Oct. 15, 1929. L. F. BURNHAM ET AL 1,731,885

MULTIPLE PUMPING GEAR UNIT

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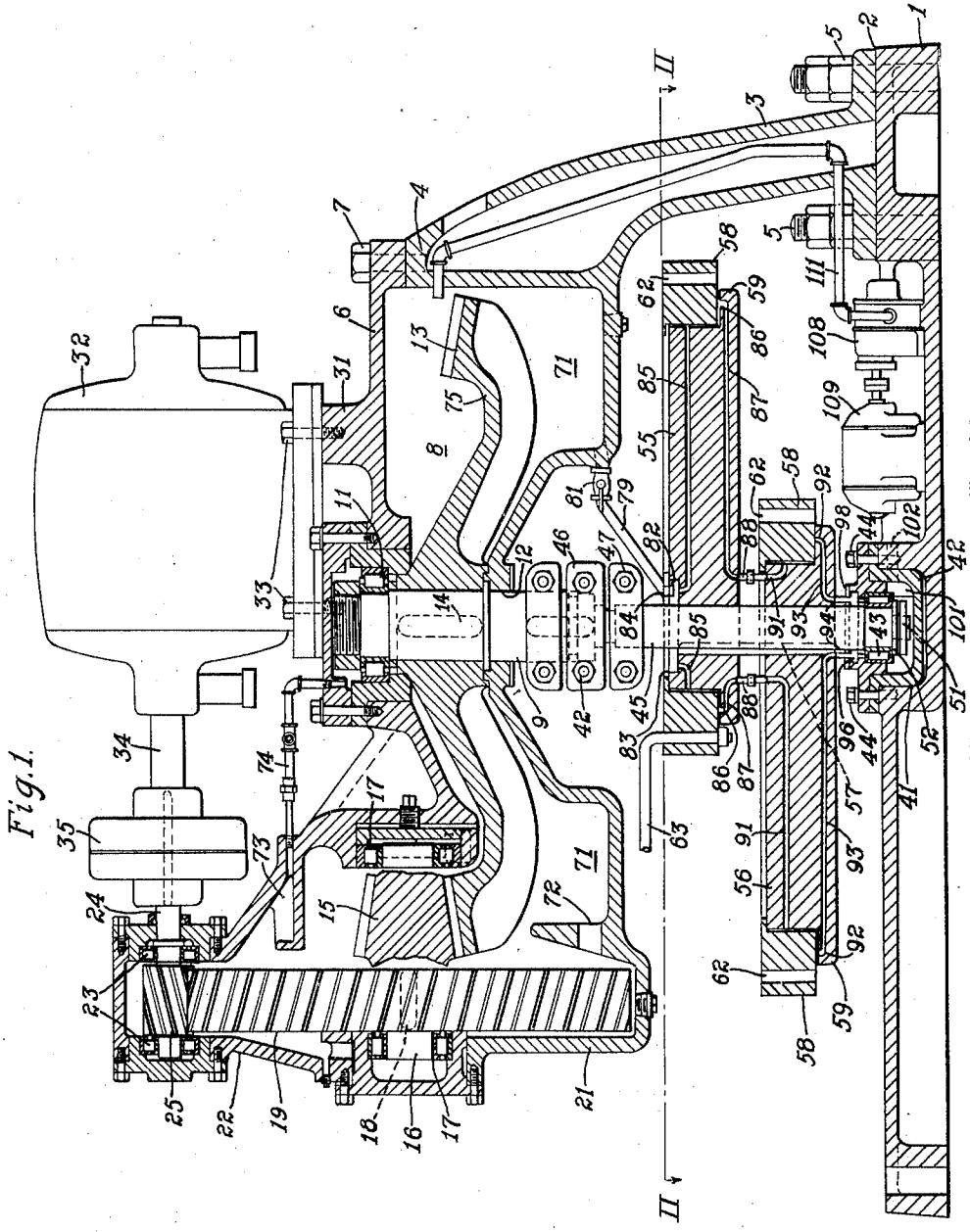


Fig. 1.

