March 7, 1933. W. D. POMEROY 1,900,735

LUBRICATING SYSTEM

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FIG. 1.

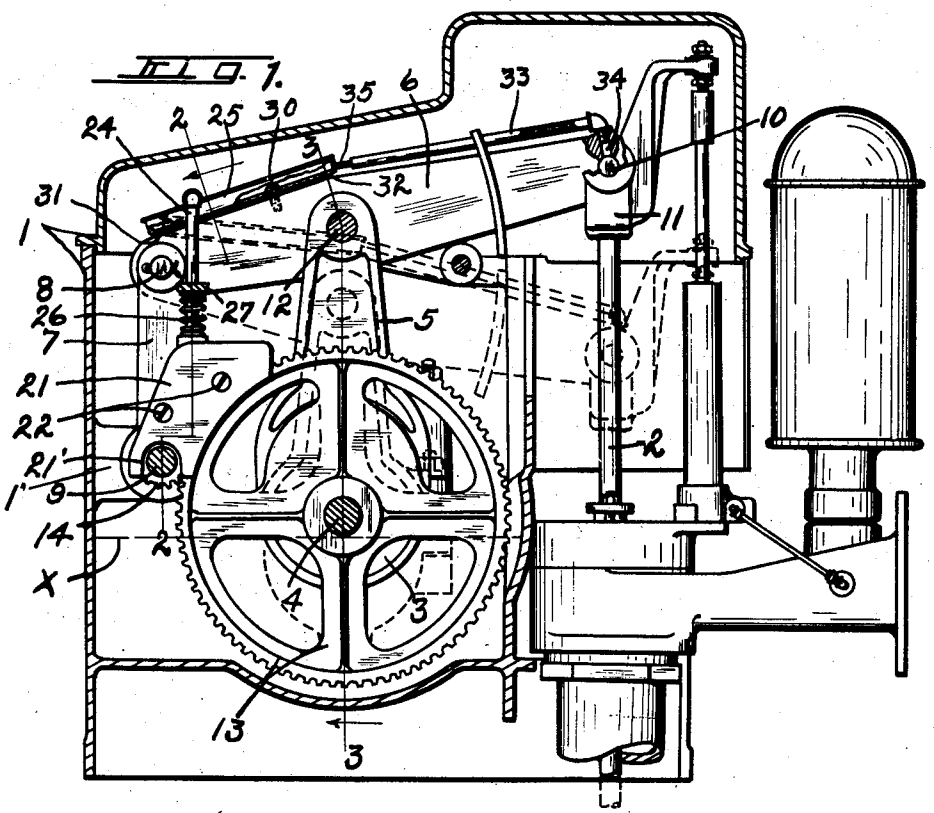
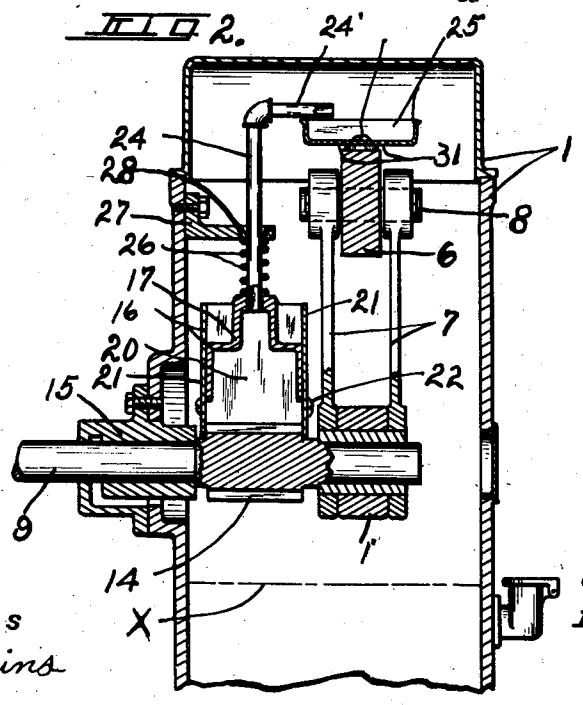


FIG. 2.



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FIG. 3.

