

June 27, 1939.

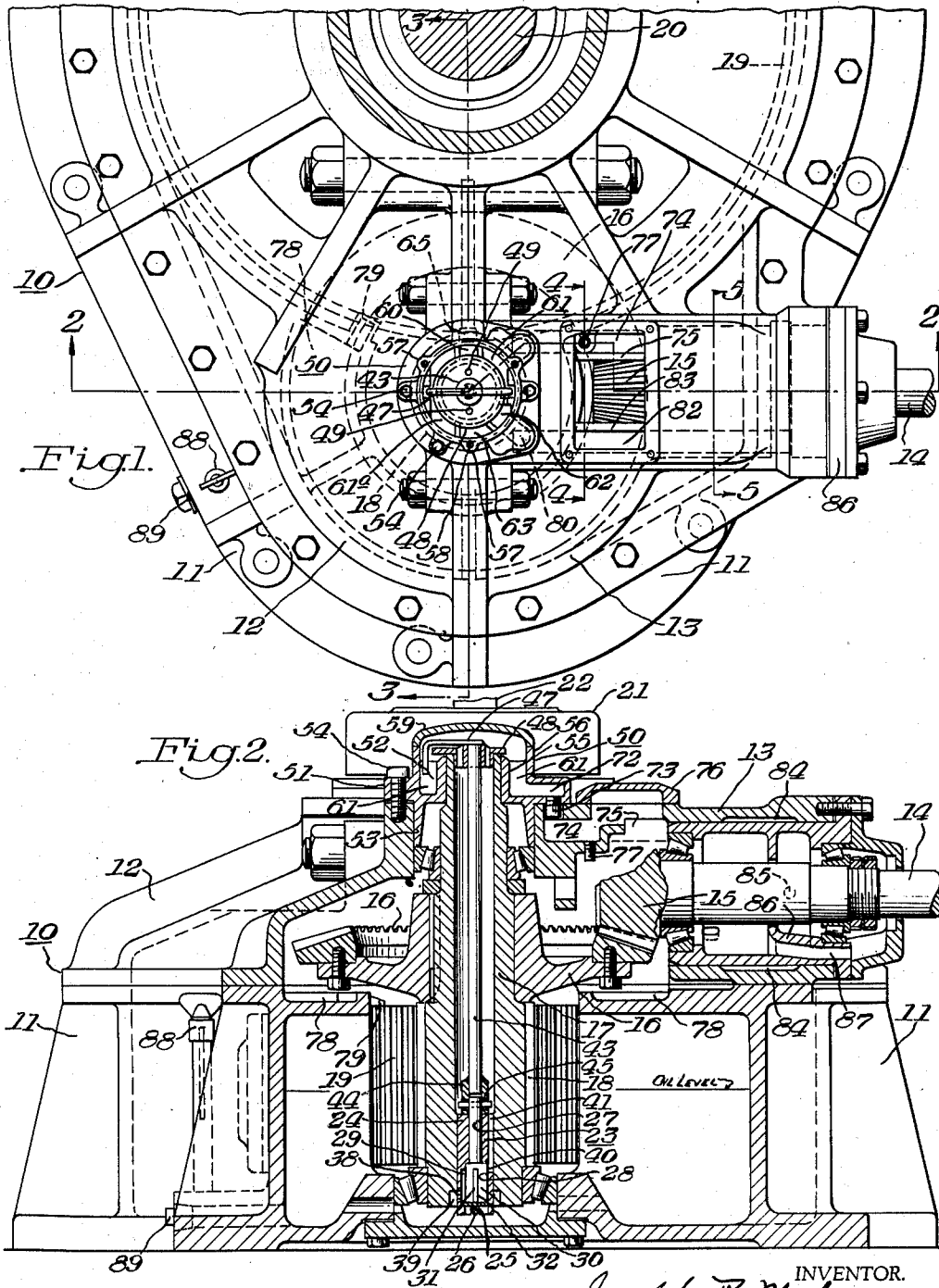
J. R. MAHAN

2,164,294

LUBRICATING SYSTEM

Filed July 13, 1938

2 Sheets-Sheet 1



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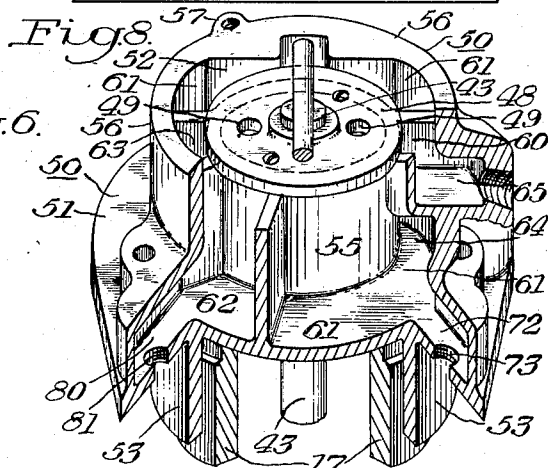