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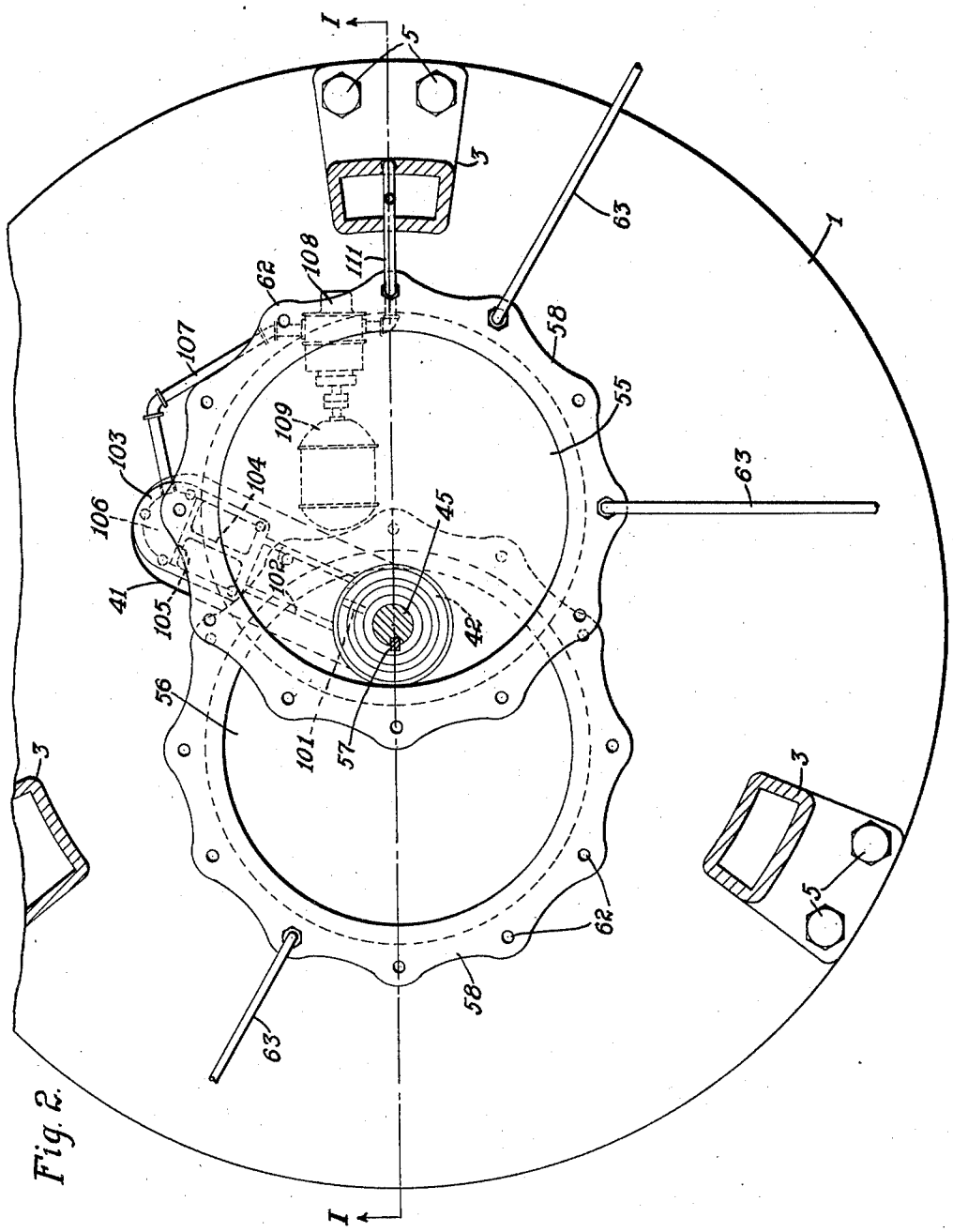


Fig. 2.

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UNITED STATES PATENT OFFICE

LELAND F. BURNHAM, OF PITTSBURGH, PENNSYLVANIA, AND PAUL W. JONES, OF LOS ANGELES, CALIFORNIA, ASSIGNORS, BY MESNE ASSIGNMENTS, TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

MULTIPLE PUMPING-GEAR UNIT

Application filed June 18, 1927. Serial No. 199,848.

