C. L. CARMAN.

CRUSHER.

APPLICATION FILED AUG. 19, 1920.

1,436,338.

Patented Nov. 21, 1922.

3 SHEETS—SHEET 1.

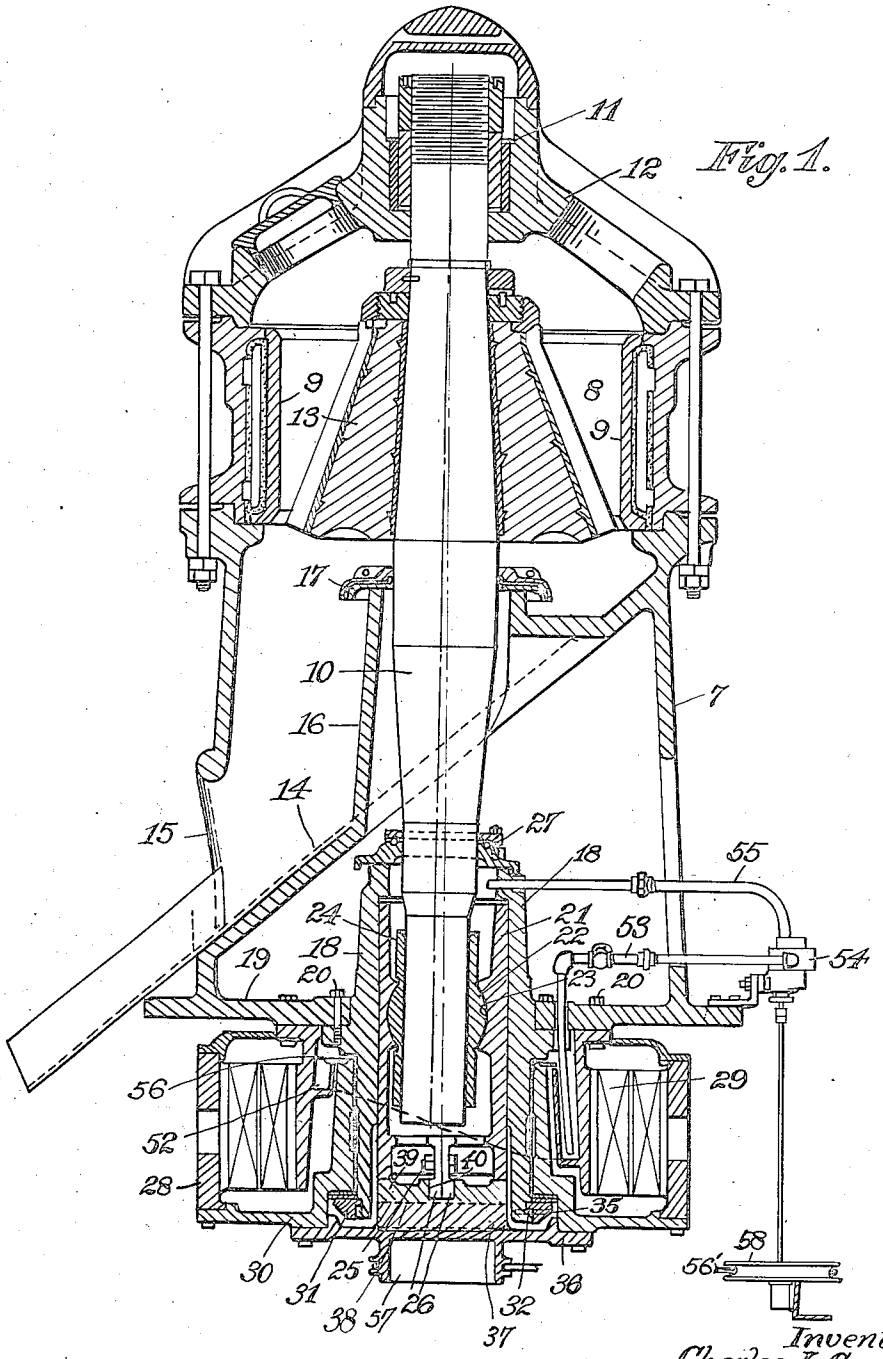


Fig. 1.

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By his Attorney
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3 SHEETS—SHEET 2.

Fig. 2.

