Feb. 10, 1931. E. B. SYMONS 1,791,584

CONE CRUSHER

Filed Dec. 9, 1929 2 Sheets-Sheet 1

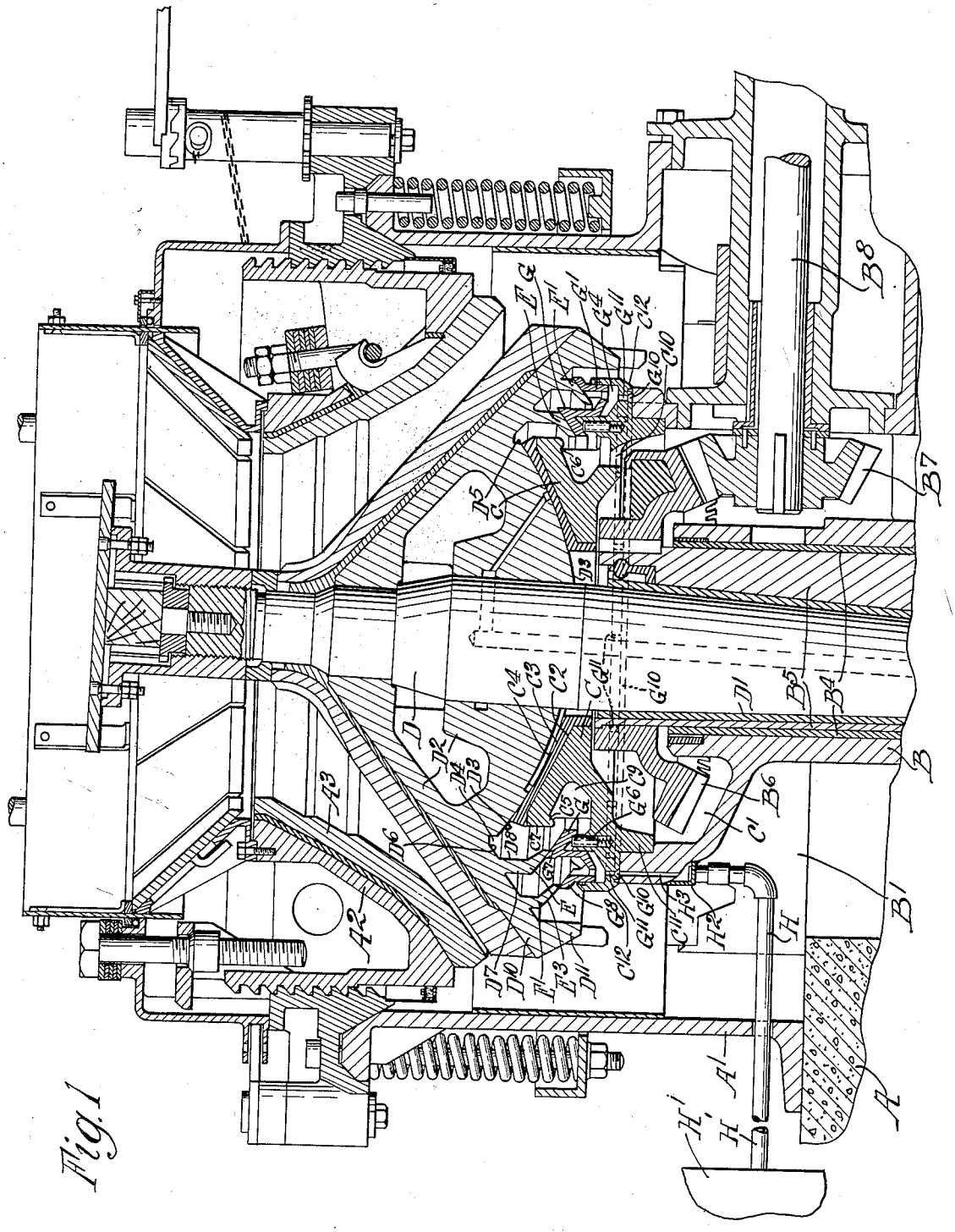

Fig. 1

