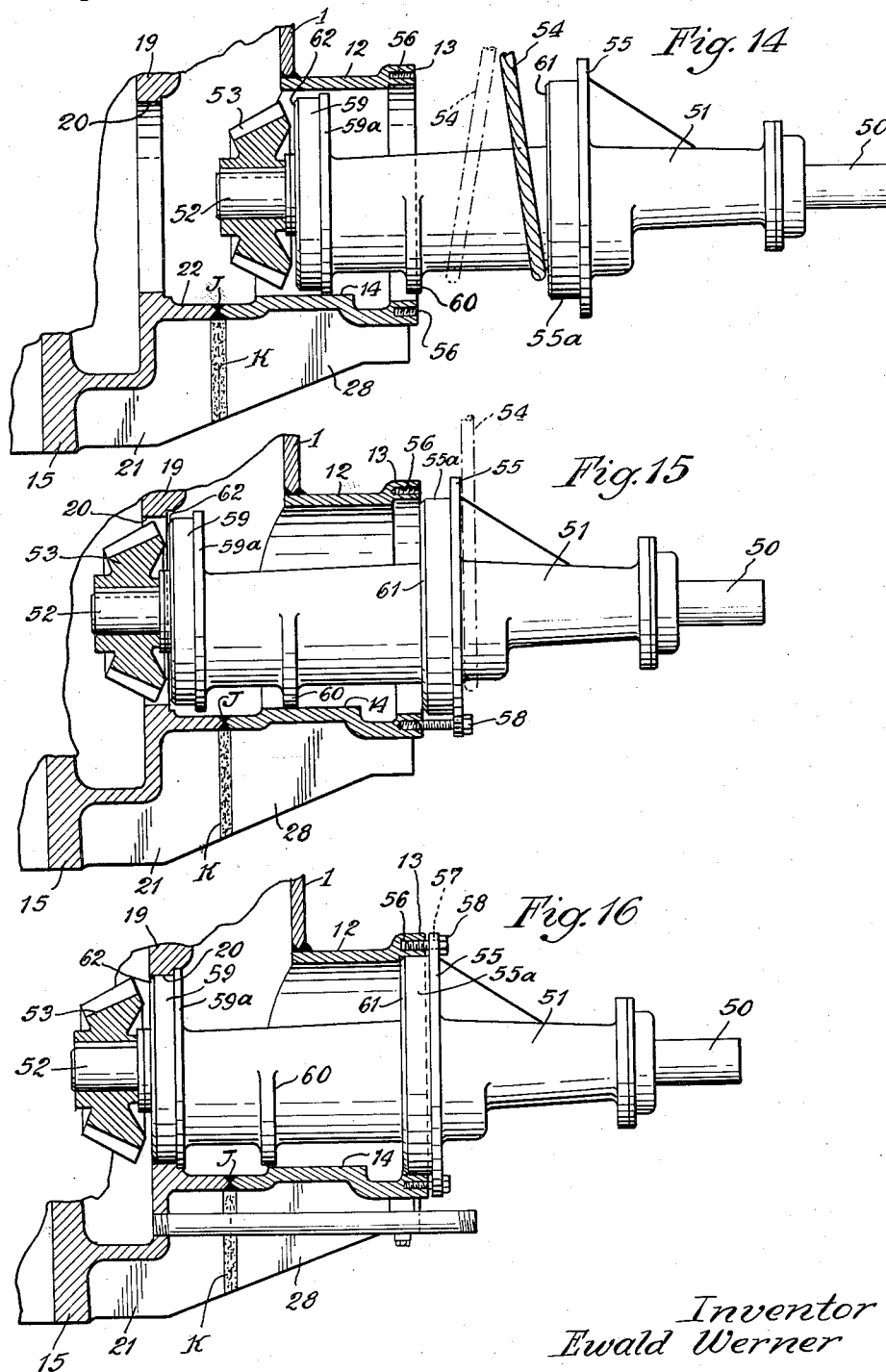
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CRUSHER MAIN FRAME

Filed Aug. 11, 1953

6 Sheets-Sheet 6



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2,860,837

CRUSHER MAIN FRAME

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Application August 11, 1953, Serial No. 373,576

7 Claims. (Cl. 241—285)

My invention relates to crushers, for example, stone crushers, and has particular relation to crusher frames, to the relationship of the parts thereof and to the method of constructing same.