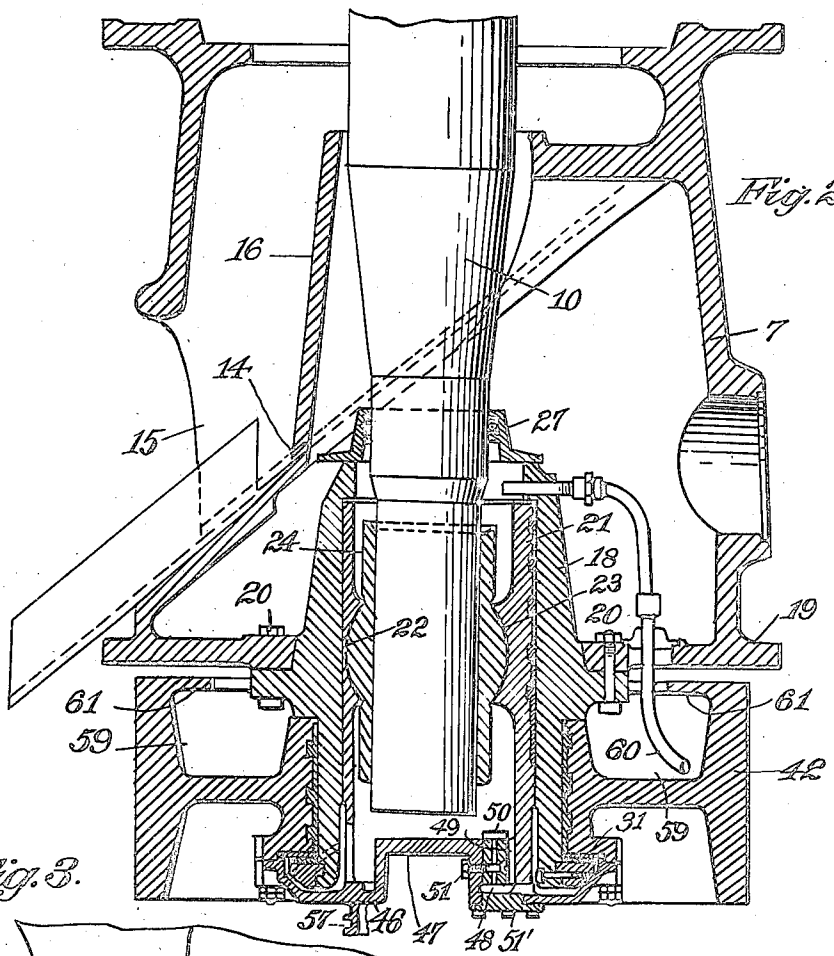
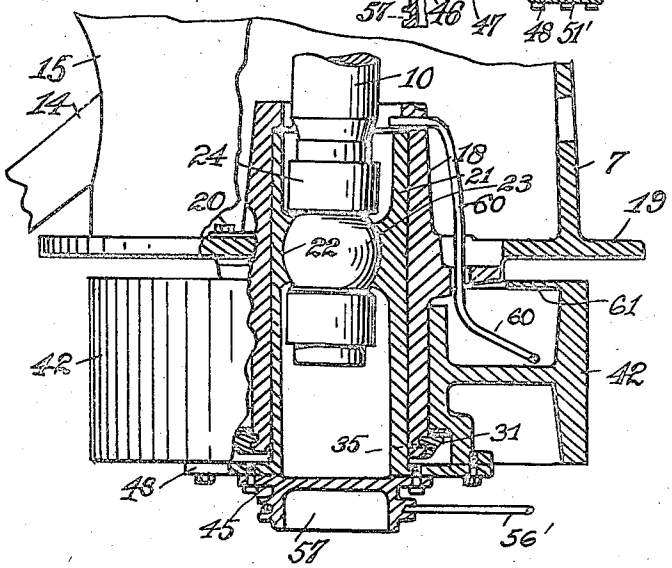


Fig. 3.



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3 SHEETS—SHEET 3.

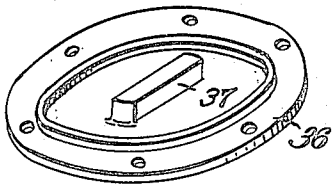


Fig. 5.

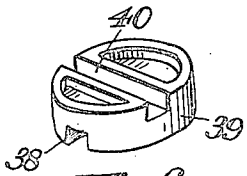


Fig. 6

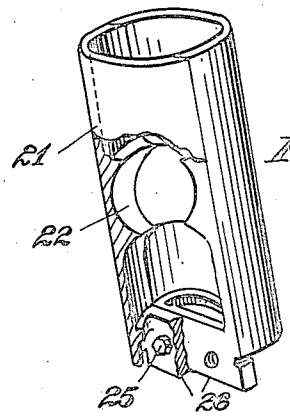


Fig. 4.