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Fig.2

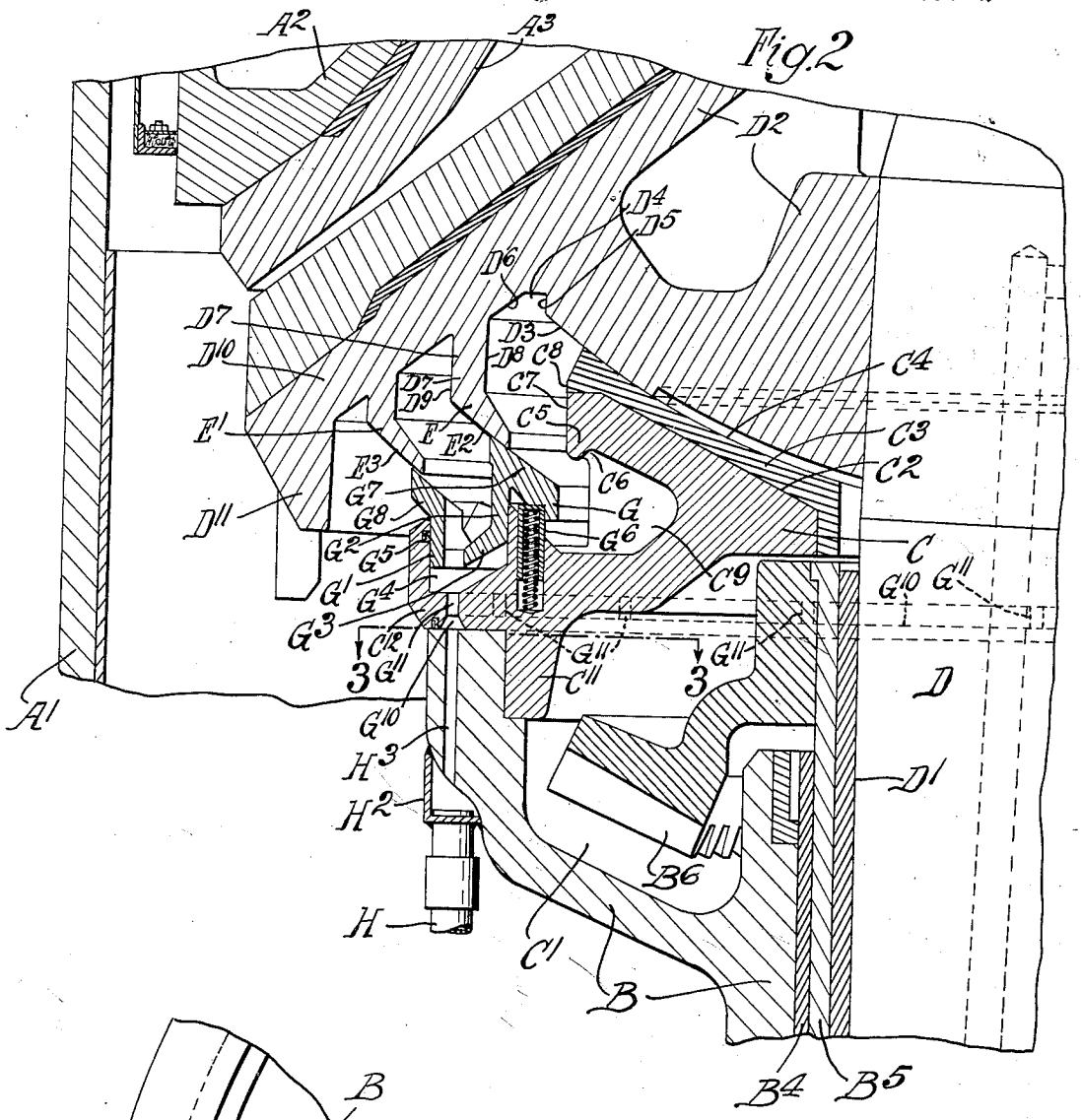
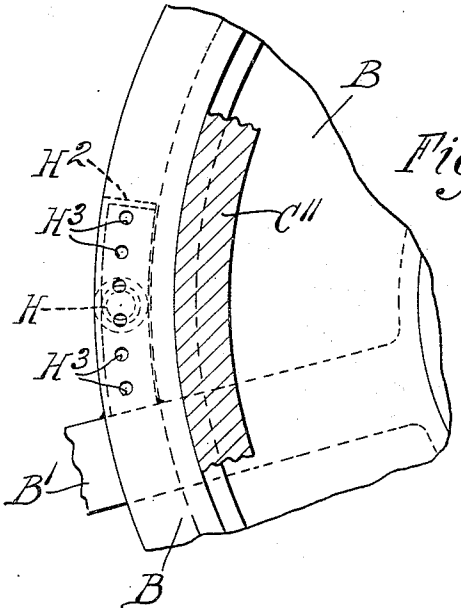