My invention has for one purpose to provide a crusher frame in which shall be combined the maximum in strength with a maximum in ease of manufacture.

Another purpose is to provide a method of constructing a crusher frame which shall be effective to produce, with a maximum of ease in manufacture and a minimum in cost, a crusher frame which shall be equal or superior in strength to crusher frames constructed in accordance with prior methods.

Another purpose is to provide a crusher frame and a drive means for driven members within said frame, the frame and drive means being formed for cooperation one with the other to insure the proper fit therebetween and to remove the difficulty surrounding the separation and reassociation of such a frame and drive means.

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

I illustrate my invention, more or less diagrammatically, in the following drawings, wherein:

Figure 1 is a side elevation of a crusher frame constructed in accordance with my invention;

Figure 2 is a top view;

Figure 3 is a section on a line 3—3 of Figure 2;

Figure 4 is a section on a line 4—4 of Figure 3, on a scale reduced from that of Figure 3;

Figure 5 is a section on a line 5—5 of Figure 2;

Figure 6 is a section on a line 6—6 of Figure 2;

Figure 7 is a section on a line 7—7 of Figure 6;

Figure 8 is a detailed view, in partial cross section, illustrating certain steps in the process of constructing a crusher frame;

Figure 9 is a detailed view, in partial cross section, illustrating the formation of other parts of the crusher frame and taken on the line 9—9 of Figure 5;

Figure 10 is a detailed view of a portion of Figure 9, on a scale enlarged over that of Figure 9;

Figure 11 is a detailed view illustrating one step in the practice of my invention;

Figure 12 is a detailed view illustrating another step in the practice of my invention;

Figure 13 is a detailed view illustrating still another step in the practice of my invention;

Figure 14 is a side view, in partial cross section, of the cooperating parts of a crusher frame and drive means, constructed and associated in accordance with my invention;

Figure 15 is a side view of the structure illustrated in Figure 14, the parts being in a different relative position;

Figure 16 is a side view of the structure illustrated in Figures 14 and 15, with the parts in operating position; and

Figures 6a, 7a, 9a and 9b are detailed sections illustrating modified forms of certain parts of the crusher illustrated in Figure 1.

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

Referring now to the drawings, and particularly to Figure 1, the upright, cylindrical side wall of a crusher frame is illustrated at 1. Indicated at 2 are a number of normally triangular rib braces attached to extend outwardly and upwardly from the side wall 1. Illustrated at 3 are a number of ribs similar to the ribs 2 but somewhat larger, the ribs 3 having downwardly curved lugs 4 extending outwardly therefrom. 5 illustrates an outwardly extending downwardly bent annular flange ring surrounding the upper portion of the frame 1 and adapted to overlie the ribs 2 and 3 to provide an upper cage member for yieldable release mechanisms (not shown), at times associated with stone crushers and the like. The ribs 2 and 3 serve as dividing walls between such individual release members. Since such yieldable release mechanisms form no part of the present invention they will not be further discussed.

Continuing to refer to Figure 1, with the understanding that Figure 1 illustrates the completed crusher frame, 6 generally illustrates an annular bowl support ring arranged above the upper reaches of the frame wall 1. An annular, outwardly extending bottom or base flange is illustrated at 8. Ribs 9 may be attached to the lower portion of the frame wall 1 to extend downwardly and outwardly for attachment to the flange 8. 10 illustrates raised bosses through which attaching means may be inserted for attaching the crusher to a supporting base. 11 indicates similar bosses on the cage member 5, which bosses may be utilized for guiding other portions of crusher mechanisms not illustrated or material herein. 12 illustrates a cylindrical member or boss extending through the frame wall 1 and adapted to receive and provide for the passage therethrough of a drive means normally required to drive mechanism within the frame wall 1. The member 12 has an outwardly facing apertured ring 13, the employment of which will be discussed hereinafter, and a pad 14, which likewise will be discussed in greater detail hereinbelow.

Supported within and below the frame member 1 is the generally vertical cylindrical member or hollow shaft member 15. The member 15 is supported from and connected to the frame wall 1 by the radial arms or ribs 16, which extend upwardly and outwardly from a lower portion of the member 15 and which have reduced outer end portions 17 extending through the wall 1.

