

Dec. 8, 1959

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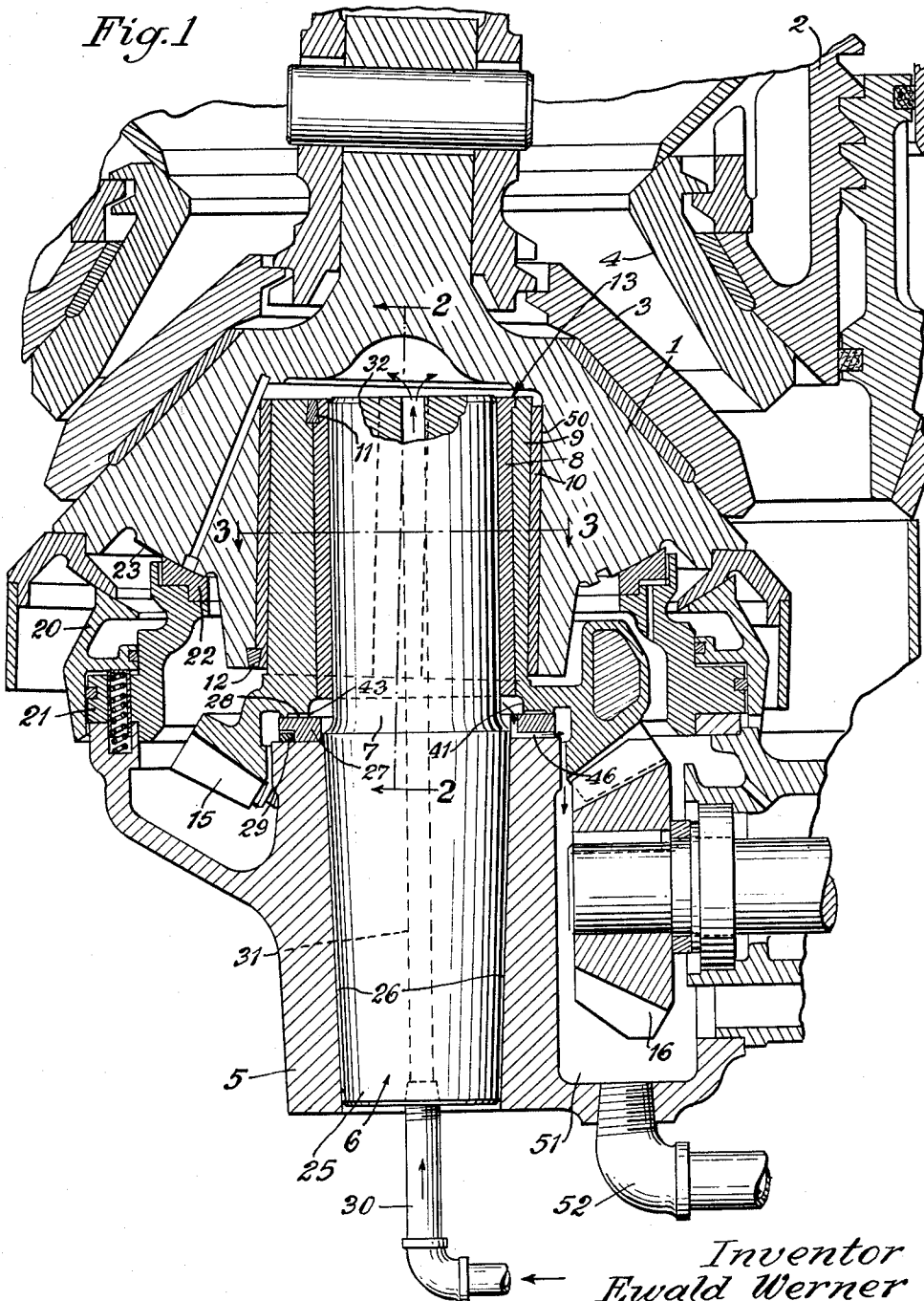
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LUBRICATING SYSTEM FOR CRUSHER BEARINGS