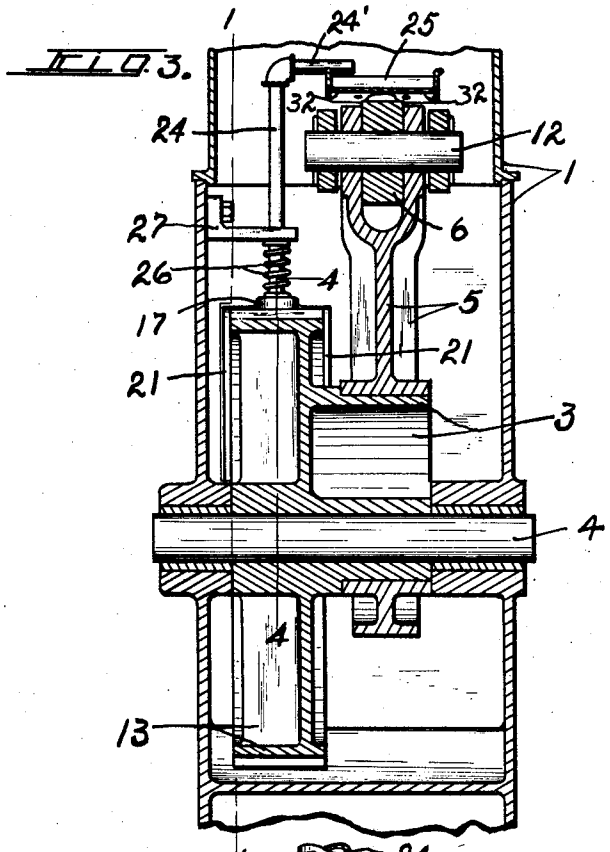
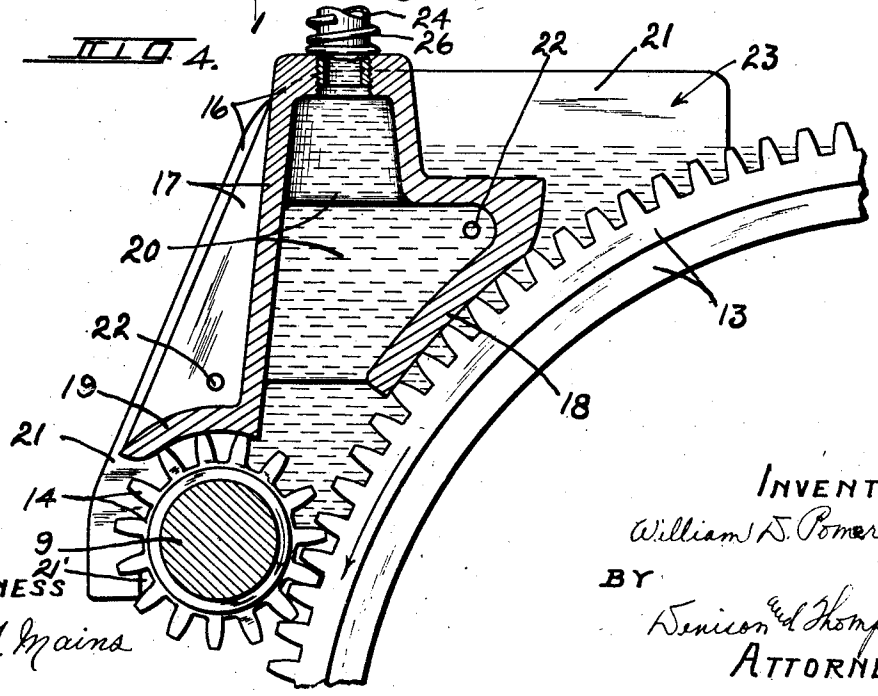


FIG. 4.



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UNITED STATES PATENT OFFICE

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LUBRICATING SYSTEM

Application filed February 3, 1930. Serial No. 425,554.

This invention relates to improvements in lubricating systems for deep well pumps and the like.

Heretofore, it has been customary to depend upon some form of an oil slinger or an oil splash system for lubricating various working parts contained within the pump case. This method has proven unsatisfactory in that certain portions of the moving parts or bearings do not always receive a sufficient amount of lubrication.

Another objection to the splash system for lubricating purposes in a device of this kind is that it is expensive and difficult to provide a pump case which is absolutely oil-tight, with the result that a certain amount of the lubricant works to the outside of the case, thus wasting the lubricant and causing an unclean and, therefore, undesirable condition of the exterior of the pump case.