As will be best seen from a view of Figure 5 the member 15 has the central hollow shaft or cylindrical bearing member 18 extending upwardly into the area surrounded by the wall 1. Secured to and surrounding the member 18 is the generally cylindrical wall 19 which is spaced from the wall of the member 18. The wall 19 is apertured as at 20 to permit the passage therethrough of a driving member for engagement with a driven member normally located in the space between the wall 19 and the upper portion 18. 21 indicates a radial, upwardly extending rib on the member 15 similar to the ribs or arms 16. The wall 19 has an outwardly extending portion 22 adjacent the aperture 20.

The crusher frame depicted in Figure 1 is constructed, in accordance with my invention, by the process of welding together, at particular points and in a particular manner, the elements and parts of the crusher frame. Considering first the points at which the welds are made, it will be seen that the ribs 2 and 3 are welded to the outer side of the wall 1 throughout the length of the rib 2 as at A, as may be best seen from a view of the left hand portion of Figure 7. The bowl support ring 6 is welded to the top edge of the frame wall 1 throughout the perimeter of the frame and the ring, as at B, best seen in Figure 8. The cage ring 5 is welded to the bowl supporting ring

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6 throughout the perimeter of the ring as at C, best illustrated in Figure 11, and the depending portion 5a of the cage ring 5 is also welded to the ribs 2 and 3 as at D. The lugs 4 are welded to the cage ring 5 and to the ribs 3 as at E. A release mechanism-centering projection 25 may be welded to the underside of the bowl support ring 6 and to the cage ring 5, as best seen in Figure 8, in order to provide a centering means for springs or the like, forming part of such mechanism contained beneath the two rings. The ribs 9 may be welded to the frame wall 1 and to the lower base flange 8 as at F. The bosses 10 are welded to the flange 8 and to the lower outer point of the rib 9 as at G. The flange 8 is welded to the wall 1 throughout the inner perimeter of the flange 8 as at H. 26 indicates an inner frame liner which may be welded to the inner surface of the wall 1 at points about its upper circumference as at I. The lower portion of the member 12 may be welded to the extension 22 as at J and may have a vertical downwardly extending rib 28 which may be welded to the rib 21 as at K and which may be formed as an extension of the rib 21. The bosses 11 may be welded to the lower outer portion of the bowl liner 6 as at L and to the corresponding rib 2 as at M and to the cage ring 5 as at N. The lower flange 8 is welded to the member 12 as at O.

In the modified forms illustrated in Figures 6a and 7a, the lugs 4a may be of greater and ribs 3a of lesser extension radially from the wall 1, in order to facilitate welding and to further strengthen the structure. The variance in size of the lugs 4a and ribs 3a is such as to place a part of the lugs 4a within the perimeter defined by the depending portion 5a of the cage ring 5. Thus the lugs 4a are welded to the ring 5 and ribs 3a as at E1, and to the depending portion 5a as at E2.

In the modified form shown in Figures 9a and 9b, the end portions 17 of the triangular ribs 16 have a skirt or flange 17a projecting outwardly at right angles from the top, sides and front face of the end portion 17. The edges of this skirt 17a are welded in the same manner as the faces of the end portion 17 shown in Figure 9 and the welds are shown at P in Figures 9a and 9b.

As seen in Figure 9, the welds securing the rib-ends 17 form, in effect, rough substitutes for fillets with the frame-wall 1 and the support flange 8. These rough areas are not only subjected to wear and vibration, but, particularly in heavy or rough duty machines, also tend to promote conditions of cleavage. In such cases at least I prefer to provide the alternative shown in Figures 9a, 9b, wherein true fillets are preformed integrally with and as a part of the rib-end 17, that is, the skirt 17a is formed with the rib 16 in such manner as to produce the curved juncture or fillet such as that shown at T in Figure 9b.

One portion of my invention which may be described as a method of construction of devices, such as the crusher frame illustrated, is shown in Figures 11, 12 and 13. While these figures are such as to illustrate the method of joining the upper end of the frame wall 1 to the bowl support ring 6, it will be understood that other elements of the crusher frame, above described, are joined in a manner similar to that now to be described.