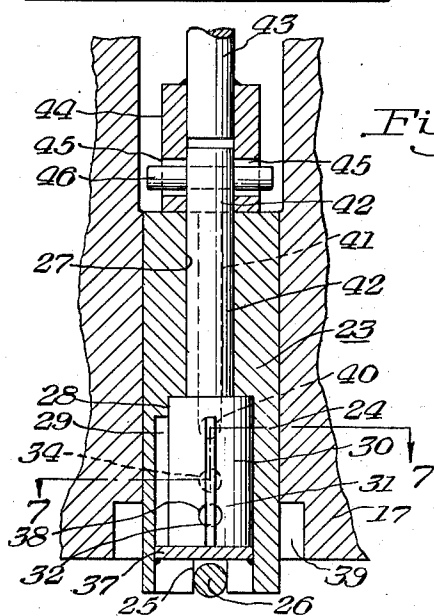
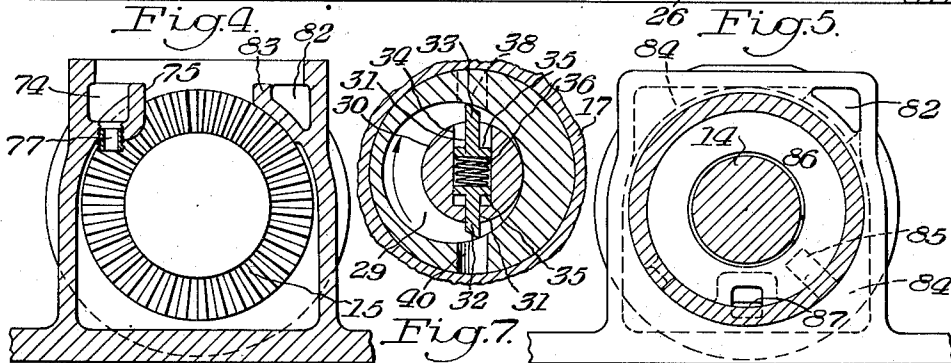
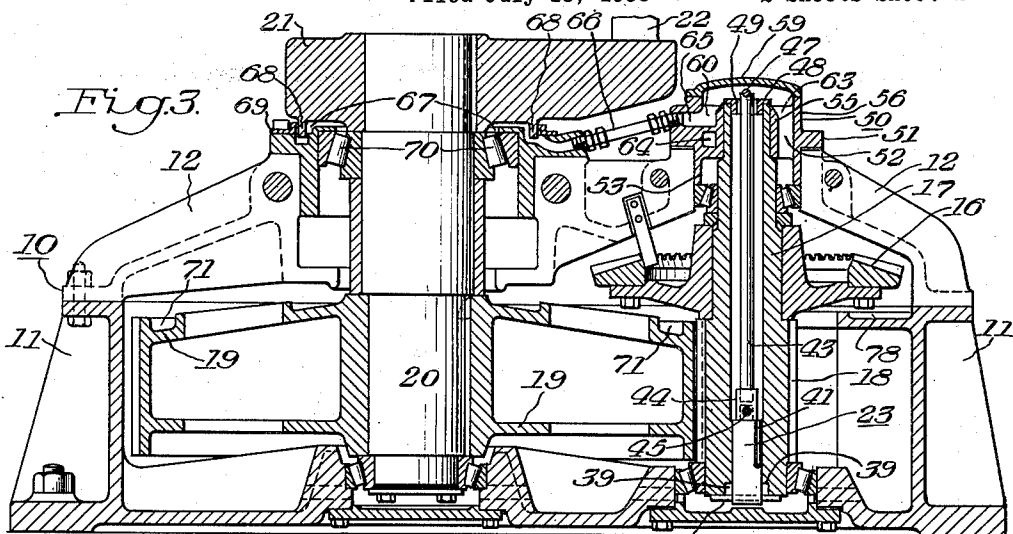
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LUBRICATING SYSTEM