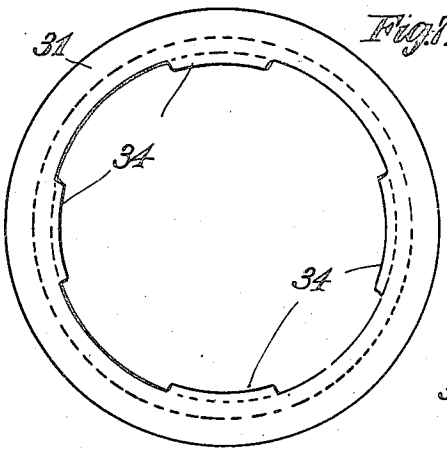
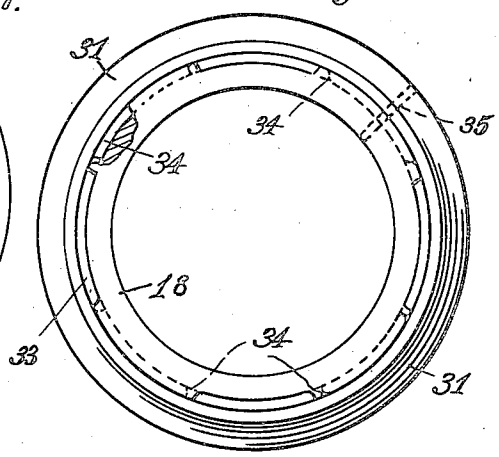


Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES L. CARMAN, OF NEW YORK, N. Y., ASSIGNOR TO JOSEPH E. KENNEDY, OF NEW YORK, N. Y.

CRUSHER.

Application filed August 19, 1920. Serial No. 404,000.

To all whom it may concern:

Be it known that I, CHARLES L. CARMAN, a citizen of the United States, and a resident of the borough and county of Bronx, city and State of New York, have invented certain new and useful Improvements in Crushers, of which the following is a specification.

This invention relates to crusher apparatus for crushing stone, ore or other material, and relates particularly to crushers known as gyratory crushers, and it is the object of the invention to provide improved driving means to impart gyratory movement to a gyratory crushing member in this type of crusher which is novel, simple and cheap in structure, and highly efficient in operation.

It is another object of the invention to provide improved driving means supported independently of the gyratory crushing member or its support and arranged to be detachably connected or coupled to the gyratory crusher member.

It is another object of the invention to provide in a gyratory crusher in which the gyratory crushing member is eccentrically mounted in a bushing concentric with the axis of the crusher improved driving means supported independently of the crushing member or its bushing and adapted to be operatively connected to the bushing at one end thereof concentrically with the axis of the crusher.

It is a still further object of the invention to provide an electric motor drive for crushers of this type with the rotatable member of the motor supported independently of the gyratory crushing member and arranged with detachable means to operatively connect the same to the gyratory crushing member.

It is still another object of the invention to provide improved driving means supported concentrically of the crusher on the bearing support of the crusher independently of the gyratory crushing member or its bearing, with means to operatively connect the driving means to the gyratory crushing member or its bearing and co-operate with the support for said bearing to provide an enclosed lubricant carrying housing for said bearing.

Other objects and advantages will hereinafter appear.

In the drawings accompanying and forming a part of this specification Figure 1 is a sectional side elevation of a gyratory crusher showing an embodiment of my improved driving means applied thereto.

Figure 2 is a sectional side elevation showing a modified form of driver and manner of connecting the driver to the gyratory crushing member.

Figure 3 is a sectional detail view showing a modified method of operatively connecting the driver shown in Figure 2 to the gyratory crushing member.

Figure 4 is a perspective view, partly in section, of a bearing in which the gyratory crushing member is eccentrically mounted.

Figures 5 and 6 are detail views in perspective of the means shown in Figure 1 to couple the driver to the gyratory crushing member.

Figure 7 is a plan view of a ring for supporting the driver upon the bearing support of the gyratory crushing member as shown in Figure 1; and

Figure 8 is a bottom view, partly in section, to show the manner of mounting the driver supporting ring.