Referring to Figure 11 it will be seen that the upper, top face of the frame wall 1 is formed in a particular manner, i. e. so as to have the upwardly tapered, generally frusto-conical annular upward extension 1a. The member to be joined, in this case the bowl support ring 6 is brought to rest on the top face of the member 1a which, as will be seen from Figure 11, is spaced inwardly from both the outer and inner surfaces of the wall 1. A mass of weld material 30 is then welded to the lower inner circumferential face of the ring 6, to the inner upwardly curved surface of the member 1a and to that portion of the top face of the wall 1 between the member 1a and the upper inner corner edge of the wall 1. The ring 6 thus being secured to the wall 1 by the mass of weld ma-

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terial 30, a cut is then made inwardly from the opposite side of the wall 1 as indicated at 31. The cut is sufficient to remove a substantial upper portion of the projection 1a and is of sufficient depth to extend inwardly into and to remove a portion of the weld mass 30. A second mass of weld material 30a is then placed between the lower surface of the ring 6, the outer tapering face of the remaining portion of the projection 1a and, in the case illustrated, to a portion of the upper circumferential outer face of the wall. The cut 31 must be sufficient to remove all direct contact between portions of the wall 1 and the ring 6 and thus to permit contact of the two weld masses 30—30a. It need not extend into the first-applied weld mass, but I find such a cut to be preferable in insuring a completely satisfactory result.

While Figure 11—13 are cross sectional views, it will be understood that the weld mass 30—30a, as illustrated in Figure 12, extends throughout the perimeter of the wall 1 and the ring 6. It will be further understood that each of the welds shown in the drawings and described above are accomplished in a similar manner. While the drawings illustrate a crusher frame it will be clear that many devices, formed of metal, may be constructed in accordance with the invention illustrated in Figures 11—13.

The bowl support ring 6, as illustrated in Figure 1, has the upwardly and inwardly tapered upper side faces 6a—6b, which, in some crusher machines, permits the bowl, normally supported on the inner tapered face 6b thereof, to tilt upwardly upon the presence of uncrushable material within the crushing area of such machines, as is known. Figure 8 illustrates the steps in my process of constructing such machines by which these faces 6a—6b are produced. The ring 6 is of generally rectangular cross-section when it is secured to the frame wall 1 as above described. The outer tapered face 6a, which as indicated in dotted lines, may be tapered at an angle of 45 degrees, is then produced by well known cutting and finishing methods. It will be noted that the weld mass 30 has an upwardly, outwardly tapered surface extending from the inner upper corner edge of the frame wall 1 to a point slightly below the mid-point on the circumferential inner wall of the ring 6, the weld surface thus rising at an angle of approximately 30 degrees. An initial tapered cut may be then made in the inner wall of the ring 6 to produce a taper of say 30 degrees from the upper edge of the weld mass 30. A finishing cut is then made, also of say 30 degrees, which finishing cut extends across the surface of the weld 30 as well as the face 6b, the two cuts in relation to the face 6b being illustrated in dotted lines in Figure 8.

In Figures 14—16, I illustrate that portion of my invention wherein a crusher frame and drive means are formed for cooperation one with the other to accomplish a particular result. 50 indicates a drive shaft which extends through and is journaled for rotation in a shaft bearing or shaft housing 51. Carried at the opposite inner end 52 of the shaft 50 is the beveled gear 53. 54 is a suspension cable adapted to surround and support the shaft housing 51. An annular flange, of a diameter corresponding to the face 13 of the boss member 12, is indicated at 55. Indicated at 55a is an annular enlargement on the shaft 51 adapted for feeding within the outer end portion of the member 12. The face 13 has the threaded apertures 56 and the flange 55 has the apertures 57 through which a securing means 58 may be inserted for threading into the aperture 56 to secure the shaft housing 51 to the member 12 and thereby to the crusher frame.

Indicated at 59 is a member, similar to the enlargement and flange 55a—55, which is adapted for insertion into the opening 20 to permit the beveled gear 53 to assume its operating position between the spaced walls 18 and 19 of the member 15. The portion 59 has an annular flange 59a adapted to seat over the perimeter area of the opening 20. While the flange 59a is shown, it is not necessary

and the portion 59 will be hereinafter described as a single unit. The shaft housing 51 carries a semi-annular flange 60 surrounding a lower portion of housing 51 between the flange 55 and the housing portion 59.

As will be noted in Figures 14-16 the enlargement 60 is adapted to ride upon the pad 14 in the floor of the member 12 as the member 51 is moved thereinto and therethrough. The enlargement 55a has the chamfered inner face 61 and the portion 59 has the chamfered inner face 62, to facilitate entry of the member 55a into the member 12 and of the portion 59 into the opening 20. As will be seen from a view of Figure 16 the entry of the portion 59 into the opening 20 causes a slight raising of the housing 51 and a corresponding slight lifting and separation of the enlargement 60 from the pad 14. The pad 14 is of sufficient linear extension to bridge the distance between the portion 59 and the enlargement 60. As indicated in dotted lines in Figures 14 and 15 the supporting cable 54 assumes an angle downwardly and inwardly inclined toward the member 12 as the drive means is inserted thereinto and as the member 55a approaches the member 12 and the flange 60 rests upon the pad 14 the cable is removed to a new position on the housing 51 on the opposite side of the flange 55.

