May 26, 1936. J. M. HAIT 2,041,999

OIL RETURN SYSTEM FOR DEEP WELL TURBINE PUMPS

Filed Sept. 11, 1934 3 Sheets-Sheet 1

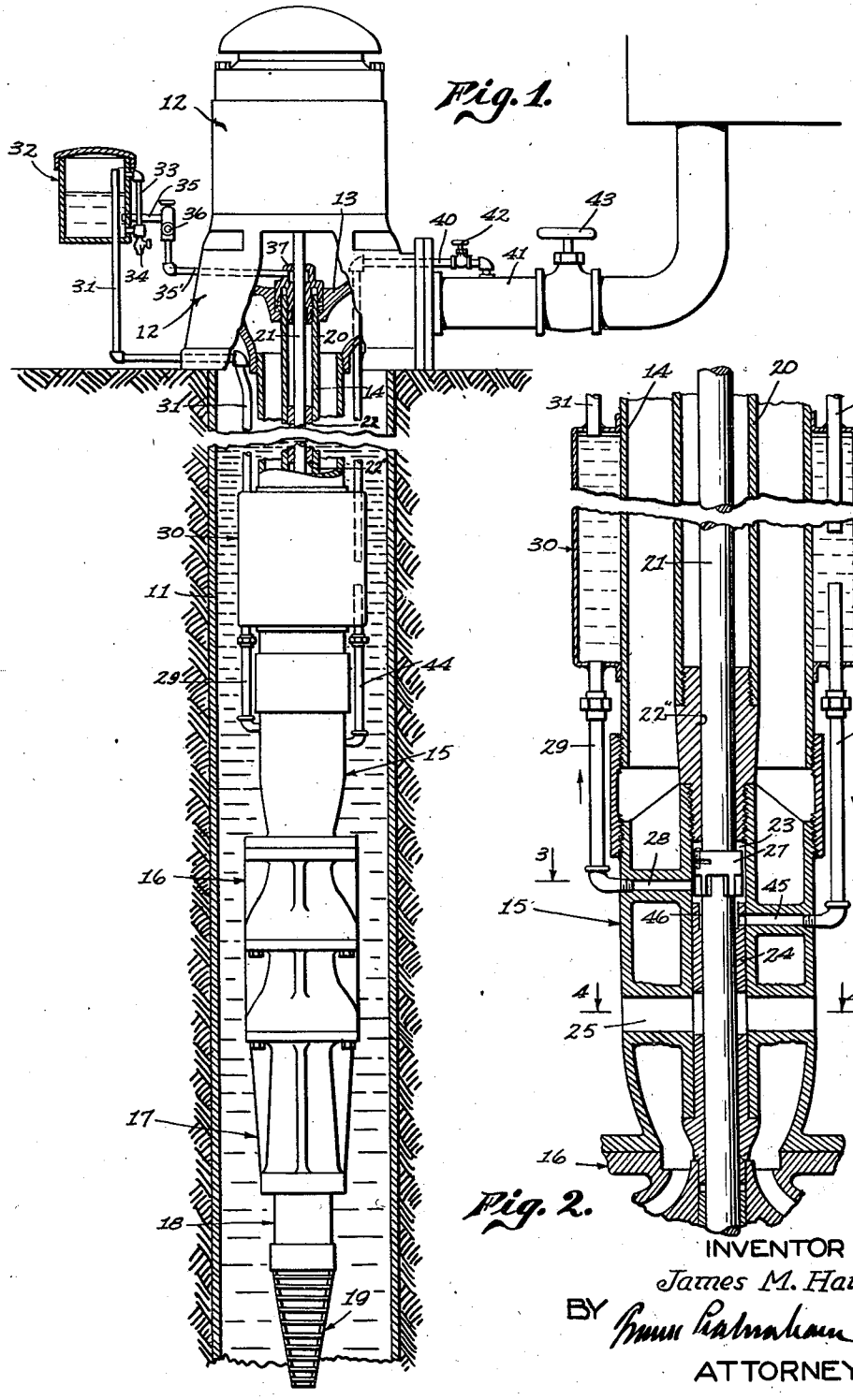


Fig. 1.