Similar characters of reference designate like parts throughout the different views of the drawings.

In the embodiment of my invention shown in the drawings the operative mechanism of the crusher is supported by a main frame or supporting base 7 arranged to be supported upon a suitable foundation. A crushing member 8 in the form of an annular shell or chamber is mounted upon the base and is provided with segmental sections of wear resisting material 9 upon the inner face. This chamber may be of cylindrical form as shown, or as commonly made of inverted truncated cone shape. A shaft 10 is fulcrumed, at at 11, concentric with the axis of the chamber 8 in the hub of a spider 12 mounted upon the crushing chamber, said shaft having a crushing head or member 13 of truncated cone shape mounted thereon with the peripheral wall thereof in opposed and spaced relation to the wall of the chamber 8, said shaft with the crushing head being adapted to be gyrated to crush material between the faces of the head and the chamber 8. The periphery of this head is also provided with a shell of wear resisting material. The material to be crushed is fed

through the spider to the space between the wall of the chamber 8 and the crushing head 13 and the crushed or broken material is delivered from between said members to a chute 14 within the supporting base and directed by said chute through an opening 15 in the wall of said base, said chute being arranged with a tubular portion or sleeve 16 through which the shaft 10 passes, a dust collar 17 being mounted upon the shaft above the sleeve 16 to prevent the crushed material and dust from passing into said sleeve.

A bearing supporting sleeve 18 is carried by the bottom plate 19 of the supporting base 7 concentric with the crushing chamber 8, which sleeve may be cast integral with said base, but to facilitate the machining and replacement of said sleeve it is preferably made separately from the bottom plate 19 and secured in an opening in said bottom plate to extend above and below the same by bolts 20 passing through a lateral flange of said sleeve and the bottom plate. A bearing member or bushing 21 is mounted in the bearing sleeve 18 to rotate on an axis concentric with the axis of the crusher and shell or chamber 8, said bearing having a bearing face on the interior thereof eccentric to the axis of rotation of the bearing and crusher, said bearing face being of globular or socket form as shown at 22 for the engagement of a circular or ball portion 23 of a bushing 24 in which the shaft 10 is loosely mounted and to have axial movement. To facilitate the mounting of the bearing for the shaft in the bearing member 21 this bearing is made of longitudinally split sections releasably secured together by bolts 25 passing through opposite rib portions 26 extending transversely of the axis of the bearing and at the end of the shaft 10. The ball and socket portions 22, 23 of the bearing 21 and bushing 24 are so arranged as to bring the line of force of pressure of the eccentric coincident with the center of the bottom plate 19 of the supporting base 7. By this arrangement gyratory movement will be imparted to the shaft 10 and through the shaft to the crushing head 13 by the rotation of the bearing 21. A dust collar 27 is also mounted upon the shaft at the end of the bearing sleeve 18.

To rotate the eccentric bearing member 21 driving means are provided consisting of a driver or driving unit rotatably mounted or journalled upon the bearing sleeve 18 below the bottom plate of the base 7 concentric with the axis of the crushing apparatus and independently of the crushing member. This driver as shown in Figure 1 of the drawings comprises an electric motor having a rotatable annular field or rotor 28 and a stator 29. The rotor is carried by a spider 30 having a central hub portion whereby it is rotatably mounted or journalled upon the bearing supporting sleeve 18 and is held against endwise movement by one end of the spider hub engaging a shoulder formed in the supporting flange of the bearing sleeve and a collar 31 removably mounted at the end of the bearing sleeve, said collar also serving to support the superimposed load of the driver and eccentric bearing. To removably mount the ring or collar 31 upon the bearing sleeve the bearing sleeve is arranged with an annular recess or groove 32 having segmental slots 33 cut thereinto from the end of the bearing sleeve, and the collar is arranged with segmental inwardly extending projections 34. To apply the collar it is adjusted to register the projections 34 thereon with the slots 33 to cause the collar projections to engage the annular groove or recess 32, and as said collar projections engage in said recess the collar is rotatably adjusted to seat the collar projections 34 upon the shoulders formed by the slots 33 cut in to said annular recess when it is secured in such position by a set-screw or pin 35.

It will be obvious that the supporting ring or collar 31 may be mounted upon the bearing sleeve 18 in various ways and other means than that described, as by splitting the collar and securing the same together by bolts, in which case the slots 33 would not be necessary, or by screw threading the collar on to the end of the bearing sleeve. The stator 29 is fixed to the bottom plate of the supporting base 7 within and concentric of the rotor.