Our invention relates to transmission mechanisms and, in particular, to geared reduction units for operating a plurality of oil-well pumps simultaneously.

It is among the objects of our invention to provide an oil-well-pumping-gear mechanism that shall be of strong and rigid construction.

Another object of our invention is to provide a transmission mechanism for operating a plurality of oil-well pumps in which the eccentrics for actuating the pull rods are placed a minimum distance above the base or bed plate in order to stabilize the pumping unit and to reduce the lever arm of the forces tending to tip the transmission mechanism from its foundation.

Another object of our invention is to provide an oil-well-pumping unit which is so designed that the so-called "blind spots" about the periphery thereof are reduced to a minimum and the pull or push rods are, therefore, free to extend radially from the transmission unit at all angles excepting in the limited spaces taken up by the supporting pedestals.

A further object of our invention is to provide an oil-well-pumping-drive mechanism that is equipped to be automatically lubricated and one in which a minimum amount of attention is required in operation.

Heretofore, oil-well-pumping units or "powers", as they are sometimes called, have been utilized in which the power-developing unit, such as a steam engine, gas engine or electric motor, was operatively connected to an eccentric shaft by means of a belt and geared drive or by a direct geared drive. However, in all previous types of multiple pumping units, the prime mover has been placed at one side of, and upon a level with, the reduction-gear mechanism.

Such types of construction resulted in a large "blind spot" or area at the side of the drive mechanism from which no pumping rods could be extended.

We avoid the difficulties encountered in the devices of the prior art by mounting the prime mover directly on the gear reduction unit and above the pumping eccentrics. In conjunction with our device, we have succeeded in making the multiple pumping unit self-lubricating and dependable; and therefore, suitable to be operated in an isolated locality with but little attention.

Our pumping unit is further constructed to facilitate inspection and the repairing of the operating parts.

In the accompanying drawings,

Fig. 1 is a sectional view of a drive mechanism embodying the principles of our invention, taken along the line 1—1 of Fig. 2, and

Fig. 2 is a sectional view of the drive mechanism shown in Fig. 1, taken along the line 11—11 of Fig. 1.

The transmission mechanism comprises a base or bed plate 1 that is provided with three bearing pads 2 near its periphery and disposed 120° apart. The bearing pads 2 are adapted to receive pedestals or feet 3 that are integral parts of a lower housing member 4 and the pedestals are secured to the bed plate 1 by means of bolts 5. An upper housing member 6 is secured to the housing member 4 by means of cap screws 7. Thus the upper and lower housing members constitute a gear chamber 8.

A vertical shaft 9 is journalled substantially in the center of the upper housing member 6 by means of an anti-friction bearing 11 that serves to restrain the shaft 9, against radial and axial movement. An opening 12 is provided in the lower housing member 4 in proper alinement with the bearing 11 to allow the shaft 9 to project from the gear chamber 8 in the direction of the bed plate 1. A relatively large bevel gear wheel 13 is securely mounted upon the shaft 9 by means of a press fit and a key 14 and is adapted to revolve within the gear chamber 8. A bevel pinion 15 meshing with the bevel gear wheel 13 is mounted upon a horizontal shaft 16 and journalled in the housing members 4 and 6 by means of bearings 17.

Rigidly mounted upon the shaft 16 by means of a press fit and a key 18 is a helical gear wheel 19. The gear wheel 19 rotates within a portion of the gear chamber 8 that is formed by a depending portion 21 of the lower housing member 4 and a raised portion

22 of the upper housing member 6. The portion 22 of the housing member 6 is provided with bearings 23 that serve to journal a horizontal shaft 24 on which is mounted a helical pinion 25 that is in operative engagement with the helical gear wheel 19.

A driving motor 32 is mounted on bearing pads 31 on the upper housing member 6 and the driving motor 32 is secured to the casing by means of cap screws 33. A shaft 34 in the driving motor 32 is disposed in axial alinement with the shaft 24 and is operatively connected thereto by means of a coupling 35.