Fig. 2.

INVENTOR
James M. Hait
BY
ATTORNEY

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OIL RETURN SYSTEM FOR DEEP WELL TURBINE PUMPS

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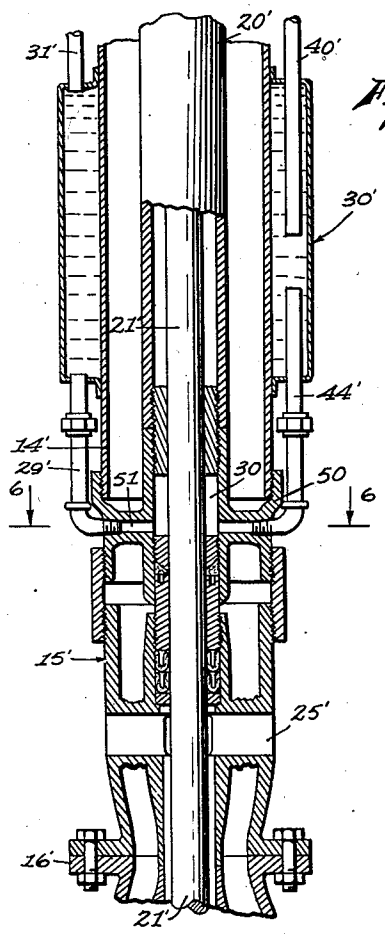


Fig. 5.

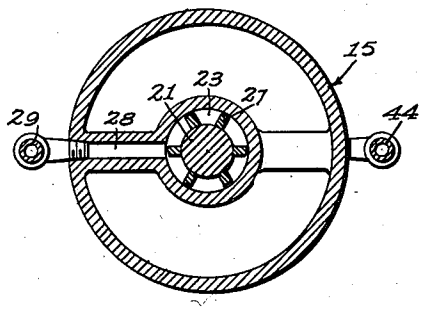


Fig. 3.

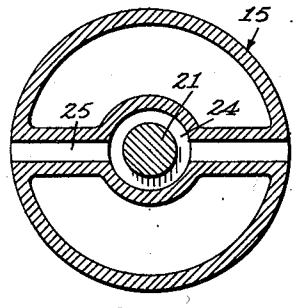


Fig. 4.

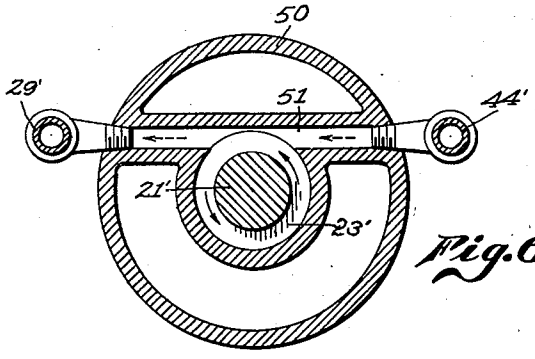


Fig. 6.

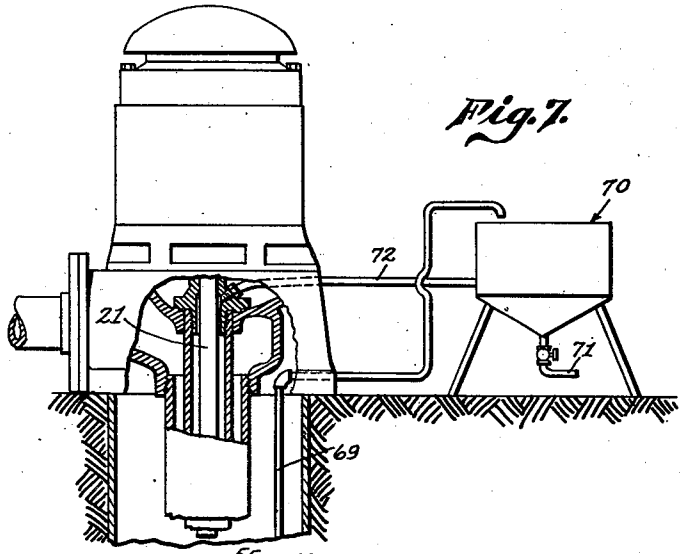
INVENTOR
James M. Hait
BY Munn Cushman
ATTORNEY

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OIL RETURN SYSTEM FOR DEEP WELL TURBINE PUMPS

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Fig. 7.