By the mounting of the driver as described the driver encircles the bearing sleeve and eccentric bearing and to operatively connect the driver to the shaft 10 and gyratory crushing member 13 at the end of said shaft concentric with the axis of the crusher a plate or disk 36 (Figure 5) is detachably secured to one end of the hub of the rotor carrying spider, as by bolts, said plate serving to close one end of the opening through the spider hub and also the opening in the bearing sleeve 18 thereby providing a closed lubricant carrying chamber for the bearing.

To operatively connect the driver with the gyratory crushing member, a plate or disk 36 is detachably connected to the driver by bolts passing through perforations circumferentially disposed in the plate adjacent the periphery and threaded into the driver. The plate is arranged with a rib 37 projecting from the face of the plate and extending transversely of the axis thereof and slidably engaging in a slot 38 extending transversely of the axis of a disk 39 interposed between the plate 36 and the end of the bearing bushing 21 (Figure 6), said disk 39 having a slot 40 in the face opposite to the slot 38 extending transversely of said slot axially

of the disk for the slidable engagement of the extended portion 26 of the mated rib portions of the bearing 21. By this arrangement of coupling the driver to the bearing 21 a detachable and flexible driving connection is provided to permit of movement of the driver and bearing transversely of the axis of one relative to the other and thereby compensating for wear upon the bearing member and maintaining the rotor of the motor in operative concentric relation to the stator thereof.

By the driving means described it will be obvious that I have provided a driving means for the gyratory member of the crusher which is supported independently of said member or its bearing and which is operatively connected to the gyratory crushing member concentric of the axis of the crusher at one end of said member, the eccentric bearing for the gyratory crushing member being supported by the driving means, and by this arrangement of mounting the driving means and connecting the same to the gyratory crushing member that the eccentric bearing for the gyratory crushing member may be readily removed without the necessity of disturbing the driving means.

While I have described the driver as consisting of an electric motor this driver may comprise a rope or belt driven pulley, as shown in Figures 2 and 3, in which case a pulley 42 is substituted for the electric motor, and the pulley may be operatively connected to the eccentric bearing for the gyratory crushing member in the manner shown in Figure 1 through the intermediary of the plate 36 and interposed coupling disk 39, or directly and rigidly connected to said bearing in a manner as shown in Figure 3. For this purpose the bearing 21 is arranged with an annular lateral flange 43 to extend below and overlap the rotor carrying spider and secured thereto as by bolts, the opening in the bearing being closed by a plate 45 secured to the bearing flange 43 and cooperating with said flange to provide a lubricant carrying chamber for the bearing.

In Figure 2 I have shown a modified means of connecting the eccentric bearing 21 to the driver. The driver is connected to said bearing by a plate 46 bolted to the hub of the driver similar to the connection of the plate 36. The plate 46 however has an inwardly projecting hub 47 having a lateral lug 48 arranged with a longitudinal slot. The bearing 21 has an inwardly extending lug 49 with a slot adapted to register with the slot of the hub lug 48 and in which registered slots a key or feather 50 is adapted to engage, said key being secured in the slot of the hub lug 48, as by a bolt 51, and being of less width than the depth of the slots in the lugs 48 and 49 to provide a space between said key and the bottom of the slot in the bearing lug 49 thereby permitting of movement laterally of the axis of the crusher to compensate for wear and otherwise. To facilitate machining of the slot in the lug 48 of the plate hub an opening is provided in line with said lug and which opening when the plate is connected to the driver and bearing 21 is closed by a plate 51 to prevent leakage of lubricant from the bearing 21.

To provide a supply of lubricant to the bearing or the chamber formed by the plate 36 in conjunction with the supporting sleeve for said bearing, the stator of the motor shown in Figure 1 may be provided with an annular and spirally arranged lubricant well 52 to lie contiguous to the hub of the rotor carrying spider, a pipe 53 leading from said well to a rotary pump, shown in a general way at 54, from which the lubricant is delivered by a pipe 55 leading to the upper end of the supporting sleeve 18. The plate 36 with the supporting sleeve 18 and the hub of the rotor carrying spider forms a lubricant carrying chamber the outlet from which is at the upper end of the hub of said spider, and to direct any flow of lubricant from the upper end of the spider hub into the well 52 an annular deflector plate 56 is provided at the top of the spider hub to extend over the top of the inner wall of the well. The pump 54 may be driven in a suitable manner, and as shown is driven from the rotor by a belt or cable 56 passing around a circular hub portion 57 extending from the plate 36, and plate 46, and a pulley 58 connected to the driving shaft of the pump.