The objects of my invention are to avoid the above objections; to provide a novel construction whereby the main gear and drive pinion therefor may be utilized to elevate the lubricant to the upper portion of the interior of the case where it may be easily distributed as required, for lubricating various bearings or moving parts of the pump mechanism and return by gravity to the lower portion of the case without the excessive splashing of the lubricant, which necessitates the oil-tight construction of the case, and also without the use of an additional oil pump and the expense this involves.

To accomplish these objects, my invention comprises a novel oil chamber positioned in co-operative relation with the main drive gear and the drive pinion operating therewith, so that the lubricant, as oil, carried up by the main gear, due to the viscosity of the oil, during the rotation thereof, will collect in said chamber and be forced through an outlet conduit by the action of said gear and pinion to the upper portion of the interior of the pump case and deposited into a suitable distributing means out of which the lubricant escapes, by gravity, over the various members to be lubricated and eventually return to the lower portion of the gear case.

Other objects and advantages relating to the form and relation of the parts will more fully appear from the following description, taken in connection with the accompanying drawings wherein:—

Figure 1 is a longitudinal vertical sectional view through the case, of a work head for deep well pumps taken in the plane of the line 1—1, Figure 3.

Figure 2 is a detail transverse vertical section taken in the plane of the line 2—2, Figure 1.

Figure 3 is a transverse vertical section taken in the plane of the line 3—3, Figure 1.

Figure 4 is an enlarged detail vertical section of the oil chamber housing taken on line 4—4, Figure 3.

In Figure 1 of the drawings is represented a common form of a workhead adapted to operate a plunger in a deep well cylinder and consists of a case —1—, a vertically disposed plunger rod —2— mounted for longitudinal reciprocative movement at one side of the case —1—, and a drive mechanism for the plunger rod comprised, in this instance, of an eccentric member —3— journaled on a horizontally disposed shaft —4— having its outer ends secured in the vertical side walls of the case —1—.

A vertically disposed eccentric rod —5— is mounted on the eccentric —3— and projects some distance above the shaft —4— with the upper end thereof forked to receive a walking beam —6—.

The walking beam —6—, in this instance, is disposed in a substantially horizontal plane near the upper portion of the interior of the case —1— with one end thereof pivotally connected to the upper end of a substantially vertically disposed pair of arms —7— by a pin —8—, which passes through registering holes provided in the upper ends of the arms —7— and the outer end of the walking beam —6—, the arms —7— being positioned one at either side of the walking beam —6— and rotatably supported at their lower ends by a lateral projection —1'— forming the inner bearing support for the pinion drive shaft —9—, so as to permit the free rocking movement of the arms dur-

ing the oscillating movement of the walking beam —6—.

The other end of the walking beam —6— is rotatably connected to the upper end of the plunger rod —2— by means of a pin —10— which has the ends thereof secured in opposite sides of a yoke member —11— secured to the upper end of the plunger rod —2—.

The eccentric rod —5— is rotatably secured to the walking beam —6— intermediate the ends thereof by means of a pin —12— which passes through registering holes provided in the upper end of the eccentric rod —5— and walking beam —6— so that any rotating movement of the eccentric —3— will cause the eccentric rod —5— to rock the walking beam —6— about the pivot —8— and thereby produce a reciprocative movement of the opposite end of the walking beam and the plunger rod —2— connected therewith.

The eccentric —3— may be rotated about the axis of the shaft —4— by means of a relatively large spur gear member —13— which may be made integral with the eccentric or secured thereto, the gear —13— in turn, being rotated by means of a pinion gear —14— made integral with or secured to the pinion drive shaft —9— which is disposed in a horizontal plane a short distance above the axis of the gear —13— with the pinion —14— in meshing engagement with the gear —13—, the shaft —9— being journaled in the lateral projection —1'— and also in a suitable bearing member —15— secured to the case —1—. Shaft —9— extends outwardly through said bearing member and is adapted to be connected in any suitable manner to a source of power, as an electric motor, not shown, for rotating said shaft.

At the junction of the gear —13— and pinion —14— I have provided an oil chamber adapted to receive the lubricant as it is displaced from the teeth of the gear —13— by the meshing engagement of the teeth of the pinion —14— therewith, in the following novel manner:

An oil housing member —16— is positioned on the gear —13— and pinion —14— and consists of a chambered head —17— having substantially the same width as the face of the teeth of the gear —13— and pinion —14—.