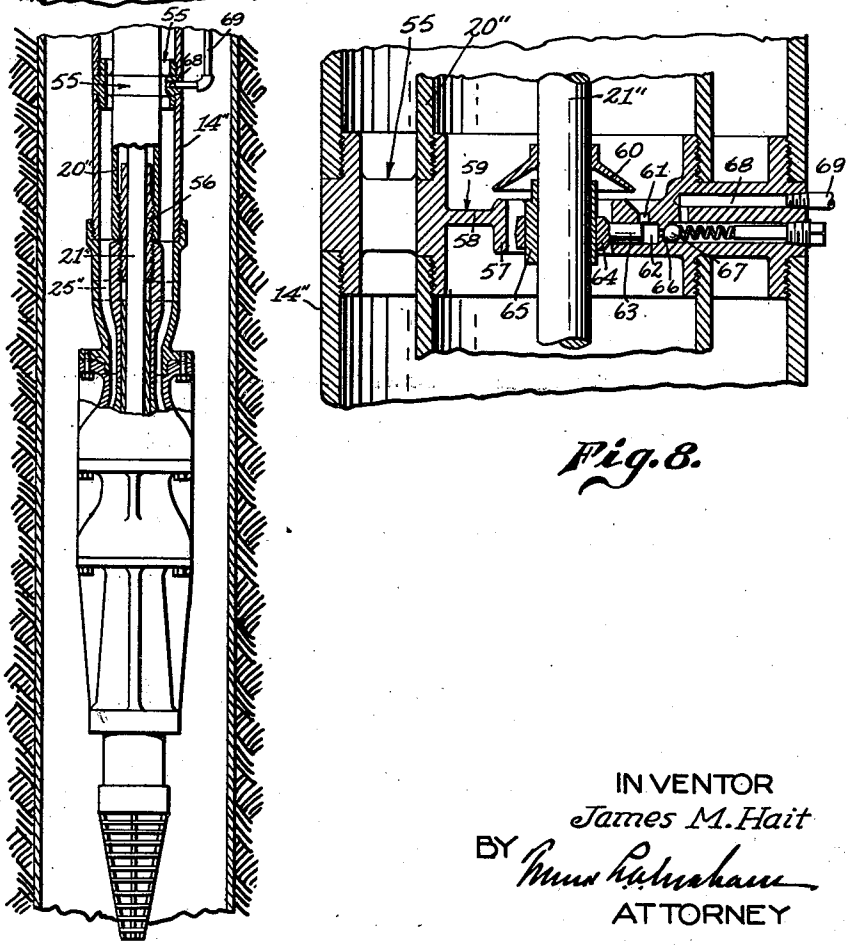


Fig. 8.

INVENTOR
James M. Hait
BY Munn Rabenhaus
ATTORNEY

Patented May 26, 1936 2,041,999

UNITED STATES PATENT OFFICE

2,041,999

OIL RETURN SYSTEM FOR DEEP WELL TURBINE PUMPS

James M. Hait, San Marino, Calif., assignor to Food Machinery Corporation, a corporation of Delaware

Application September 11, 1934, Serial No. 743,562

25 Claims. (Cl. 103—102)

This invention has to do in a general way with turbine pumps such as are used in pumping deep water wells for domestic and industrial purposes and has as its primary object the provision of improvements in pumps of the class described wherein the lubricant employed in lubricating the line shaft bearings is so controlled that it does not enter either the well water or the water being pumped whereby contamination of the water is eliminated.

It is one object of this invention to provide a lubricating system for pumps of the class described wherein the lubricant may be delivered into the line shaft enclosing tubing by the so-called "drip" method and is withdrawn from the enclosing tubing through a water seal into an isolated accumulating reservoir from which it may be raised to the surface of the ground from time to time as it accumulates.

