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V. SCHLEYER

CLEANING LUBRICATION OF DEEP WELL PUMPS

Filed Feb. 16, 1923

Fig. 1.

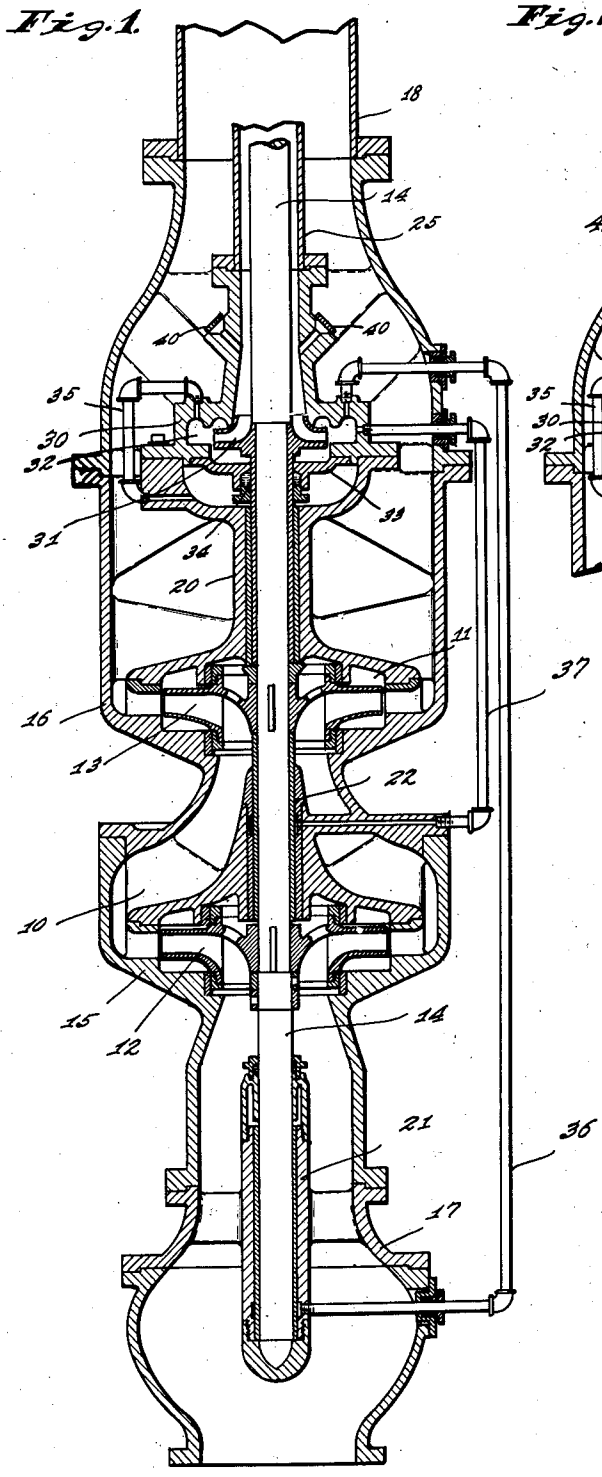
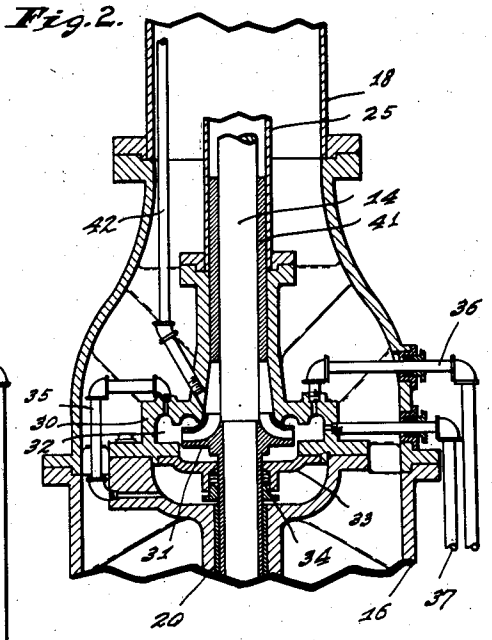


Fig. 2.



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BY

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UNITED STATES PATENT OFFICE.

VICTOR SCHLEYER, OF ANDERSON, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO DEAN HILL PUMP COMPANY, OF ANDERSON, INDIANA, A CORPORATION OF INDIANA.

CLEANING LUBRICATION OF DEEP-WELL PUMPS.

Application filed February 16, 1923. Serial No. 619,348.

To all whom it may concern:

Be it known that I, VICTOR SCHLEYER, a citizen of the United States, residing at Anderson, in the county of Madison and State of Indiana, have invented a new and useful Cleaning Lubrication of Deep-Well Pumps, of which the following is a specification.

It is the object of my invention to lubricate and keep clean the bearings of a deep-well pump, whether the lubricant for the main shaft be water or oil, so that such pump bearings will not only be well lubricated but will be protected against destruction by sand carried into them by the water being pumped.

In carrying out my invention, I provide a lubricant-water pump which discharges its full pressure into the various bearings of the main pump, including the upper bearing above the top-most runner of the main pump and also any intermediate bearings and the tail bearing; so that the water supplied under pressure from this lubricant-water pump will not only lubricate the bearings thus supplied but will largely prevent any sand or dirt from getting into the bearings and force out any such sand or dirt which does get in.