The front lower surface —18— of the head —17— is formed in an arc having a radius equal to the radius of the periphery of the teeth of the gear —13— while the lower end of the rear vertical wall of the head —17— is provided with a rearwardly extending flange —19— which has the lower surface thereof curved to conform to the periphery of the teeth of the drive pinion —14— so that when the housing —16— is placed in operative position on the gear —13— and pinion —14—, as illustrated more particularly in Figure 4, the portions —18— and —19— of the head —17— will rest upon the face of and form a substantially oil-tight connection between the head —17— and the adjacent portion of the teeth of the gear —13— and pinion —14— respectively.

The head —17— is provided with an interior oil chamber —20— which is open at the bottom for receiving the oil or lubricant as it is displaced from the teeth of the gear —13— by the action of the pinion —14—. The head —17— is maintained against lateral displacement on the gear and pinion by a pair of side plates —21— positioned one at either side of the head —17— and secured thereto by screws —22—.

The plates —21— are each formed with a surface area greater than that of the respective end of the head member —17— with the lower edge of the plates overlapping the sides of the gear —13— and pinion —14—, thus positioning the plates in proximity to the side surfaces of the gear and pinion for preventing the escapement of the lubricant therebetween.

The plates —21— are each provided with a substantially U-shaped opening —21'— in their rear lower edges, adapted to receive the pinion shaft —9—, while the upper portion of the plates extends above the head member —17— and forwardly thereof to form an oil reservoir —23— between the plates, the front face of the housing member —17— and the adjacent portion of the gear —13—.

A vertically disposed oil discharge pipe or conduit —24— is secured to the chambered head —17— in communication with the upper portion of the chamber —20— for conveying the lubricant from the chamber —20— to the upper portion of the interior of the case —1—. The upper end of the discharge pipe —24— is provided with a laterally disposed pipe —24'— adapted to deposit the lubricant into a distributing pan —25— secured to the upper edge of the walking beam —6—.

The housing —16— is yieldingly maintained in operative relation with the gear and pinion by a compression spring —26— coiled about the pipe —24— and positioned between the upper face of the head —17— and a horizontally disposed bracket —27— which is secured to the adjacent side wall of the case —1— and provided at its inner end with an opening —28— for receiving the pipe —24— therethrough.

The opening —28— is constructed somewhat larger than the diameter of the pipe —24— so as to permit the free movement of the pipe through said opening in case the oil pressure in the chamber —20— increases

to such an extent as to lift the member —16— against the action of the spring —26—.

This excessive pressure in the chamber —20— will be caused at any time that the discharge pipe —24— is not able to conduct the oil as rapidly as the gears pump the oil into the chamber —20—, and this excessive pressure is relieved as soon as the housing —16— is lifted sufficiently to by-pass the excessive oil, whereupon the member —16— will be returned to operative relation with the teeth of the gear —13— and pinion —14— by the action of the spring —26—.

The distributing pan —25—, in this instance, is a relatively shallow receptacle open at the top for receiving the lubricant and secured by screws —30—, or otherwise, to the rear portion of the upper edge of the walking beam —6— to rock therewith.

The bottom of the pan —25— is provided with perforations —31— and —32— near each end thereof in substantial vertical alignment with the pivotal pin —8— and the cam rod connecting pin —12— respectively, so that any lubricant contained in the pan will escape through the perforations —31— or —32—, depending upon the position of the walking beam —6— and thus lubricate said pins, for it is evident that when the walking beam —6— is in the up position, as illustrated by full lines in Figure 1, the pan —25— will be tilted downwardly toward the rear, which causes the lubricant to flow to the rear end of the pan and out through the perforations —31—, which distributes the lubricant over the pivotal pin —8—.

When, however, the walking beam —6— is moved by the eccentric —3— to the down position, as illustrated by dotted lines, the lubricant will flow to the forward end of the pan and be distributed as it escapes through the perforations —32— located at that end of the pan over the pin —12— for lubricating said pin.

A pipe —33—, positioned parallel with the upper edge of the forward end of the walking beam —6—, is secured at one end in an opening —34— provided in the forward end of the walking beam —6— in communication with the bearing pin —10— for the plunger rod —2—.