Fig.3



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Patented Feb. 10, 1931

1,791,584

UNITED STATES PATENT OFFICE

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Application filed December 9, 1929. Serial No. 412,617.

My invention relates to gyrating cone crushers of the type in which a cone or inclined member is gyrated. One object of my invention is to provide means for preventing the access of dust or small particles to a supporting bearing or supporting means for such a cone, or to prevent the access of dust to the working or gyrating parts. A particular application of my invention is to a machine in which a gyrated head is seated upon and supported on a concave spherical bearing surface, the lower portion of the head being spherically convex in general conformity to the supporting surface. However, I do not wish to be limited specifically to this particular use or application, except so far as I do specifically limit myself by the language of individual claims. One object of the invention is to prevent the access of dust or dirt to such a bearing. Another object is the provision of pneumatic means for expelling fine particles from the vicinity of the bearing or supporting or operating means of such a cone. Other objects will appear from time to time in the course of the specification and claims.

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

Figure 1 is a vertical axial section;

Figure 2 is an enlarged detailed section; and

Figure 3 is a section on the line 3—3 of Figure 2.

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

Referring to the drawings, A indicates a bed upon which rests a frame A^1 upon which is supported in any suitable manner the bowl or concave A^2 provided with a liner A^3.

Positioned within the main frame member A^1 is the rigid bearing sleeve B which may be connected to the outer frame member as by the radial arms or connecting elements B^1. The cylindrical inner aperture of the sleeve B receives a liner or bearing B^4. Mounted for rotation with it is the eccentric sleeve B^5 which may be driven through the gear B^6 as for example by the pinion B^7, on the shaft B^8, and any suitable driving means.

C indicates a bearing cap positioned at the upper end of the sleeve B and adapted to serve as a closure also for the gear box or space C^1. It is provided with the concave conical upper surface C^2 adapted to receive the actual bearing member C^3 with its true spherical bearing surface C^4. The upper edge of the member C terminates in the overhanging flange or trip member C^5 which is undercut or recessed as at C^6 and terminates in an outer peripheral generally vertical surface C^7 and continues with a corresponding surface C^8 about the outer edge of the member C^3. C^9 generally indicates a circumferential oil well or sump which communicates, as by the passage C^{10}, with the gear box C^1. The member C is continued, exteriorly of said sump C^9 by a portion C^{11} and a lateral outer extension C^{12} therefrom, the members C^{11} C^{12} conforming to the upper edge of the expanded end of the sleeve B, as shown.