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Fig. 1



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Fig. 2

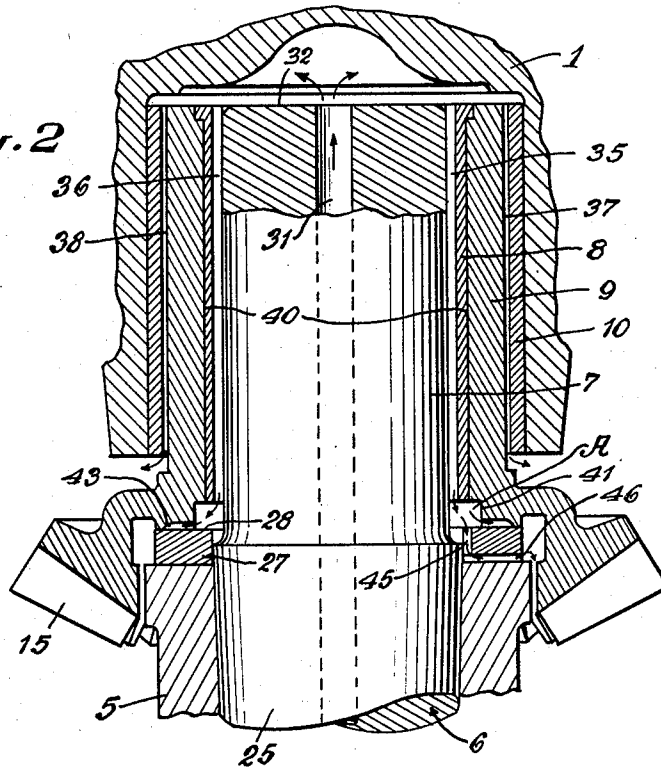
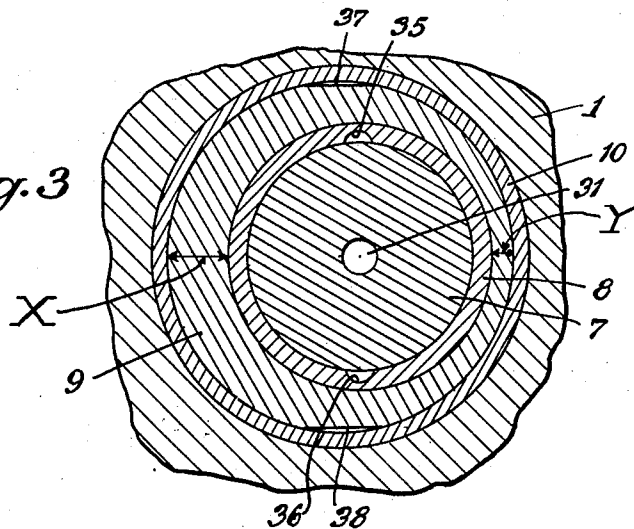


Fig. 3



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Fig. 4

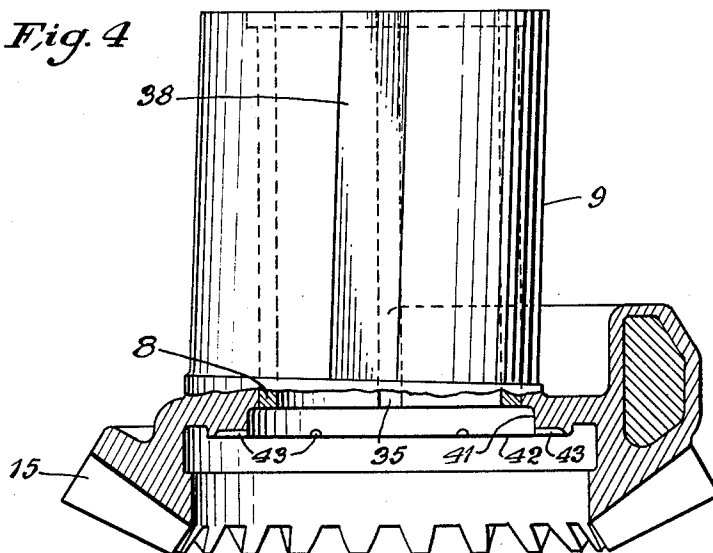
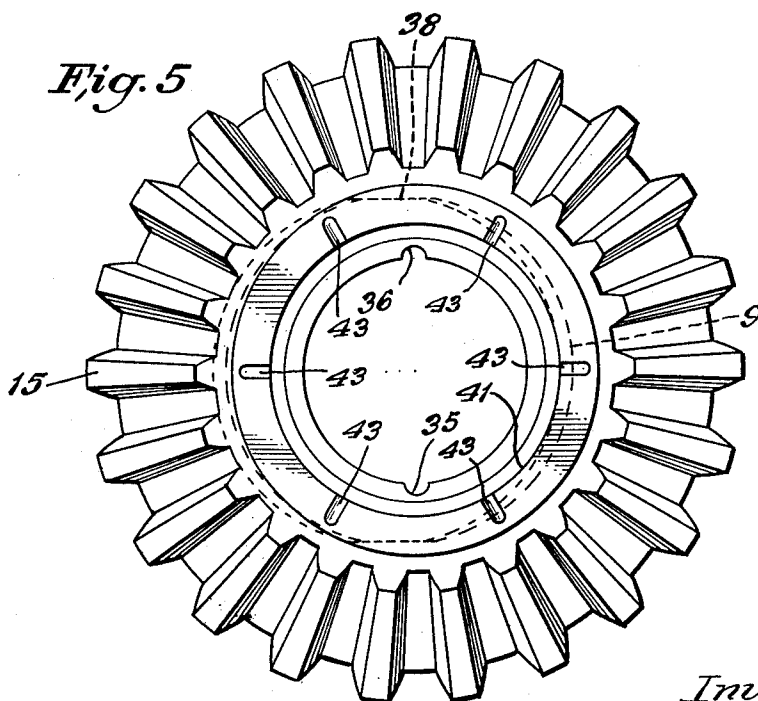