My invention employs, in combination, a bleeder or by-pass port connecting the enclosing tubing with the water of the well at a point between the pump and the region of oil removal whereby the upper portion of the enclosing tubing and the reservoir are maintained under the normal static head of the well itself. In this way I take advantage of the difference in specific gravity between water and oil to maintain a water seal between the body of accumulated oil and the water of the well at all times, and since static conditions are maintained throughout, except for the intermittent purging operation, there can be no "drain back" of oil into the well, such as would be occasioned by the use of an oil pump at the bottom of the well, when the pump is shut down.

It is a further object of the invention to provide a device of the class described in which the oil is removed from the enclosing tubing by a current of water which is set in motion by the rotation of the shaft whereby the device is not subject to loss in efficiency or being rendered inoperative through continued use and wear of parts.

A still further object of this invention is to provide a device of the class described which is of simple form and construction and may be incorporated in the standard types of turbine pumps without material changes or modifications.

The details in the construction of certain preferred embodiments of my invention, together with other objects attending its production, will be best understood from the following description of the accompanying drawings, which are chosen for illustrative purposes only, and in which

Fig. 1 is an elevational view, partly in section, showing a preferred form of my invention;

Fig. 2 is an enlarged fragmentary section in elevation illustrating further details in the construction of the device shown in Fig. 1;

Fig. 3 is a plan section taken in a plane represented by the line 3—3 of Fig. 2;

Fig. 4 is a plan section taken in a plane represented by the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary sectional elevation showing details in the construction of a modified form of the device shown in Figures 1 to 4, inclusive;

Fig. 6 is a plan section taken in a plane represented by the line 6—6 of Fig. 5;

Fig. 7 is an elevational view with parts broken away similar to Fig. 1 but showing another modified form of the invention; and

Fig. 8 is an enlarged sectional elevation illustrating further details in the construction of the mechanical pump contemplated by the device shown in Fig. 7.

Referring more particularly to the drawings, I have illustrated in Figures 1 to 4, inclusive, a preferred form of my invention. As shown in Fig. 1, 11 designates the well casing and 12 the pump head in which is mounted the discharge fitting 13. Suspended from the discharge fitting is the delivery pipe or tubing 14, to the lower end of which is attached a discharge manifold 15, a bowl assembly 16, the suction manifold 17, the suction pipe 18 and the strainer 19.

Within the discharge pipe or delivery tubing 14 is the line shaft enclosing tubing 20 through which the line shaft 21 extends. The line shaft enclosing tubing 20 is provided with a plurality of conventional line shaft bearings 22, 22' and the lower end of such tubing contains a bearing indicated at 22'', which in turn is connected at its lower end into the discharge manifold 15.

Arranged below the lower end of the bearing 22'' and spaced apart therefrom to form a chamber 23 therebetween is a bushing member 24 terminating at or above a by-pass port 25.

In the discharge manifold 12, secured to the shaft 21 in any suitable manner and within the chamber 23, is an impeller 27. Reference numeral 28 designates a discharge outlet for the chamber 23, extending through the discharge manifold 15 in communication with a discharge pipe 29. The pipe 29 is shown as extending upwardly outside the delivery pipe 14 into the bottom of an accumulator tank or reservoir 30 mounted on the outside of the discharge pipe 14. Reference numerals 31 designates a pipe connected into the top of the accumulator reservoir 30 and extending upwardly in the well to a lu-

bricant storage reservoir 32 situated above the surface of the ground, the pipe 31 discharging into the reservoir 32 near the top thereof.

Mounted on the side of the reservoir 32 is a sight glass 33 provided with a pet cock 34. Numeral 35 designates an outlet pipe for the lubricant storage reservoir 32 which is connected through a drip control valve 36 and a conduit 35' into the top bearing 37 for the line shaft 21. The lubricant fed into this top bearing 37 flows downwardly to lubricate the successive line shaft bearings in the line shaft enclosing tubing 20.