D indicates a crusher shaft, penetrating the eccentric aperture D^1 in the eccentric sleeve B^5. Mounted at the upper end of the shaft D is a conic head generally indicated as D^2, which is provided with a convex spherical surface D^3 opposed to the corresponding concave spherical surface C^4 of the member C^3. This spherical surface terminates in the upwardly recessed channel D^4 with its vertical inner wall D^5 and its inclined outer wall D^6. Exterior of this wall D^6 is the depending circumferential flange D^7 bounded by an inner generally vertical wall D^8 and an outer wall D^9 preferably parallel thereto. D^{10} indicates an extension of the cone or head outwardly beyond the flange D^7, the extension D^{10} terminating in a downwardly turned apron D^{11}.

E, E^1, generally indicate concentric dust guard or wiping members or flanges, which may have generally spherical surfaces E^2 and E^3 respectively, these surfaces being concentric with the main spherical bearing surface C^4.

G generally indicates a wiping and dust closure member which includes an outer wall G^1 and an inner wall G^2, the two walls being connected as by the transverse member G^3.

The outer wall is shown as exteriorly vertical and the inner wall as interiorly vertical, these opposed outer and inner vertical walls serving to guide the wiping member for vertical movement in the circumferential depression or guiding passage G^4. G^5 is any suitable packing means opposed to the outer face of the wall G^1. G^6 is any suitable yielding means tending normally to thrust the member G upwardly in such fashion that the spherical wiping member G^7 is opposed to the spherical surface E^2 of the flange E. G^8 is a corresponding generally spherical surfaced wiping member, associated with the wall G^1, and opposed to the spherical surface E^3 of the flange E^1. As shown in Figure 2 there is a slight but perceptible clearance between the opposed members E^1 and G^8.

It will be realized that a sufficient number of the springs or yieldingly upwardly thrusting members G^6 may be provided for maintaining the entire periphery of the member G upwardly thrust against the flange E. G^{10} is a circumferential passage passing entirely about the bottom of the member or bearing cap generally indicated as C. It is in communication with the circumferential passage G^4, as by a plurality of apertures G^{11}.

H generally indicates an inlet passage adaptable for example to admit air under pressure. H^1 diagrammatically indicates any suitable source of air pressure, such as a compression tank, the means for maintaining and supplying air under pressure being not shown herein in detail, since its details form no part of the present invention. H^2 indicates any suitable manifold or distribution member, associated with the inner end of the passage H. It may be secured in any suitable manner to the sleeve B and may for example be welded at any desired position. As means for making an air inlet connection between the manifold H^2 and the circumferential passage G^{10} and thus with the passage G^4, I may provide a plurality of apertures H^3, of the desired total cross-sectional area to admit the necessary flow or volume of air. It is preferable to employ a relatively large number of small passages rather than a small number of large passages, since weakening of the sleeve B is thus avoided.

It will be realized that whereas I have described and shown a practical and operative device, nevertheless many changes might be made in the size, shape, 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 and diagrammatic rather than as limiting me to my specific showing. The use and operation of my invention are as follows:

In gyratory crushers of the type herein shown and for example of the type in which an extended bearing surface is employed, it is extremely important that the supporting bearing surface is protected from the access of dust, grit or any foreign matter which might tend to burn out the bearings or reduce their wear or penetrate to the transmission. In other words the supporting bearing for the cone and the eccentric bearing for the shaft D, and all other bearings and wearing parts should be protected from dust, dirt and fine particles which otherwise would materially reduce the life of the crusher or even stop its operation. It happens that I have illustrated my invention in connection with a gyratory crusher in which the head is supported by a ball and socket or spherical bearing connection. It will be understood that my invention is adaptable to use with other types of supporting means.