Fig. 5



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LUBRICATING SYSTEM FOR CRUSHER BEARINGS

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5 Claims. (Cl. 241—208)

This invention relates to machinery and particularly to improved means of lubricating relatively movable parts of such machinery.

One purpose of the invention is to provide improved lubrication of the members of an eccentric driving means.

Another purpose is to provide an improved means for lubricating a thrust bearing.

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 accompanying drawings wherein:

Figure 1 is a side elevation in cross section and with parts broken away;

Figure 2 is a view taken on the line 2—2 of Figure 1;

Figure 3 is a view taken on the line 3—3 of Figure 1;

Figure 4 is a detail view on an enlarged scale with parts broken away and parts in cross section; and

Figure 5 is a bottom view on an enlarged scale of the structure illustrated in Figure 4.

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

While the invention is applicable to a variety of mechanical structures, I illustrate it here in association, for example, with a crushing machine. Referring now to the drawings and particularly to Figure 1, the numeral 1 generally indicates a movable crushing member or crushing head of the type generally employed with the crushers known in the trade as Symons crushers. The numeral 2 refers to a showing of a part of the stationary crushing elements in such a crusher. In order to perform the crushing operation, the member 1 is caused to gyrate within the member 2, thus causing a crushing surface 3 on the member 1 to move toward and away from a crushing surface 4 on the member 2. An eccentric driving means, as generally indicated by the numeral 13, is effective to produce this gyratory action on the member 1. While the above-described structure is illustrated in order to make clear the function of my invention, it will be understood that my invention is applicable to the relatively moving members of an eccentric structure and that such an eccentric structure may be employed in a variety of mechanisms without departing from the nature and scope of my invention.

A base member 5 may support a fixed shaft 6. The shaft 6 may have an upwardly-extending, generally cylindrical portion 7 which may, in turn, be surrounded by a bushing or bearing member 8. An eccentrically-apertured sleeve 9 may surround the member 8 and may, in turn, be encased within a second bushing or bearing member 10. Means are provided, such as the keys 11, 12, for preventing relative rotation respectively between the members 8 and 9 and between the member 10 and the head 1.

The eccentric sleeve 9 may have adjacent its lower end and extending outwardly therefrom, a gear portion generally indicated by the numeral 15. A driving gear 16 may be encased within the support 5 and may have its teeth in engagement with the teeth of the gear portion

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15, in order to rotate the eccentric sleeve 9 and the bearing member 8 about the fixed shaft portion 7. The driving gear 16 may be itself driven by any suitable means (not shown). The numeral 20 generally indicates sealing and protective members surrounding the above-described structure beneath the head and, in cooperation with a member mounted on the head, is effective to impede the entry of dust and foreign particles into the area in which the gear 15 is rotated. Supported on the base support 5 as by the ring member 21 is the generally spherical bearing member 22 on which a lower spherical surface 23 of the head 1 seats.

The base 5 may support the lower tapered portion 25 of the shaft 6 within a tapered aperture 26. Surrounding the shaft 6 and resting upon the base support 5 about the aperture 26 is a thrust bearing 27 having a flattened annular top surface 28. The bearing 27 may be keyed to the support 5 against relative rotation therewith, as at 29. It will be realized that the bearing 27 may be similarly secured with relation to the support 5 in a variety of manners, for example as by welding. The eccentric sleeve 9 may seat upon the upper surface 28 of the bearing 27 and rotates thereon, as best seen in Figures 1 and 2.