The base or bed plate 1 is provided with an elongated depression 41 having one end at substantially the center of the base and extending radially therefrom. A bearing cup 42 in the base encloses an anti-friction bearing 43 which is adapted to be moved radially in the depression 41 and to be secured at substantially the center of the base 1 by means of cap screws 44.

An eccentric shaft 45 is journalled at its lower end in the bearing 43 and is axially alined with and connected to the vertical shaft 9. A clamp coupling 46 having clamping bolts 47 detachably secures the shaft 45 to the shaft 9 and lock nuts 51 are provided at the lower end of the shaft 45 for holding the inner race 52 of the bearing 43 in proper operating position.

A plurality of eccentric discs 55 and 56 are mounted, one above the other, on the eccentric shaft 45 and are secured thereto by keys 57. On the peripheries of the eccentric discs 55 and 56, ring members 58 are mounted in such manner that the discs are free to rotate within them and the ring members are restrained from axial displacement with respect to the discs by means of flanges 59 that are integral parts of the eccentrics 55 and 56. Holes 62 at intervals in the peripheries of the rings 58 are provided for securing rods 63.

A reciprocating motion is imparted to the rods 63 when the eccentric discs 55 and 56 are rotated about the center of the shaft 9 and within the ring members 58, in accordance with the well known action of the conventional eccentric mechanism. The rods 63 extend radially from the transmission mechanism and operate a plurality of oil-well pumps (not shown).

The eccentric shaft 45 and the eccentric discs 55 and 56 may be removed from the transmission mechanism for repairing them or replacing them with eccentrics of a different type as follows: The bolts 47 in the clamp coupling 46 are removed and the entire coupling 46 taken from the shafts 9 and 45. The cap screws 44 are then unscrewed from the bearing cup 42, thus loosening it from the base piece 1. The entire assembly comprising the eccentric shaft 45, the eccentrics 55 and 56, and the bearing cup 42 with the bearing 43 are then drawn along the depression 41 to a position from which they can be lifted vertically therefrom and removed from the transmission unit.

A reservoir 71 is provided in the lower part of the lower housing member 4 for receiving a supply of lubricant that is distributed to the bearing surfaces of our transmission mechanism by means of a system of passages and pipes.

The lubricant passes through an opening 72 in the reservoir 71 to the helical gear chamber formed by the portion 21 of the housing member 4. The oil is splashed and carried upwards by the helical gear 19 to the helical pinion 25 and the bearings 23. A portion of the oil carried up by the gear-wheel 19 splashes into a trough 73 in the portion 22 of the upper housing member 6. From the trough 73 the oil flows through a pipe 74 to the bearing 11 in the center of the upper housing portion 6. From the bearing 11 the oil flows onto the bevel gear 13 in the bowl-shaped portion 75 thereof.

The overflow of oil from the bowl-shaped portion 75 must necessarily pass through the toothed spaces of the bevel gear 13, and in so doing it thoroughly lubricates it and the bevel pinion 15.

The excess oil then returns to the reservoir 71 which also serves as a sediment chamber wherein foreign matter in the oil is permitted to precipitate.

A pipe 79 in which there is a valve or petcock 81, opens from the chamber 71 to an annular oil basin or groove 82 in the eccentric 55. A cover plate 83 having an opening 84 for the pipe 79 is loosely fitted on the shaft 45 and serves to exclude foreign matter from the oil basin 82. Radial channels 85 are provided in the eccentric 55 for distributing the oil to the bearing surface, between the eccentric and its corresponding ring member 58.

The oil is collected in an annular groove 86 at the lower edge of the eccentric and is conducted through the radial passages 87 to vertical pipes 88 that communicate with the radial channels 91 in the eccentric 56. The pipes 88 conduct the oil to the bearing surface of the eccentric 56 where the oil is again collected in an annular groove 92 and returned through the radial passages 93 to pipes 94 that extend downwardly and parallel with the shaft 45.

The pipes 94 communicate with an annular oil reservoir 96 in the upper portion of the bearing cup 42 and a cover member 98 having openings for receiving the pipes 94 is provided for the basin 96 and is adapted to rotate with the shaft 45. From the basin 96 the oil is drained directly into the bearing cup 42.