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2 Sheets-Sheet 2



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2,164,294

LUBRICATING SYSTEM

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Application July 13, 1938, Serial No. 218,927

3 Claims. (Cl. 184—6)

This invention relates generally to lubricating systems and more particularly to a lubricating system for continuously supplying oil to the moving parts of a machine.

5 Lubricating systems for heavy duty machinery designed for continuous operation without an attendant are principally of the force feed type. Machinery of this character in the oil fields is generally inspected periodically. These inspections may be made weekly, monthly or during other periods of time, depending upon the age and the class of the machinery and the experience that the operating company has had with the same.

15 Irrespective of the care taken in designing, manufacturing and inspecting these machines failures frequently occur in their lubricating systems. The principal source of failure in the force feed lubricating systems has been in the stoppage of the relatively small diameter tubing which conveys the oil under pressure from the pump to the moving parts.

20 The principal object of this invention is the provision of a lubricating system that does not rely upon relatively small diameter tubes and high pressure for delivering the oil to the moving parts of the machine. Another object is the provision of a lubricator for receiving, measuring and distributing proportional quantities of oil to different parts of the machine.

25 Another object is the provision of a compact mechanism for pumping and distributing a lubricant.

30 Another object is the provision of an improved lubricating system for a geared pumping power.

Other objects and advantages appear hereinafter.

35 In the accompanying drawings a geared pumping power is shown illustrating a practical embodiment of the principles of this invention wherein:

40 Fig. 1 is a plan view of a portion of the geared pumping power with the dust cap removed showing the oil distributor.

45 Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1.

50 Figs. 4 and 5 are enlarged detailed vertical sections taken on the lines 4—4 and 5—5 respectively of Fig. 1.

Fig. 6 is an enlarged vertical section illustrating an oil pump.

55 Fig. 7 is a horizontal section of the oil pump taken on the line 7—7 of Fig. 6.

Fig. 8 is an enlarged perspective view of the oil distributor.

The geared pumping power illustrated is designed to be operated in the open and is adapted to be driven by any suitable prime mover. This power is provided with double reduction gearing which is enclosed in the weatherproof housing 10 made up of the ribbed base casting 11 and the split cover halves 12 and 13. The first reduction is made from the horizontal drive shaft 14 through the beveled pinion 15 secured on the inner end thereof, to the beveled gear 16 on the vertically disposed intermediate shaft 17. The intermediate shaft 17 is hollow and has a single helical pinion 18 formed on its lower portion which meshes with the single helical gear 19 secured to the vertical shaft 20. A crank arm 21 is secured to the upper end of the shaft 20 and is provided with an upwardly extending crank pin 22 arranged to rotatably receive a pull rod connecting wheel or the like.

Each of the three shafts 14, 17 and 20 are supported by antifrictional bearings and the principal object of this invention is to continuously supply these bearings and the teeth of the gears with a lubricating oil when the power is being operated. To provide a simplified and compact structure the pump 23 for supplying the lubricant is mounted in the bore of the intermediate shaft 17. A positive vane type pump is illustrated on the drawings. However the position and the particular type of pump employed are optional insofar as the oil distributing system is concerned, as any type of pump may be located at any convenient place provided it delivers the proper quantity of oil to the distributor.