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 parts without departing 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 provide a crusher frame which may be formed of individual prefabricated elements such as a circumferential framing wall 1, the ribs 2-3, a cage ring 5, bowl support ring 6, lugs 4 ribs 9, lower flange 8 bosses 10 and 11, boss member 12, internal member 15 and the web formed of the radial ribs 16. The preformed elements enumerated are welded in a particular manner to fabricate my crusher frame. The ribs 16 have end portions 17 extending through the wall 1. The ribs 16 are shown as generally triangular in shape with a base along the vertical wall of the central member 15 and an apex (ends 17) extending through the wall 1 at the base thereof. This feature permits the application of my welding process to the securing of the internal mechanism support to the frame wall, since a weld mass is applied from both sides of the wall 1 to the ends 17 of the ribs 16, as illustrated best in Figures 9 and 10.

I further provide a method of construction wherein metallic parts to be joined are formed in a particular manner prior to the securing step of welding and wherein the securing step incorporates the removal of a part of at least one of the joined members and may include also removal of a portion of an initially applied mass of weld material. Upon completion of the securing welding operation the parts to be joined are nowhere in direct contact one with the other but, on the contrary, are separated throughout the area surrounding the point of joining by a continuous mass of weld material. The weld mass completely covers the possible area of contact also so that no open spaces remain. I have found that this method of joining produces a maximum of static and fatigue strength and the minimization or elimination of stress weaknesses in the joint between the members to be joined. At no place is there permitted an open unfilled space between the members to be joined and at no place are the members in direct contact one with the other. It will be realized that, whereas in Figure 13 I illustrate the removal of a portion of the originally applied weld mass the invention may be practiced by the removal of a portion of one of the members, such as the upper portion of the projection 1a, without the removal of a por-

tion of the initially applied weld mass, but I find such removal to be preferable.

I further provide means whereby a drive means for mechanisms such as gyratory crushers may be easily and simply inserted and removed from such mechanisms with the minimum of difficulty. The drive means, which incorporates a massive drive shaft housing with the internal shaft and bevel gear, presents substantial difficulties. The operator, of course, cannot see within the crusher frame as the drive means is being inserted. He is, therefore, forced to manipulate the outer end of the shaft 50 and housing 51 to attempt to align the inner housing bearing, indicated in Figures 14-16 as the portion 59, with a bearing or opening, such as illustrated at 20, in order to insert the drive means. When the massiveness of the drive means structure is considered it is realized that such manipulation presents difficulties. It is, of course, necessary that the beveled gear which is normally of a diameter only slightly less than an opening such as that illustrated at 20 shall not be permitted to strike portions of the crusher as it is inserted. Similar problems and difficulties are met in the removal of the drive means for repairs. Thus it is, with prior structures, it has been common practice for an operator to insert a supporting cable or the like downwardly through the crushing members and within the frame 1 to attempt to encircle the inner portion of the shaft housing 51 to support it. Prior practice also has had a man stationed below the crusher structure to observe the position and movement of the drive means and to shout instructions, an obviously dangerous practice. An elimination of these difficulties is achieved with the provision of my pad 14 and enlargement 60 along with the particular formation of the housing bearing or portion 59. As the drive means is initially inserted its outer portion is supported by means such as the cable 54 and its inner portion carrying the beveled gear 59 is supported on the pad 14 by the contact therewith of the portion 59 immediately adjacent the beveled gear 53. The pad 14 is of sufficient linear extension to provide a support for the inner portion of the drive means for substantial length of travel as the drive means is inserted. As the portion 59 is about to leave the innermost edge of the pad 14, during the course of insertion, the enlargement 60 is brought into contact with the outermost edge of the pad 14 to support the inner portion of the drive means during the remainder of its travel, as indicated at Figure 15. As the chamfered inner face 62 of the portion 59 makes contact with the outer perimeter of the opening 20 a very slight pressure is sufficient to force the inner end of the drive means upwardly into alignment with the opening 20 to permit the final insertion of the portion 59 into the opening, the enlargement 60 being raised off its seat on the pad 14 by the action of the chamfered face 62 with the outer edge of the opening 20.