The pipe —33—, in this instance, extends rearwardly to within a short distance of the front end of the pan —25— and is connected with the interior of the pan by means of a suitable oil-absorbing material, which is contained in said pipe, such as candle wicking —35—, for absorbing a sufficient amount of the lubricant contained in the pan and feeding it by capillary attraction to the pin —10—.

In operation, the case —1— is provided with a suitable lubricating oil, the level of which is maintained below the drive pinion —14— at substantially the plane of the line X, Figures 1 and 2, so that a large portion of the gear —13— is submerged in the lubricant.

As the gear —13— is rotated by the action of the pinion —14— in an anti-clockwise direction, a considerable amount of the lubricant will be carried upwardly by the gear due to the viscosity of the lubricant. A large percentage of the lubricant thus carried by the gear —13— will be displaced from the teeth thereof by their engagement with the teeth of the pinion —14— and be stored in the chamber —20— and forced out through the delivery pipe —24— to the oil pan —25— as the lubricant continues to accumulate in said chamber.

In other words, the gear —13— and pinion —14— function as a gear pump to elevate the lubricant through the chamber —20— and the pipe —24— to the upper portion of the case —1—. The forwardly extending portions of the side plates —21—, due to their close relation to the sides of the gear —13— will collect an appreciable amount of the lubricant from the teeth and sides of the gear —13— that would otherwise escape before reaching the junction of said gear and pinion —14—.

This lubricant is stored in the reservoir —23— until carried forwardly by the teeth of the gear —13— to the place where the teeth of the pinion —14— engage the teeth of the gear —13—, thereby greatly increasing the amount of lubricant pumped by the gear and pinion through the chamber —20— and delivery pipe —24—.

If, however, the amount of the lubricant collected in the chamber —20— is greater than can be discharged through the pipe —24—, the housing —16— will be lifted by the increased pressure thus produced against the action of the spring —26—, sufficiently to permit the excess lubricant to escape from the reservoir —23— and the oil chamber —20— without injuring any of the mechanism or retarding the operation of the workhead.

Although I have shown and particularly described the preferred embodiment of this invention, it is evident that various changes in the construction, both in the form and relation of the parts, thereof, may readily be made and that the mechanism is readily applicable to various classes of devices, without departing from the spirit of this invention, as set forth in the appended claims.

I claim:

1. In a device of the class described, in combination with a pair of gears in meshing engagement and one of said gears adapted to be partially submerged in a lubricant, of an oil housing supported by the periphery of said gears, a chamber in said

housing adjacent the teeth of said gears at the junction thereof, adapted to receive the oil discharged by said gears, and a conduit secured to the housing in communication with said chamber for distributing the lubricant.

2. In a device of the class described, in combination with a pair of gears in meshing engagement and one of said gears adapted to be partially submerged in a lubricant, of an oil housing mounted on the gears, a chamber in said housing adjacent the teeth of said gears at the junction thereof, adapted to receive the oil discharged by said gears, resilient means connected with the housing for yieldingly maintaining said housing in operative relation with the gears, and a conduit secured to the housing in communication with said chamber for distributing the lubricant.

3. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing mounted on the periphery of said gears comprising a chamber adjacent the teeth of the gears at the junction thereof adapted to contain the oil discharged by said gears, and an oil reservoir spaced at the rear of said chamber in registration with the teeth of the submerged gear, and a discharge conduit secured to the housing in communication with the chamber for distributing the lubricant.

4. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing mounted on the periphery of said gears comprising a chamber adjacent the teeth of the gears at the junction thereof adapted to receive the oil discharged by said gears and an oil reservoir spaced ahead of said chamber in registration with the teeth of the submerged gear, resilient means connected with said housing for yieldingly maintaining the housing in operative relation with said gears, and a discharge conduit secured to the housing in communication with said chamber for discharging the lubricant.

5. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing adapted to have surface contact with the face of the teeth of said gears, resilient means for yieldingly maintaining said housing in contact with said gear teeth, and a chamber in said housing adapted to receive the oil discharged by said gears and a discharge conduit connected with said chamber.

6. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing having the contour of a portion of its surface conforming to the periphery of one of said gears and the contour of another portion thereof conforming to the periphery of the other gear, resilient means connected with the housing for yieldingly maintaining said portions of the housing in contact with the respective gears, and a chamber in said housing adapted to receive the oil discharged by said gears.

7. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing consisting of a chambered head having the contour of a portion of its surface conforming to the periphery of one of said gears and the contour of another portion thereof conforming to the periphery of the other gear and opposed end plates extending inwardly in proximity to the sides of said gears for preventing the escapement of the lubricant at the sides of the teeth, resilient means connected with the housing for yieldingly maintaining said portions of the housing in contact with the respective gears, a chamber in said head open at one side for receiving the lubricant carried by the partially submerged one of said gears, and a discharge pipe in communication with said chamber.

8. In a device of the class described, in combination with a pair of gears in meshing engagement, one of said gears adapted to be partly submerged in a lubricant, of an oil housing consisting of a chambered head having the contour of a portion of its surface conforming to the periphery of one of said gears and the contour of another portion thereof conforming to the periphery of the other gear and opposed end plates extending forwardly from the head and downwardly from said head in proximity to the sides of said gears for preventing the escapement of the lubricant at the sides of the teeth, a chamber in said head open at one side for receiving the lubricant carried by the partially submerged one of said gears and an oil reservoir formed between said side plates, the front portion of the chambered head and adjacent portion of the submerged gear, and a discharge pipe in communication with said chamber.

9. In a lubricating system in combination with a gear adapted to be partly submerged in a lubricant and a drive pinion meshing with said gear, of an oil housing mounted on said gear and pinion, having an oil chamber adjacent said gear and pinion at the junction thereof, adapted to receive the oil discharged by said gear and pinion, resilient means connected with said housing for yieldingly maintaining the housing in operative

relation with the gear and pinion, and a conduit connected with the housing, adapted to receive the lubricant from said chamber.

10. In a lubricating system in combination with a workhead for a deep well pump comprising a gear adapted to be partly submerged in oil, a drive pinion meshing with said gear, a walking beam pivoted at one end and operably connected with said gear for movement thereof and a plunger rod pivotally connected with said walking beam, of an oil housing mounted on the face of the teeth of the gear and pinion to permit the free rotation thereof, resilient means connected with the housing for yieldingly maintaining said housing in operative relation with the gear and pinion, an oil chamber in said housing adjacent the gear and pinion at the junction thereof, adapted to receive the oil discharged by said gear and pinion, and a discharge conduit connecting said chamber with the bearings of the walking beam for lubricating said bearings.

11. In a lubricating system, in combination with a workhead for a deep well pump comprising a gear adapted to be partly submerged in oil, a drive pinion meshing with said gear, a walking beam pivoted at one end and operably connected with said gear for movement thereof and a plunger rod pivotally connected with said walking beam, of an oil housing mounted on the face of the teeth of the gear and pinion to permit the free rotation thereof, resilient means connected with the housing for yieldingly maintaining said housing in operative relation with the gear and pinion, an oil chamber in said housing adapted to receive oil from the gear and pinion at the junction thereof, oil-distributing means for the bearings of said walking beam comprising a perforated pan secured to the upper edge of said walking beam, and a discharge conduit connected with said chamber for depositing oil in said pan.

12. In a lubricating system, in combination with a workhead for a deep well pump comprising a gear adapted to be partly submerged in oil, a drive pinion meshing with said gear, a walking beam pivoted at one end and operably connected with said gear for movement thereof and a plunger rod pivotally connected with said walking beam, of an oil housing mounted on the face of the teeth of the gear and pinion to permit the free rotation thereof, resilient means connected with the housing for yieldingly maintaining said housing in operative relation with the gear and pinion, an oil chamber in said housing adapted to receive oil from the gear and pinion at the junction thereof, oil-distributing means for the bearings of said walking beam comprising a perforated pan secured to the upper edge of said walking beam said perforations being in registration with a portion of the bearings of the walking beam, an oil conduit connecting said pan with the remaining bearings and a discharge conduit connected with said chamber for supplying oil to said pan.