Means are provided for flushing the accumulator reservoir 30 which consists of a pipe 40 extending through the top of the accumulator reservoir to a point well above the bottom of the same as shown in Fig. 2, such pipe being connected at its upper end into a main discharge pipe 41 on the discharge fitting 13. The pipe 40 is provided with a valve 42 to control the flushing operation, and the main discharge pipe 41 is provided with a valve 43 which can be regulated during the flushing or purging operation to increase the head in pipe 40 if necessary to raise the contents of the reservoir 30 into the storage reservoir 32.

For the purpose of maintaining a circulation of liquid through the chamber 23, I provide what may be termed a circulating pipe or return pipe 44 having its upper end extending through the bottom of the reservoir 30 and to a sufficient distance above the bottom to prevent the entrance of any sediment into this pipe. The bottom of the pipe 44 is connected in a duct 45 which is formed in a web of the fitting 15 and extends through an opening in the bushing member 24 into a circular space 46 formed therein below the chamber 23 which contains the impeller 27. The top of the pipe 44 is situated a substantial distance below the top of the reservoir 30 so that the recirculated liquid will be substantially free from oil, and to insure the reservoir being filled with liquid at all times it should be located below the liquid level in the well. In this way the liquid in reservoir 30 is under the static head of the water in the well, by virtue of the by-pass ports 25, and due to the difference in specific gravity between water and oil, it will be observed that the oil is always on the upper surface of the water in the reservoir 30 (and the pipe 31 during purging) so that there is always a static water seal between the body of accumulated oil and the by-pass port 25, which positively prevents any drain-back of oil into the well when the pump is shut down.

The form of the invention just described operates in the following manner: as the line shaft is operated the impeller 27 functions to set up a flow of liquid from the duct 45 to the duct 28 so that any lubricant which reaches the chamber 23 from the line shaft enclosing tubing is immediately directed through duct 28 into pipe 29 where it is delivered into the reservoir 30 and separates from the water therein by gravitation. Since the chamber 23 is situated above the by-pass ports 25, the lubricant is positively removed from the enclosing tubing before it has an opportunity to seep through the bushing member 24 and find egress into the water of the well as is the case in the conventional construction now in use. In order to prevent the reservoir 30 becoming completely filled with oil (from the top down), the valve 42 will be opened from time to time to admit water under pressure into the reservoir 30 through the pipe 40. If necessary the valve 43 may be restricted during this operation to assure sufficient pressure to rapidly lift the oil in the top of chamber 30 through pipe 31 into the storage reservoir 32. It is to be understood that this flushing or purging operation will occur only at brief intervals from time to time during the operation of the pump, and the frequency of such intervals will be governed to a large degree by the rate of feed of the lubricant and the size of the accumulator reservoir 30. Any water delivered into the reservoir 32 during the purging operation is withdrawn through the pet cock 34 until the lower oil level, as observed in the gauge glass 33, is below the point of take off for the pipe 35.

In the form of my invention shown in Figures 5 and 6, the parts of the pump assembly are substantially the same as described in connection with Figures 1 to 4, inclusive, as are also the construction of the accumulator reservoir 30 and pipe connections thereto.

In this form of my invention, however, I form the chamber 30 in a fitting 50 on the lower end of the discharge pipe 14' above the discharge manifold 15'. Extending through the fitting 50 tangentially of the line shaft 21' is a passage 51 into one end of which is connected the circulating pipe 40', the other end communicating with a pipe 29'. I have found that by so arranging the passage 51, the rotation of the shaft in the direction of the full line arrows shown in Fig. 6 causes a flow of liquid in the passage 51 in the direction of the dotted arrows, thereby removing from the chamber 23' accumulation of liquid therein and discharging the same into the accumulator reservoir 30'.