In the particular form of my invention herein shown I provide the circumferential oil sump defined by or enclosed by the flange E, the member G^7, and the adjacent parts of the cover member C. Into this chamber oil may seep from the opposed main bearing surfaces, once there it may drain down into the interior of the sleeve B. In order to prevent the access of dust or grit to this inner chamber, I provide the outer chamber defined by the exterior of the flange E, the interior of the flange E^1, the exterior of the wall G^2 and the interior of the wall G^1. Into this space I admit air under pressure through the passage H, the apertures H^3, the groove G^{10} and the apertures G^{11}. I provide a slight clearance between the opposed members E^1 and G^8, whereby the air admitted to the above defined space may escape. By maintaining a constant outflow of air through this restricted opening, I maintain a species of circumferential blast which not only prevents the admission of fine particles, but actually blows them away from the vicinity of the spherical bearing E^3, the blast having a scouring action across the surface E^3. Thus, although the air about the crushing cone is inevitably filled with dust and fine particles, these particles cannot in any damaging quantity penetrate to the space within the flange E^1 and the wall G^1.

I claim:

1. In a gyratory crusher, a bearing member having an upwardly concave spherical bearing surface, a cone element supported upon said bearing surface, and means for gyrating it, a wiping member surrounding said bearing member and a wiping connection between it and the cone, exterior to the connection between the cone and said spherical bearing surface, and means for admitting air under pressure into the space between

said wiping members and the bearing engagement of the cone with the spherical bearing surface.

2. In a gyratory crusher, a bearing member having an upwardly concave spherical bearing surface, a cone element supported upon said bearing surface, and means for gyrating it, a plurality of wiping members surrounding said bearing surface and spaced therefrom and wiping connections between said wiping members and the cone, exterior to the bearing connection between the cone and the spherical bearing surface, and means for admitting air under pressure into the space between the outermost of said wiping connections and the wiping connection next therewithin.

3. The structure of claim 2 characterized by the employment of an oil receiving sump positioned between the first mentioned bearing member and the wiping connection next exterior thereto, and means for draining said sump.

4. In a gyratory crusher a head, and means for gyrating it, a bowl opposed to the head, supporting means for said head and shielding means for said supporting means, effective at all normal positions of the head, said shielding means including a wiping connection exterior to said supporting means, said wiping connection including opposed wiping elements, one associated with the head and the other opposed thereto, and pneumatic means for preventing the passage of dust through said wiping connection.

5. In a gyratory crusher a head, and means for gyrating it, a bowl opposed to the head, supporting means for said head and shielding means for said supporting means, effective at all normal positions of the head, said shielding means including a wiping connection exterior to said supporting means, said wiping connection including opposed wiping elements, one associated with the head and the other opposed thereto, and pneumatic means for preventing the passage of dust through said wiping connection, including means for directing a current of air adjacent said wiping connection.

6. In a gyratory crusher a head, and means for gyrating it, a bowl opposed to the head, supporting means for said head and shielding means for said supporting means, effective at all normal positions of the head, said shielding means including a wiping connection exterior to said supporting means, said wiping connection including opposed wiping elements, one associated with the head and the other opposed thereto, and pneumatic means for preventing the passage of dust through said wiping connection, including means for passing a current of air through said wiping connection.

7. In a gyratory crusher which includes a head and means for gyrating it and a bowl opposed to said head, supporting means for the head and shielding means, effective at all normal positions of the head, for preventing the access of dust to the supporting means, said shielding means including a member normally fixed and a member, movable with the head, opposed to the fixed member, the size and shape of the members, in relation to the movement of the head, being adapted to maintain them constantly opposed to each other at all normal positions of the head, and means for maintaining a current of air outwardly between said opposed means.

8. The structure of claim 7 characterized in that the opposed faces of said members are spaced slightly apart to provide a restricted passage for the air.

9. In a gyratory crusher which includes a head and means for gyrating it, and a bowl opposed to said head, a normally fixed supporting member for said head and a bearing connection between said supporting member and the lower portion of the head, and housing means surrounding the peripheries of the opposed bearing portions of head and supporting member and enclosing their zone of bearing contact, and means for supplying air under pressure to the space so defined.

Signed at Los Angeles, county of Los Angeles and State of California, this 30th day of November, 1929.

EDGAR B. SYMONS.