A lubricant supply conduit or pipe is illustrated at 30. Lubricant may be forced through the pipe 30, under pressure, by an suitable means (not shown). The pipe 30 may be in communication with a central passage 31 in the shaft 6. The passage 31 extends throughout the length of the shaft 6 from its bottom surface, at which point it may be connected to the pipe 30, to its top surface. Thus oil may be conveyed upwardly through the passage 31 and caused to flow outwardly over the top surface 32 of the fixed shaft 6.

Referring now to Figures 2 and 3, it will be seen that a pair of diametrically opposed longitudinal channels or passages or grooves 35, 36 are provided in the inner surface of the bushing or bearing member 8. Similarly, the outer surface of the eccentric sleeve 9 is flattened at two points which are diametrically opposed with relation to the center of the sleeve 9. The flattened portions or flats 37, 38 on the outer surface of the sleeve 9 are generally in alignment and have portions which are in precise alignment with the grooves 35, 36 of the member 8. Whereas the elements 37, 38 are illustrated as longitudinal flat portions on the eccentric sleeve 9, it will be realized that these elements could take the form of grooves similar to the grooves 35, 36 without departing from the nature and scope of my invention. The flats 37, 38 which form, in cooperation with the inner cylindrical surface of the bearing member 10 passage means, means from the top of the eccentric sleeve 9 to a position beneath the lower edge of the member 10. As best seen in Figure 3, the grooves 35, 36 and the flats 37, 38 are positioned on what might be called the "non-eccentric" areas of the shaft 6, sleeve 9, and members 8, 10, the purpose of which will appear hereinafter.

The inner cylindrical surface 40 of the eccentric sleeve 9 may be recessed at a point adjacent the lower edge of the member 8 as indicated generally at 41 to create an annular space surrounding the lower portion of the shaft section 7 above the thrust bearing 27, upon which the bottom surface 42 of the eccentric sleeve 9 rides. A plurality of radially extending grooves 43 may be formed in the under-surface 42 of the sleeve 9. The grooves 43 communicate with the annular recess 41 and terminate before reaching the peripheral edge of the surface 42 and thus also before reaching the outer edge of the thrust bearing 27.

The thrust bearing 27 may have an axial opening 45 positioned adjacent the shaft 6 beneath the annular space A which is defined by the recess 41. The axially di-

rected opening 45 communicates with a radially extending passage 46 in the lower annular surface of the bearing 27, the radial passage 46 extending to the outer edge of the bearing 27.

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:

As the eccentric sleeve 9 is rotated by means of the gears 16, 15, a gyratory action is imparted to the head 1, through the well 50, within which the sleeve 9 is rotated. It is important that a very close clearance be maintained along the relatively long bearing surface between the fixed shaft portion 7 and the member 8, as well as between the outer surface of the sleeve 9 and the inner surface of the head bearing member 10. With such a close, limited clearance, the problem of supplying and maintaining a proper lubrication over such long, close-clearance bearing surfaces becomes acute. It will be realized that the bearing members 8, 10, when desired, could be eliminated in some types of structures, in which case the bearing surfaces of the sleeve 9 would have the passages 35—38.

As illustrated diagrammatically in the drawings, I provide the lubricant conduit 30 from which a lubricant may be pumped upwardly through the fixed shaft 6 and out over the top surface thereof. The lubricant then flows downwardly into the grooves 35, 36, and also downwardly through the passages formed by the flats 37, 38. The path of the lubricant is illustrated by the arrows, as may be best seen in Figure 2.

It is important to note that I provide the lubricant passages 35—38 at the points of least pressure. The points of greatest pressure are, of course, indicated by the arrows marked X and Y in Figure 3, i.e., the points opposite the thickest and thinnest parts of the eccentric sleeve 9, X being the area of greatest pressure during the crushing or operating periods and Y being the area of pressure during idling of the machine. The passages 35—38 are positioned at 90° from the pressure points X and Y. Thus, the oil which flows downwardly through the passages 35—38 may be disposed on the surfaces to be lubricated at their "unloaded" areas with a minimum amount of resistance and the areas of greater pressure will be rotated thereafter into a position previously occupied by the passages 35—38. Thus the oil is picked up and "wedged" into the pressure areas of the bearings, creating a type of oil pumping means and effectuating proper lubrication of the long close clearance bearings employed.