13. In a lubricating system in combination with a workhead for deep well pumps comprising a gear adapted to be partly submerged in oil, a drive pinion meshing with said gear, a walking beam pivoted at one end and operably connected with said gear for movement thereof and a plunger rod pivotally connected with said walking beam, of an oil housing mounted on the face of the teeth of the gear and pinion to permit the free rotation thereof, comprising an oil chamber adapted to receive oil from the teeth of the gear and pinion at the junction thereof and an oil reservoir spaced ahead of said chamber in registration with the teeth of the gear, resilient means connected with the housing for yieldingly maintaining said housing in operative relation with the gear and pinion, oil-distributng means comprising a perforated pan secured to the upper edge of the walking beam, said perforations being in registration with a portion of the bearing members for said walking beam and a conduit connected with said pan for supplying lubricant to the remaining portion of the bearings, and a discharge conduit connected with said chamber for supplying oil to the pan.

14. A pumping device comprising a pair of gears in meshing relation, one of said gears adapted to be partially submerged in a lubricant, of a chamber adjacent the teeth of one of said gears for receiving and containing the lubricant displaced from between the teeth of said gears as they rotate, and an additional chamber adjacent the periphery of the gear adapted to be partially submerged in a lubricant and arranged rearwardly of the first-mentioned chamber for receiving lubricant carried by said gear.

15. A pumping device comprising a pair of gears in meshing relation and one of said gears adapted to be partially submerged in a lubricant, of a chamber adjacent one of said gears for receiving lubricant displaced from between the teeth of said gears as they rotate, and resilient means for holding a wall of said chamber in contact with the teeth of one of said gears.

16. A pumping device comprising a pair of gears in meshing relation and one of said gears adapted to be partially submerged in a lubricant, of a chamber adjacent the teeth of one of said gears for receiving lubricant displaced from between the teeth of said gears as they rotate, and resilient means for holding a wall of said chamber in contact with the periphery of one of said gears.

17. A pumping apparatus comprising two

gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, and means resiliently maintaining said receptacle with the inlet passage in position to receive lubricant carried by one of said gears.

18. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, and means for supporting said receptacle including a spring acting to press the receptacle toward said gear.

19. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, and means for resiliently holding said portions in contact with the periphery of said gears.

20. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, and flanges on opposite sides of said portions extending along the opposite sides of said gears, and means for resiliently holding said portions in contact with said gears.

21. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, means resiliently maintaining said receptacle with the inlet passage in position to receive lubricant carried by one of said gears, and spaced flanges extending from the receptacle and disposed closely adjacent the opposite sides of one of said gears to form a lubricant reservoir.

22. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, means for supporting said receptacle including a spring acting to press the receptacle toward said gear, and spaced flanges extending from the receptacle and disposed closely adjacent the opposite sides of one of said gears to form a lubricant reservoir.

23. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, means for resiliently holding said portions in contact with the periphery of said gears, and spaced flanges extending from the receptacle and disposed closely adjacent the opposite sides of one of said gears to form a lubricant reservoir.

24. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, flanges on opposite sides of said portions extending along the opposite sides of said gears, means for resiliently holding said portions in contact with said gears, and spaced flanges extending from the receptacle and disposed closely adjacent the opposite sides of one of said gears to form a lubricant reservoir.

25. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, means resiliently maintaining said receptacle with the inlet passage in position to receive lubricant carried by one of said gears, a walking beam actuated from one of said gears, a distributing pan mounted on the walking beam, and means for distributing lubricant from the receptacle into the distributing pan.

26. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having an inlet passage adjacent a juncture of said gears, and means for supporting said receptacle including a spring acting to press the receptacle toward said gear, a walking beam actuated from one of said gears, a distributing pan mounted on the walking beam, and means for distributing lubricant from the receptacle into the distributing pan.

27. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, means for resiliently holding said portions in contact with the periphery of said gears, a walking beam actuated from one of said gears, a distributing pan mounted on the walking beam, and means for distributing lubricant from the receptacle into the distributing pan.

28. A pumping apparatus comprising two gears in meshing relation, one of which is adapted to be partially submerged in a lubricant, a lubricant receptacle having portions of its wall shaped to conform to the periphery of respective gears, flanges on opposite sides of said portions extending along the opposite sides of said gears, means for resiliently holding said portions in contact with said gears, a walking beam actuated from

one of said gears, a distributing pan mounted on the walking beam, and means for distributing lubricant from the receptacle into the distributing pan.

In witness whereof I have hereunto set my hand this 22d day of January, 1930.

WILLIAM D. POMEROY.