A baffle plate 101 is provided in the bearing cup 42 and two pipes 102 extend from positions at each side of the baffle plate 101 to a tank 103 that is disposed in the depres-

sion 41. The oil tank 103 is divided into three chambers by means of dams 104 and 105.

When the transmission mechanism is in operation the lock nuts 51 turn and agitate the lubricant in the bearing cup 42 and cause it to impinge upon the baffle plate 101, thereby forcing the lubricant through one of the pipes 102 to the tank 103 over the dam 104 and back through the other pipe 102 to the bearing cup 42.

Excess lubricant that may drain into the bearing cup 42 from the eccentric 56 will cause the level of the lubricant in the tank 103 to raise to the top of the dam 105 and to flow over it into the chamber 106.

From the chamber 106, the lubricant is withdrawn through a pipe 107 to a pump 108 that is driven by a motor 109. The pump 108 discharges through a pipe 111 that extends upward through one of the pedestals 3 and discharges into the reservoir 71.

In operation, it is desirable to place the transmission mechanism with reference to the oil wells to be pumped so that an approximate balance may be obtained between the forces exerted upon the eccentrics by the radially extending pull rods 63.

It is evident from the foregoing description of our invention that a drive mechanism for pumping a plurality of oil wells that embodies a reduction gear unit constructed in accordance with the principles of our invention constitutes a durable, efficient, and convenient device that may be operated with a minimum amount of attention.

Although we have described a specific embodiment of our invention, it will be evident to those skilled in the art that various changes may be made in the details of construction and the proportions of the various parts without departing from the spirit and scope of our invention as defined in the appended claims.

We claim as our invention:

1. In a drive mechanism for oil-well pumps, a base member, supporting pedestals mounted thereon, a housing supported upon said pedestals, a vertical shaft journalled in said housing and an eccentric shaft journalled in said base and detachably secured to said vertical shaft, said eccentric shaft being disposed between the base and the housing.

2. In a drive mechanism for oil-well pumps, a base member, supporting pedestals mounted thereon, a housing supported upon said pedestals, a vertical shaft journalled in said housing and a second vertical shaft journalled in said base in alignment with said first-named vertical shaft and detachably secured thereto, said second vertical shaft being disposed between the base and the housing.

3. In a drive mechanism for oil-well pumps, a base member, supporting pedestals mounted thereon, a housing supported on said pedestals, a vertical shaft journalled in said housing, an eccentric shaft having a plurality of eccentrics mounted thereon journalled in said base member and disposed between the housing and the base, and means for detachably securing said eccentric shaft to the vertical shaft, said eccentric shaft and eccentrics being removable from the drive mechanism as a unit without disturbing the remaining parts thereof.

4. In a drive mechanism for oil-well pumps, a base member having an elongated radially disposed depression in the center thereof, supporting pedestals mounted on the base, a housing supported upon said pedestals, a bearing detachably secured in said depression, a vertical shaft journalled in said bearing and a vertical drive shaft journalled in the housing and secured to the first-named shaft by a detachable coupling, said first-named shaft being removable from the drive mechanism by detaching the coupling and bearing.

5. In a drive mechanism for oil-well pumps, a base member, a plurality of supporting pedestals mounted on said base, a housing supported on said pedestals, a shaft journalled vertically in said base and housing, a motor mounted on said housing, and a gear train for operatively connecting said motor to said vertical shaft, an oil reservoir in said housing, means associated with said gear train for lubricating the upper journal of said vertical shaft, an oil passage from said reservoir to the lower journal of said shaft, means for collecting excess oil in said base and means for returning said oil to the oil reservoir.

6. In a drive mechanism for oil-well pumps, a base member, supporting pedestals mounted thereon, a housing supported upon said pedestals, an oil reservoir in said housing, a vertical shaft journalled in said base and housing members, eccentrics secured to said shaft, an oil passage from said reservoir to said eccentrics, oil collecting means on said eccentrics, an oil passage from said collecting means to said base and a pump for returning the oil to the reservoir.

In testimony whereof, we have hereunto subscribed our names this 4th day of June, 1927.

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