As shown in Figures 2 and 3 the lubricant well is arranged in the pulley 42, as shown at 59, the entrance to which well from the lubricant carrying chamber is from one end of the hub of the pulley, and the lubricant is led from said well by a pipe 60 to the top of the bearing sleeve 21, and the lubricant may be elevated to the top of the bearing by inertia of the lubricant through the rotation of the pulley, or a suitable pump may be interposed between the inlet and outlet of the pipe. To prevent splashing and throwing of the lubricant laterally from the well through centrifugal action an annular flange 61 is arranged at one edge of the rim of the pulley to extend toward the axis of the pulley.

Having thus described my invention I claim:

1. In a crusher, a gyratory crushing member, a fixed bearing supported concentrically of the crusher in which the gyratory crushing member is eccentrically mounted, a driver rotatably supported on the bearing, and a detachable driving connection between the driver and crushing member.

2. In a crusher, a gyratory crushing mem-

ber, an eccentric mounting for said member, driving means rotatably supported independently of the crushing member and its mounting, and detachable means for operatively connecting the driving means with the mounting of the gyratory crushing member concentrically thereof.

3. In a crusher, a gyratory crushing member concentrically journalled with relation to the axis of the crusher, and a driver for said crushing member rotatably mounted independently of and concentric with the axis of the crusher, and detachable means to operatively connect said driver with said crushing member.

4. In a crusher, a crushing chamber, a gyratory crushing member fulcrumed concentrically of the crushing chamber, a bearing, means to journal the crushing member eccentrically in said bearing, a rotary driving unit rotatably mounted independently of the crushing member, and detachable means to operatively connect the driving unit to the eccentric bearing concentric with the axis of the crusher.

5. In a crusher, a gyratory crushing member eccentrically-concentrically supported with relation to the axis of the crusher, driving means for said crushing member supported independently thereof concentrically of the axis of the crusher, and a detachable connection between the driving means and gyratory crushing member to permit of movement of the latter relative to the driving means and transversely of the axis thereof.

6. In a crusher, a gyratory crushing member, driving means for said crushing member supported independently thereof, and an operative connection between the driving means and crushing member arranged to permit of movement of one relative to the other in a direction transversely of the axis and during the rotation thereof.

7. In a crusher, a gyratory crushing member, a bearing concentrically of the axis of the crusher in which the gyratory crushing member is eccentrically mounted, a driver for said crushing member supported independently thereof concentric with the axis of the crusher, and an operative connection between the bearing and driver arranged to permit of movement of the bearing relative to the driver transversely of the axis of rotation during the rotation thereof.

8. In a crusher, a gyratory crushing member, a bearing to support the crushing member eccentrically-concentrically of the axis of the crusher, a driver for the gyratory crushing member arranged concentrically of the bearing, and means to operatively connect said driver to the bearing concentrically at the end thereof.

9. In a crusher, a gyratory crushing member supported eccentrically-concentrically of the axis of the crusher, a driver for the gyratory crushing member, and an operative connection between the gyratory crushing member and driver arranged to permit of movement of one relative to the other transverse of the axis of rotation during the rotation thereof.

10. In a crusher, a gyratory crushing member, a bushing in which said crushing member is mounted, a driver supported concentrically to and independent of the gyratory crushing member and bushing, and detachable means to operatively connect said driver with the bushing to permit of the removal of the bushing without removing the driver.

11. In a crusher, a gyratory crushing member, a bearing, a bushing in the bearing in which the crushing member is mounted, means to rotatably support the bearing, a driver rotatably supported upon the bearing independently of the bushing, and detachable means to operatively connect the driver with the bushing concentrically of the axis of the crusher and support the bushing in the bearing.

12. In a crusher, a gyratory crushing member, a support in which said crushing member is journaled concentrically and eccentrically of the axis of the crusher, a driver rotatably mounted on said support concentrically of the axis of the crusher, and detachable means to operatively connect the driver with the gyratory crushing member concentrically of the axis of the crusher.

13. In a crusher, a gyratory crushing member including a shaft; a bearing in which the shaft of said member is eccentrically mounted; a support in which the bearing is rotatably mounted concentric with the axis of the crusher; an electric motor the rotor part of which is journaled upon the bearing support, and detachable means to operatively connect said rotor with the bearing concentric of the axis of the crusher.