The pump 23 is made up of a cylindrical casing 24 arranged to fit in the bore of the intermediate shaft 17. The lower end of this casing is provided with an open transverse groove 25 arranged to receive the drive pin 26 which may be welded or otherwise secured to the lower end of the shaft 17 and lie transversely of the bore thereof.

The upper end of the casing 24 is provided with an axial bore 27, which opens into a second bore 28 in axial alignment therewith and of greater diameter. The bore 28 in turn opens into the eccentrically disposed cylindrical bore which forms the pump chamber 29. The wall of the bore 28 has a common point of tangency with the wall of the pump chamber 29 as shown in Figs. 6 and 7.

The pump rotor 30 is arranged to extend through the bore 29 and snugly fit the bore 28. A transverse slot 31 is provided in the lower por-

tion of the rotor 30 for receiving the vanes 32 and 33. Intermediate of the ends of the slot 31 a transverse hole 34 is cut into the rotor substantially three fourths of the diameter thereof. The axis of the hole 34 passes through the plane of the slot 31.

Semi-circular lugs are provided on the opposite faces of each vane forming circular heads 35. When assembling the rotor the vertical sealing edge of the vane 32 is guided into the other end of the slot 31 with its circular head 35 in the hole 34. A helical spring 36 is then placed in the hole abutting the head 35 of the vane 32 and the head 35 of the vane 33 is guided into the hole 34 against the other end of the spring. The vanes may then be forced toward one another compressing the spring therebetween and permitting their insertion into the pump chamber 29. The upper end of the rotor 30 fits in the bore 28 and the top edges of the vanes are in sealing contact with the upper wall of the pump chamber 29. The bottom edges of the vanes are flush with the bottom of the rotor and form a sealing contact with the disk 37 which is inserted in the lower end of the pump chamber bore forming the lower wall thereof. The disk 37 may be soldered or otherwise secured therein as indicated in Fig. 6 and sufficient clearance is provided to prevent the bottom of the disk from engaging the pin 26.

Adjacent its lower end the wall of the casing 24 is provided with the inlet port 38 which connects the pump chamber with the annular recess 39 at the bottom of the intermediate shaft 17. The outlet port 40 is positioned diagonally across from the inlet at the upper end of the pump chamber and connects the same with the vertically disposed groove 41 in the perimetral surface of the casing 24 which extends to the top thereof, opening into the bore of the intermediate shaft 17.

The upper section of the rotor 30 snugly fits in the bore 27 of the casing 24 and extends therebeyond forming the lower section 42 of the pump shaft. The upper section 43 of the pump shaft has a collar 44 secured thereto which is arranged to receive the end of the lower shaft section 42. Diametrically disposed slots 45 are cut through the wall of the collar for receiving the transversely disposed pin 46 mounted in the lower shaft section 42. This arrangement provides a coupling between the upper and lower sections of the pump shaft and the slots 45 permit the pump casing 24 to be inserted over the drive pin 26 and carried thereby when assembling the mechanism.

The pump shaft 43 extends up through the bore of the intermediate shaft 17 and out the end thereof. The end of the pump shaft is provided with a transverse groove for receiving the rod 47 which may be welded or otherwise secured thereto. The ends of the rod are bent downwardly for engaging a stationary portion of the housing and thus hold the pump shaft and the rotor with the vanes therein from turning. The casing 24 being in engagement with the drive pin 26 secured to the lower end of the intermediate shaft 17 is rotated therewith and the relative movement between the casing and the rotor 30 produces a positive acting pump withdrawing oil from the sump below the shaft 17, the annular recess 39, the inlet ports 38 into the pump chamber 29, from whence it is forced through the outlet port 40, the groove 41 upwardly into the bore of the intermediate shaft 17.