The lubricant which flows downwardly through the passages 37—38, as illustrated in Figure 2, is permitted to flow downwardly over the gear 15 and into the lubricant receiving well 51 in the support member 5. The lubricant which flows downwardly through the passage 35, 36 will be discharged into the space A above the thrust bearing 27. Since the oil is under pressure and is being fed at a predetermined rate through the passage 31, a sufficient supply of oil is maintained within the space A in order to lubricate the thrust bearing 27. The radial grooves 43 in the lower surface of the sleeve 9 are effective to facilitate lubrication of the thrust bearing. Since the grooves 43 are formed in the rotating lubricating sleeve, rather than in the fixed thrust bearing itself, the oil within the space A is subjected to centrifugal force and is thus urged radially outwardly toward the terminal ends of the grooves 43, thus serving to dispose a film of oil on the upper surface 28 of the thrust bearing 27. The area of contact between the lower sleeve surface 42 and the upper thrust bearing surface

28, beyond the grooves 43, is of limited extension in order to permit the escape of a controlled amount of oil radially outwardly from the grooves 43.

In order to insure a continuous flow of cooler, fresh lubricant, an escape passage 45, 46 is provided, beneath the space A, through which a predetermined amount of lubricant is permitted to flow outwardly beneath and beyond the thrust bearing 27, from whence the oil will flow downwardly between the inner surface of the gear member 15 and a portion of the support 5 into the well 51. Indicated at 52 is a lubricant discharge conduit connected to a lower portion of the well 51.

I claim:

1. In a mechanism for gyrating the crushing head of a crusher assembly, a fixed generally upright cylindrical shaft and support therefor, an eccentric sleeve mounted for rotation about the shaft and having bearing contact therewith and with the crushing head, means for rotating the sleeve, means for directing lubricant to the bearing surfaces between the shaft and sleeve including a lubricant passage extending up through the shaft for the upflow of lubricant and adapted to deliver lubricant to an area adjacent the upper portion of the bearing surfaces, a groove in one of the bearing surfaces for the downflow of lubricant and extending the length thereof, the sleeve having a generally annular recess at the lower end of the bearing surface thereof, the recess being in communication with the groove, a thrust bearing for the sleeve on the support, the sleeve having a lower annular face seated on the thrust bearing, a plurality of radial grooves between the thrust bearing and the annular face on the sleeve in communication with the annular recess to convey lubricant outwardly from the recess in response to the centrifugal force created by rotation of the sleeve and thus to fully lubricate the bearing surfaces between the sleeve and the thrust bearing, and an otherwise open passage means through the thrust bearing putting the generally annular recess in communication with the area outside of the thrust bearing and sleeve to permit a controlled discharge of lubricant and the consequent continuous supply of cooler fresh lubricant to the bearing surfaces.

2. The structure of claim 1 wherein the radial grooves terminate at a point spaced inwardly from the outer peripheral edges of the lower annular face of the sleeve and thrust bearing whereby resistance is created to the outward flow of lubricant through the grooves.

3. The structure of claim 1 further characterized in that the radial grooves are in the lower annular face of the sleeve.

4. In an eccentric driving means, a fixed cylindrical shaft, an eccentric sleeve mounted for rotation about and having bearing surfaces in contact with the shaft, means for rotating the sleeve, said sleeve having an annular bearing surface seated upon a thrust bearing, means for directing lubricant to the bearing surfaces between the sleeve and shaft, and means for lubricating the annular surface on the sleeve and the thrust bearing, including radial grooves between the thrust bearing and the annular surface on the sleeve in communication with said lubricant directing means, said radial grooves being positioned to conduct lubricant radially outwardly in response to centrifugal force created by rotation of the sleeve, and terminating at a point spaced inwardly of the peripheral edge of the annular surface whereby a certain degree of resistance is created to the outward flow of lubricant through the grooves, a generally annular recess disposed generally at the lower end of the bearing surface of the sleeve in communication with the radial grooves to function as a reservoir for supplying lubricant to the radial grooves, and an otherwise open passage in parallel with the radial grooves and disposed to discharge a controlled flow of lubricant from the annular recess to set up a controlled flow of cooler fresh lubricant to the bearing surfaces.

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5. The structure of claim 4 further characterized in that the radial grooves are in the lower annular face of the sleeve.

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