In the form of my invention shown in Figures 7 and 8, I place in the delivery pipe 14'' a spider 55 which also extends through the line shaft enclosing tubing 20''. This spider is placed in the discharge pipe 14'' above the by-pass ports 25'' and the lower bearing 56 of the shaft 21''. The spider being constructed within the tubing 20'' with a ring 57 connected to the spider by means of a flange 58 forming a cup 59 to receive from a circular deflector 60 mounted on the shaft 21'' thereabove, any oil or lubricant in the line shaft enclosing tubing which reaches the level of the cup 59 is discharged therefrom through a duct 61 into a cylinder or housing 62, such cylinder 62 being provided with a piston 63 mounted on a ring 64 which in turn is mounted on an eccentric 65 secured in any suitable manner to the shaft 21''. Outward movement of the piston 63 discharges the contents of the cylinder 62 through a port 66 against the action of a spring-pressed ball valve 67 and through passage 68 into a discharge pipe 69, discharging into any suitable reservoir, such as a tank 70 situated above the ground, in which any water in the lubricant will settle and be drawn off through pipe 71. A pipe 72 is provided to return the lubricant to the upper bearings of the shaft 21''.

It will be apparent from the foregoing description that my invention contemplates a method of recovering lubricant from the bottom portion of the line shaft enclosing tubing and that as one means of practicing such method it embodies a lubricating system having two directional circulation parallel to the axis of the pump shaft. It is a further feature of the preferred forms of my invention shown in Figs. 1 and 5, that lubricant is returned from a lower

level to an upper level with respect to the water in the well, intermittently or at periodic intervals, which, as has been pointed out hereinabove, may depend upon the rate at which the lubricant is delivered and the size of the lubricant receiving reservoir.

While I have shown and described a preferred form and two modified forms of my invention, it is to be understood that my invention is not limited to the forms shown but is inclusive of other adaptations which come within the spirit of my invention which includes in its broadest aspect the removal of lubricant from the space between the line shaft and its enclosing tubing at a point before it can find egress into the water of the well.

I claim as my invention:

1. In a turbine well pump having a line shaft and a shaft enclosing tubing: means at the upper end of said enclosing tubing for introducing lubricant into said enclosing tubing; an accumulator reservoir in said well; means associated with said tubing, at a point below said accumulator reservoir and above said pump, for withdrawing lubricant from said tubing and delivering same into said accumulator reservoir; and means independent of said shaft enclosing tubing for intermittently purging said accumulator reservoir to deliver the liquid therein to the surface of the ground.

2. The method of recovering lubricant from the bottom portion of the line shaft enclosing tubing in a turbine well pump which comprises: accumulating said lubricant in a quiescent body at the lower portion of said tubing out of contact with the water in the well and the water being pumped and outside of said shaft enclosing tubing; maintaining a circulating water seal between the body of accumulated lubricant and the water in said well; and intermittently applying the pressure of said pump to the accumulated lubricant thereby forcing same to a point above the water in the well.

3. The method of recovering lubricant from the bottom portion of the line shaft enclosing tubing in a turbine well pump which comprises: accumulating said lubricant in a relatively large quiescent body at the lower portion of said tubing out of contact with the water in the well and outside of said shaft enclosing tubing; maintaining a circulating water seal between said body of accumulated lubricant and the water in said well and intermittently establishing communication between the discharge of said pump and said body of accumulated lubricant to apply pressure to said lubricant for lifting same to a point above the water of the well.

4. In a well pump having a vertical drive shaft, a lubricating system embodying: a shaft enclosing tubing for conducting lubricant downwardly along said shaft; means including a reservoir outside of said conducting means and below the water level in said well, for accumulating shaft lubricant; and means controlled by fluid pressure from said pump for intermittently lifting said accumulated lubricant from a point below the level of water in a well being pumped to a point above said water level out of contact with the water in said well, and means for maintaining the interior of said enclosing tubing under the static head of the water in said well.

5. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe and an outlet pipe connecting said chamber with the bottom of said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

6. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft and a shaft enclosing tubing: a circulating chamber formed in said shaft enclosing tubing below the water level in said well and enclosing said shaft whereby the rotation of said shaft is effective to set up a circulation of liquid in said chamber, said chamber being adapted to receive lubricant flowing downwardly along said shaft; a water reservoir mounted on said pump assembly above the level of said circulating chamber with a portion thereof below the water level in said well; an inlet pipe and an outlet pipe connecting said chamber with the bottom of said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

7. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a water reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe and an outlet pipe connecting said chamber with the bottom of said reservoir; an impeller on said shaft in said circulating chamber for maintaining a circulation of water from said reservoir through said inlet and outlet pipes and said chamber and back into said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

8. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe and an outlet pipe connecting said chamber with the bottom of said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure; and a by-pass connection, connecting the interior of said enclosing tubing with said well at a point between said circulating

chamber and said pump whereby the circulating chamber and the water reservoir are normally maintained under the static head of the water in said well.

9. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe extending from the bottom of said reservoir to the bottom portion of said chamber; an outlet pipe extending from a point between the top and bottom of said chamber to the bottom of said reservoir; and an impeller on said shaft in said circulating chamber for maintaining circulation of liquid from said reservoir through said circulating chamber.

10. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe extending from the bottom of said reservoir to the bottom portion of said chamber; an outlet pipe extending from a point between the top and bottom of said chamber to the bottom of said reservoir; an impeller on said shaft in said circulating chamber for maintaining circulation of liquid from said reservoir through said circulating chamber; means for intermittently applying fluid pressure to the contents of said reservoir; and a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

11. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water lever in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe extending from the bottom of said reservoir to the bottom of said chamber; an outlet pipe extending from the bottom of said reservoir to a point between the top and bottom of said chamber; means for intermittently applying fluid pressure to the contents of said reservoir; and a pipe for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

12. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water lever in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe extending from the bottom portion of said reservoir to the bottom of said chamber; and an outlet pipe extending from a point between the top and bottom of said chamber to the bottom of said reservoir.

13. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; an inlet pipe extending from a point above the bottom of said reservoir to the bottom portion of said chamber; an outlet pipe extending from said reservoir to a point in said chamber above the point at which said inlet pipe communicates therewith; means for intermittently applying pressure to the contents of said reservoir; and means for conducting the contents of said reservoir to the surface of the ground.

14. In combination with a well pump having a vertical line shaft, a shaft enclosing tubing, and a water delivery conduit: means for delivering oil into the top of said shaft enclosing tubing; a reservoir mounted on said delivery conduit above said pump with a portion thereof below the level of the water in said well; a by-pass connection situated at a point above said pump and below said reservoir and establishing direct communication between the well and the interior of said enclosing tubing; a circulating chamber formed in said enclosing tubing at a point above said by-pass connection and below the level of the water in said well; and an inlet and an outlet conduit, both communicating between said reservoir and spaced points in said circulating chamber, whereby water is caused to circulate from said reservoir through said conduits and said chamber and back into said reservoir during the rotation of said shaft.

15. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing below the water level in said well and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly above the level of said circulating chamber and with a portion thereof below the water level in said well; and an inlet pipe and an outlet pipe connecting said chamber with the bottom of said reservoir, said pipe connections being arranged so as to set up a flow of liquid from said reservoir through said chamber which is countercurrent to the flow of oil entering said chamber.

16. In combination with a well pump having a vertical line shaft, a shaft enclosing tubing, and a water delivery conduit; means for delivering oil into the top of said shaft enclosing tubing; a reservoir mounted on said delivery conduit above said pump with a portion thereof below the level of the water in said well; a by-pass connection situated at a point above said pump and below said reservoir and establishing direct communication between the well and the interior of said en-

closing tubing; a circulating chamber formed in said enclosing tubing at a point above said by-pass connection and below the level of the water in said well, whereby oil flowing downwardly along said shaft enters the top of said chamber; and an inlet and outlet conduit, both communicating between said reservoir and spaced points in said circulating chamber whereby water is caused to circulate from said reservoir through said conduits and said chamber and back into said reservoir during the rotation of said shaft, said conduits being arranged so that the flow of water through said chamber is countercurrent to the flow of said oil.

17. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing: means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said shaft enclosing tubing and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit and an outlet conduit connecting said chamber with the bottom of said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a conduit for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

18. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft and a shaft enclosing tubing: a circulating chamber adapted to receive lubricant flowing downwardly along said shaft, said circulating chamber being formed in said shaft enclosing tubing and surrounding said shaft whereby the rotation of said shaft is effective to set up a circulation of liquid through said chamber; a water reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit and an outlet conduit connecting said chamber with the bottom of said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a conduit for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

19. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft and a shaft enclosing tubing: a circulating chamber adapted to receive lubricant flowing downwardly along said shaft, said circulating chamber being formed in said shaft enclosing tubing and surrounding said shaft whereby the rotation of said shaft is effective to set up a circulation of liquid in said chamber; a water reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit and an outlet conduit connecting said chamber with the bottom of said reservoir; an impeller on said shaft in said circulating chamber for maintaining a circulation of water from said reservoir through said inlet and outlet conduits and said chamber and back into said reservoir; means for intermittently applying fluid pressure to the contents of said reservoir; and a conduit for conducting the contents of said reservoir to the surface of the ground during the application of such pressure.

20. The method of collecting lubricant at the bottom portion of the line shaft enclosing tubing in a turbine well pump which comprises: maintaining a circulating water seal through a portion of said tubing to remove lubricant therefrom; and delivering the mixture of water and lubricant so removed into a relatively large quiescent liquid body at the lower portion of said tubing out of contact with the water in the well and outside of said shaft enclosing tubing wherein the lubricant is separated from the water by gravitation, said water seal being maintained between the body of separated lubricant and the water in the well.

21. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft, and a shaft enclosing tubing; means for delivering lubricant into the upper end of said shaft enclosing tubing; a circulating chamber formed in said enclosing tubing and adapted to receive lubricant flowing downwardly along said shaft; a reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit for delivering water from the bottom of said reservoir to said chamber; and an outlet conduit for delivering a mixture of water and oil from said chamber to said reservoir.

22. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft and a shaft enclosing tubing: a circulating chamber adapted to receive lubricant flowing downwardly along said shaft, said circulating chamber being formed in said shaft enclosing tubing and surrounding said shaft whereby the rotation of said shaft is effective to set up a circulation of liquid through said chamber; a water separating reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit for delivering water from the bottom of said reservoir to said circulating chamber; and an outlet conduit for conducting a mixture of oil and water from said circulating chamber to said reservoir.

23. In combination with a turbine well pump assembly having a water delivery conduit, a line shaft and a shaft enclosing tubing: a circulating chamber adapted to receive lubricant flowing downwardly along said shaft, said circulating chamber being formed in said shaft enclosing tubing and surrounding said shaft whereby the rotation of said shaft is effective to set up a circulation of liquid through said chamber; a water separating reservoir mounted on said pump assembly with a portion thereof below the water level in said well; an inlet conduit for delivering water from the bottom of said reservoir to said circulating chamber; an outlet conduit for conducting a mixture of oil and water from said circulating chamber to said reservoir; and an impeller on said shaft in said circulating chamber for maintaining a circulation of water from said reservoir through said inlet and outlet conduits and said chamber and back into said reservoir.

24. In combination with a well pump having a vertical line shaft, a shaft enclosing tubing, and a water delivery conduit; means for delivering oil into the top of said shaft enclosing tubing; a water separating reservoir mounted on said pump assembly with a portion thereof below the level of the water in said well; a by-pass connection situated at a point above said pump and below the water level in said well for establishing direct communication between the well and the interior of said enclosing tubing; a circulating chamber formed in said tubing at a point above said by-pass connection and below the level of the water in said well; an inlet connection for delivering water from the bottom of said reservoir to said

circulating chamber; and an outlet connection for conducting a mixture of oil and water from said circulating chamber to said reservoir, said inlet and outlet connection communicating with said circulating chamber at spaced points therein.

25. The method of collecting lubricant at the bottom portion of the line shaft enclosing tubing in a turbine well pump which comprises: maintaining a relatively large quiescent body of water at the lower portion of said tubing separated from the water in the well and outside of said shaft enclosing tubing; conducting lubricant from said enclosing tubing into said quiescent body of water wherein the lubricant separates by rising to the top of said body of water; and maintaining a water seal between the bottom of said quiescent body and the water of the well thereby insuring the isolation of the separated lubricant from the water in the well.

JAMES M. HAIT.