48 represents a rotary spout which comprises a circular disk member having a depending hub arranged to be secured in the end of the bore of the rotary intermediate shaft 17. This hub is provided with a plurality of vertical passageways 49 for conveying the oil from the bore of the intermediate shaft 17 to the upper surface of the disk where it is uniformly distributed radially therefrom by the rotary movement of the disk. The axis of the rotary spout is provided with a vertical opening having sufficient clearance for receiving the upper section of the pump shaft 43 which extends therethrough.

The distributor 50 is an annular casting arranged to be mounted in the throat formed by the split cover halves 12 and 13 around the upper end of the intermediate shaft 17. This distributor comprises an annular flange portion 51, an upwardly open trough 52 having partitions therein forming independent oil receiving pockets and a depending annular flange 53 which retains the stationary race member of the upper antifrictional bearing of the intermediate shaft 17. The annular flange 51 is provided with holes for receiving the bolts 54 which secure the distributor to the split cover parts 12 and 13.

The inner wall 55 of the trough is shorter than the outer wall 56 and encircles the upper end of the intermediate shaft 17 and underlies the perimeter of the disk of the rotary spout 48. The outer wall 56 extends above the upper surface of rotary spout and is provided with a series of lugs 57 which are drilled and tapped to receive the bolts 58 for securing the distributor cover plate 59.

In this particular installation the trough of the distributor is provided with four pockets 60, 61, 62 and 63 formed by short partitions between the annular walls 55 and 56. The oil pocket 60 as seen in Figs. 1, 3 and 8 is shallow to permit an inner connecting passageway 64 between the two sections forming the pocket 61. A horizontal passageway 65 connects the pocket 60 to the outer periphery of the distributor for conducting oil to the pipe 66 leading to the annular oil groove 67 formed in the upper surface of the split cover 12 and 13 around the shaft 20. The oil groove 67 is enclosed by the depending annular flange 68 on the underside of the crank 21 and the dust ring 69. The pocket 60 being at a higher level than the groove 67 provides a pressure head causing the oil to overflow the groove and pass through the upper antifrictional bearing 70 supporting the shaft 20. When the oil passes through this bearing it runs down the shaft onto the upper surface of the gear 19 where it runs to the trough 71 around the periphery thereof. This trough likewise can hold only a given amount of oil and then it overflows the sides thereof across the face of the single helical teeth into the oil that stands approximately halfway up the base casting 11.

The sections forming the pocket 61, which represents the largest amount of oil directed to any one place, are connected by the lateral passageway 72 in the flange 51 through the vertical passageway 73, to the horizontal passageway 74, in the cover section 13 shown in Figs. 2 and 4 and which terminates in an open trough formed by the wall 75 under the beveled pinion and gear inspection plate 76. A spout 77 is provided in the bottom of the passageway 74 for discharging oil onto the beveled gear 16 where it overflows across the face of the teeth and onto the horse-shoe trough 78 which carries the oil around the shaft 17 to the spout 79 which delivers it to the

trough 71 on the single helical gear 19 and on the teeth thereof just before they are engaged by the teeth of the single helical pinion 18.

The spout 77 directs only a portion of the oil from the passageway 74. The balance of the oil spills over the wall 75 onto the revolving beveled pinion 15 and the inner antifrictional bearing supporting the horizontal drive shaft 14 and thence to the horseshoe trough 78.

The pocket 62 delivers oil to the lateral passageway 80 in the flange 51, through the vertical passageway 81 to the horizontal passageway 82 in the cover section 13 and which passes under the inspection plate 76 in the form of an open trough made by the wall 83 as shown in Fig. 4, and opens into the oil chamber 84 from whence it travels upwardly through the radial passageway 85 into the bearing housing 86 which carries the outer antifrictional bearing for supporting the horizontal drive shaft 14. The oil then flows through this bearing and is collected at the outer side thereof by the passageway 87 which brings the oil back through the inner antifrictional bearing and thence to the horseshoe trough 78.

The fourth pocket 63 in the distributor has no floor and the oil collected thereby flows down onto the antifrictional bearing supporting the upper end of the intermediate shaft 17, thence to the beveled gear 16 where it joins the oil directed from the sections of the pocket 61.