The reverse is true when the drive means is removed from the crusher structure. A support or sling is placed about the outer portion of the member 51. Securing means 58 are then removed. The drive means is then backed a sufficient distance to permit the portion 59 to leave the opening 20, the entire inner portion of the drive means being permitted to ride gradually downward a very slight distance as the chamfered face 62 travels over the outer perimeter edge of the opening 20, to permit the enlargement 60 to seat once again on the pad 14. As the enlargement 60 is about to leave the outer edge of the pad 14, during the continued course of removal of the drive means, the portion 59 is brought into seating contact on the pad 14 to continue the support of the inner portion of the drive means until such time as the portion leaves the pad 14. By this latter time virtually the entire drive means has been removed from the crusher structure sufficient to permit its complete support by other means such as slings.

I claim:

1. In a housing for driven mechanism and a drive means therefor having a gear, a shaft and a housing for said shaft, an enlargement adjacent the inner end of said shaft housing, an inwardly chamfered face on said enlargement, means for supporting said drive means during its excursion into said mechanism housing comprising a passage in said mechanism housing adapted to permit the excursion therethrough of said drive means, a raised portion in the floor of said passage and a second enlargement on said shaft housing, said first and second enlargements being adapted to ride on said raised portion during said excursion, a seat in said housing for said first enlargement, the lower portion of said seat being adapted to contact said seat and upon continued inward excursion to rise upwardly into said seat whereby said second enlargement is lifted off and held above said raised portion.

2. In a housing for driven mechanism and a driving means for said mechanism having, a shaft housing, a shaft extending through said shaft housing and a gear on said shaft outside said shaft housing, means for guiding the insertion of said drive means into said mechanism housing comprising a passage in said mechanism housing, a raised portion in the floor of said passage adjacent the inner end thereof, a second raised portion in the floor of said passage extending upwardly to a height less than that of said first raised portion, and members on said shaft housing adapted to ride on said second raised portion during the excursion of said drive means through said passage, said passage being substantially larger in diameter than said housing.

3. The structure of claim 2 wherein said shaft housing members include a chamfered enlargement adjacent the forward portion of said shaft housing and a second enlargement, of substantially equal diameter with said first enlargement and positioned on said housing behind said first enlargement, said chamfered enlargement being adapted to contact said first raised portion and to ride upwardly thereover, said second enlargement adapted to ride on said second raised portion prior to said contact between said first enlargement and said first raised portion and to be raised out of contact with said second raised portion when said chamfered enlargement is seated upon said first raised portion.

4. The structure of claim 3 wherein said second raised portion is of sufficient linear extension laterally of said passage to bridge the distance between said first enlargement and said second enlargement.

5. A frame for crushers and the like, including a horizontally disposed, generally ring-like supporting plate

having a central aperture therein, a vertically disposed circumferential frame wall welded along its lower edge to said plate within said aperture, a plurality of lower supporting rib members welded to the upper surface of said plate and the outer surface of said wall, a massive ring welded to said frame wall along and above the upper edge of said wall and extending outwardly beyond the periphery of said wall, and a plurality of upper rib members welded to the lower surface of said ring and the outer surface of said wall, said ring having its inner and outer peripheral surfaces inclined in upwardly converging planes, said ring being secured to the frame wall by a mass of weld material having an inner peripheral edge lying in the same inclined plane as that of the inner peripheral surface of said ring.

6. A main frame for gyratory crushers and the like, including a circumferential frame wall, a housing for gyratory mechanism within the frame wall, the housing having generally radially disposed supporting arms extending outwardly therefrom, the supporting arms being paired with the extremity of each pair being closed by an integral end wall which projects slightly through and beyond the frame wall, openings in the frame wall at spaced intervals into and through which the paired arms extend, the extremity of the paired supporting arms generally closing the openings in the frame wall, and weldments connecting the paired arms and the edges of the openings in the frame wall to provide a unitary main frame.

7. A main frame for gyratory crushers and the like, including a circumferential frame wall, a housing for gyratory mechanism within the frame wall, the housing having generally radially disposed supporting arms extending outwardly therefrom, openings in the frame wall at spaced intervals into which the arms extend, integral flanges on the extremity of the supporting arms generally closing the openings in the frame wall, and a weldment connecting the flanges and the edges of the openings in the frame wall to provide a unitary main frame.

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