14. In a crusher, the combination of a crushing member, a bearing in which said member is mounted eccentrically-concentrically with relation to the axis of the crusher, an electric motor the rotor part of which is rotatably supported on the bearing and the stator part supported in fixed position concentric of the rotor, and a detachable driving connection between the rotor of the motor and the crushing member.

15. In a crusher, a crushing member; a bearing in which said crushing member is eccentrically mounted; a journal in which the bearing is rotatably mounted concentric with the axis of the crusher; a driver for said crushing member rotatably mounted on said journal; and a disk fixed to the driver at the end of the journal to close said end and arranged to couple the driver to the bearing for the purpose specified.

16. In a crusher, the combination of a supporting framework having a sleeve concentric with the axis of the crusher; a crushing member mounted in said sleeve to have gyratory movement; a driver rotatably supported upon said sleeve; and a disk fixed to the driver arranged to operatively connect the driver to said crushing member and close the end of the sleeve for the purpose specified.

17. In a crusher, the combination of the framework having a sleeve concentric with the axis of the crusher; a crushing member; a bearing journaled in said sleeve in which said crushing member is eccentrically mounted; driving means rotatably supported upon said sleeve; and means to couple the driving means to the bearing and cooperate with the driving means to provide a lubricant carrying housing for the bearing and support for the driving means.

18. In a crusher, the combination of the framework having a sleeve concentric with the axis of the crusher, a crushing member; a bearing in the sleeve in which said crushing member is rotatably mounted; a driver rotatably mounted upon the sleeve; a plate fixed to the driver arranged to close the end of the sleeve; and means to couple said plate to the bearing to rotate therewith.

19. In a crusher, a crushing member; a bearing in which the crushing member is eccentrically mounted; a sleeve in which the bearing is journaled; a driver rotatably mounted upon the sleeve; a plate fixed to the driver arranged to close one end of the sleeve; and means to couple said plate to the bearing, comprising a disk interposed between the end of the bearing and plate having a slot in one face extending transversely of the axis of the bearing for the slidable engagement of a rib extending transversely at the end and axially of the bearing, and said disk having a rib on the face opposite to the slot extending at right angles to the slot for the slidable engagement of a rib projecting up from the plate for the purpose specified.

20. In a crusher, a gyratory crushing member; a bearing in which said crushing member is mounted; a sleeve in which the bearing is journalled; a driver journalled upon the sleeve; a support upon the sleeve for said driver and to maintain the same against endwise movement, comprising an annular member to engage around the sleeve, said annular member having circumferentially disposed inwardly extending projections to engage longitudinal recesses and an annular groove in the sleeve and supported upon lugs formed by the longitudinal recesses cut into the annular recess; and means to couple said driver to the bearing.

21. In a crusher, a gyratory crushing member; a bearing in which the said crushing member is mounted; a sleeve in which the bearing is journalled; a driver journalled upon the sleeve; means removably mounted upon said sleeve to support and maintain the driver against longitudinal movement on the sleeve; and means to operatively connect the driver to the bearing.

22. In a crusher, a rotatable bearing, a crushing member eccentrically mounted in said bearing, a driver for said bearing supported independently thereof, and detachable means to operatively connect the bearing to and support the same from the driver.

23. In a crusher, the combination of a rotatable bearing, a crushing member eccentrically mounted in said bearing, an electric motor supported independently of the bearing concentric with the axis of the crusher, and means to detachably connect the motor with and support the bearing.

24. In a crusher, a rotatable bearing, a crushing member eccentrically mounted in said bearing and adapted to have gyratory movement imparted thereto through the rotary movement of the bearing, a driver supported independent of the bearing, and a detachable driving connection between said driver and the bearing arranged to relieve the driver of the strains of the lateral thrust of the bearing imparted thereto through the gyratory movement of the crushing member.

25. In a crusher, the combination of a supporting framework including a base plate, a bearing journaled in the base plate concentric with the axis of the crusher, a crushing member eccentrically mounted in said bearing, a driver rotatably supported concentric with the axis of the crusher and the bearing at one side of the base plate and independent of the bearing, and means to couple the driver to the bearing.

Signed at the city of New York, in the county of New York and State of New York this 10th day of August, 1920.

CHARLES L. CARMAN.