Since the lower section 11 of the housing 10 acts as a reservoir and is maintained half full of oil the lower portion of the helical pinion 18 and the helical gear 19 together with the antifrictional bearings supporting the lower ends of the shafts 17 and 20 run in oil and the pump 23, which is continuously removing oil from the sump below the shaft 17, creates a circulation of oil in the reservoir toward the shaft 17 and through the lower antifrictional bearing thereof. Oil may be supplied to the reservoir housing through the pipe 88 and drained therefrom by removing the plug 89 as shown in Figs. 1 and 2.

The capacity of the oil pump is sufficient to provide a continuous flow of oil that will supply a generous quantity to the moving parts of the machine. The oil fills the bore of the intermediate shaft 17 and flows upwardly through the passageways 49 in the rotary spout 48. The rotary movement of the spout spreads the oil uniformly over the flat surface and off the periphery against the outer wall 56 of the trough 52. Thus the rotary spout delivers an equal quantity of oil per unit area of the annular trough and by varying the angular size of the pockets in the trough the quantity of oil to be delivered to each of the several points lubricated may be properly proportioned. The oil thus divided by the partitions forming the pockets gravitates to their respective lubricating points.

In laying out the lubricating paths the size of the pockets is first determined to provide the proper proportions of oil for lubricating the particular points in each path and after passing one or more lubricating paths the oil of two or more paths is reunited and continues to gravitate on its way for lubricating additional points before the oil is all finally collected in the base. In some installations it may be desirable to employ a second rotary spout for redistributing oil col-

lected after passing one or more lubricating points before it finally reaches the reservoir. These methods of distribution of lubricating oil by gravitation have been found particularly advantageous in the development of this art. These systems are preferably completely enclosed and any small particles which ordinarily plug up a high pressure oil line are merely washed into and settle in the reservoir and are not in the least bothersome or detrimental to the operation of the machine.

The pump shown in the particular machine design chosen to illustrate this invention seals in the bore of the intermediate drive shaft and uses it merely as a delivery pipe. However any type of pump could be employed provided it is capable of delivering the required amount of oil and the discharge line of the pump delivers the oil adjacent the axial center of a rotary spout to produce a uniform distribution to the pockets of the distributor. Radially and arcuately disposed grooves have been employed on the face of the rotary spout for directing the flow of oil therefrom. In most installations grooves of this character are not necessary as the volume of flow per unit of time is usually greater than the capacity of a moderate size groove and the oil overflows but is still proportionately delivered. Experience therefore teaches that a simple smooth surface flat disk is preferable for moderate and high speeds, whereas a spout or pipe may be satisfactory for machinery operating at very slow speeds.

A viscosity type screw pump is also adaptable for use with a hollow rotary shaft to lift the oil to a rotary spout. The advantage of employing a hollow shaft for pumping the oil is highly desirable from the standpoint of conserved space in this type of equipment and it usually reduces the number of parts which is also an advantage.

I claim:

1. In a lubricating device the combination with a distributor having a plurality of pockets annularly arranged for receiving and conducting a lubricant to various parts of a machine, of a rotary disk concentrically mounted relative to said distributor and upon the upper surface of which the lubricant is deposited, and means for rotating the disk to uniformly discharge the lubricant to the distributor.

2. In a lubricating device the combination with a distributor having a plurality of pockets annularly arranged for receiving and conducting a lubricant to various parts of a machine, of a rotary disk concentrically mounted relative to said distributor, means for supplying lubricant from below to the upper surface of the disk, and means for rotating the disk to uniformly discharge the lubricant to the distributor.

3. In a lubricating device the combination with a distributor having a plurality of pockets annularly arranged for receiving and conducting a lubricant to various parts of a machine, of a rotary disk concentrically mounted relative to said distributor, a tubular support for said disk, means for supplying lubricant through said support to the upper surface of the disk, and means for rotating the disk to uniformly discharge the lubricant to the distributor.

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