The accompanying drawing illustrates my invention: Fig. 1 is a vertical central section through the lower part of a deep-well pump embodying my invention, with water-lubrication throughout; and Fig. 2 is a fragmental section similar to the upper part of Fig. 1, but showing a system in which the shaft has oil (or grease) lubrication.

The deep-well pump shown is a multi-stage pump, in which there are two superposed pump-stages 10 and 11, arranged at the bottom of the well. These pump-stages have their respective runners 12 and 13 mounted on a vertical shaft 14 which extends down into the well from the surface of the ground, and have stationary parts 15 and 16 respectively, ordinarily provided with suitable vanes for preventing the whirling of the water column. Below the lower pump-stage 10 is an inlet fitting 17, through which the lower pump-stage 10 draws in the supply of water; the lower pump-stage 10 discharges upward into the bottom of the upper pump-stage 11; and the upper pump-stage 11 discharges into the lower end of an upwardly extending discharge pipe 18 which carries the water to the surface of the ground. As the upper part of the pipe 18 and its connections may be anything desired, and constitute no part of my present invention, I have not illustrated them. The pump has a main bearing 20 above the upper pump-stage 11, a tail bearing 21 below the lower pump-stage 10, and any intermediate bearings 22 between pump-stages as the number of pump-stages may require, in which bearings the shaft 14 is rotatably mounted and supported.

Preferably the shaft 14 above the pump proper is surrounded with a casing 25, in which the bearings for the shaft 14 above the pump proper are carried. This casing 25 serves as a carrier and container for lubricant for the shaft 14 and its bearings. This lubricant may be either oil or water, both of which are used for this purpose; though it involves minor differences in my construction according as oil or water is used as the lubricant. The lubricant which fills the casing 25 is usually supplied thereto at the top of the well, and is fed downward by gravity; and when the lubricant is water, this downward movement of the lubricant is assisted by a special lubricating-water pump which I provide, though when the lubricant within the casing 25 is oil I keep as much of it as possible away from the lubricating-water pump.

This lubricating-water pump is a small pump 30 arranged above the pump-stages 10 and 11. It also has a runner 31 fixed on the shaft 14, and preferably has its intake upward; and has a stationary member within which is a pressure chamber 32 in which pressure is created by the centrifugally acting runner 31. Between the runner 31 and the upper end of the main bearing 20 there is preferably a diaphragm 33, in which there is a packed gland 34 around the shaft 14, or around a supporting sleeve mounted on said shaft and carrying the runner 31 if that construction is used. The lubricant-water pump 30 pumps water, received by its runner 31 at the top thereof, and forces said water out under pressure into the pressure chamber 32.

From this pressure chamber 32, the water under pressure is carried to the various bearings of the pump, including the main bearing 20, the tail bearing 21, and any intermediate bearings 22 which there may be. All these bearings 20, 21, and 22 have at least one end through which there is a possibility for lubricant to escape. For the main bearing 20, this possible escape is at the lower end of the bearing, where the escape is somewhat augmented by the pull of the runner 13, for the diaphragm 33 and the gland 34 prevent any save negligible leakage at the top. For the tail bearing 21, this possible escape is at the top of the bearing, for usually the lower end of the tail bearing is closed. For any intermediate bearing 22, as shown, there is a possible escape at both the upper and lower ends, but the escape at the lower end is somewhat augmented by the pull of the subjacent runner 12.

In ordinary pumps, sand tends to get into these bearings, causing both loss of power and excessive wear. To keep out this sand, and keep the bearings both clean and lubricated, I supply them with water-lubricant under pressure from the pressure chamber 32, at points remote from the points of possible escape of lubricant. For the main bearing 20, I supply this water-lubricant by a pipe 35 to the upper end of such bearing, just below the diaphragm 33, which water-lubricant is forced by the pressure behind it downward along the main bearing 20 to keep it clean and to carry out any sand which may have worked in, the escaping lubricant and the sand which it is pushing with it being delivered into the runner 13 and there thrown outward. For the tail bearing 21, I supply the water-lubricant by a pipe 36 to a point near the bottom of such tail bearing, especially if the bottom of such tail bearing is closed, as shown, so that the water-lubricant under the pressure moving it will be forced through such tail bearing and will escape to some extent at the top, carrying with it any sand which has forced its way in, and largely preventing sand from being forced in. For each intermediate bearing 22, I supply the water-lubricant from the pressure chamber 32 through a pipe 37 to an intermediate point in the height of the intermediate bearing, preferably nearer the top than at the bottom; from which point the water-lubricant divides, some flowing upward and some downward, and that flowing downward over the greater length of the bearing having its flow augmented by the pull of the runner 12; so that sand is forced out, and largely kept out, at both ends of the intermediate bearing. In this way, all the bearings 20, 21, and 22, are kept clean and freshly lubricated, and the wear and loss of power from sand which otherwise gets into these bearings are prevented. This cleaning lubrication is obtained under the full pressure developed by the lubricant-water pump.

If the lubricant for the main part of the shaft 14 is water, the lower end of the casing 25 may open directly to the upper or inlet face of the runner 31 of the lubricant-water pump 30, as is shown in Fig. 1, so that such lubricant-water pump will assist in movement of lubricant downward through the casing 25, and will use the water received through such casing 25 for supplying the bearings 20, 21, and 22. If desired, the lubricant-water pump may receive its supply of lubricant-water from the main stream of water being pumped, as through suitable filter plugs 40, which admit water from such main stream into the space just above the runner 31, as is also shown in Fig. 1. I prefer to provide the water supply for the pump 30 by both the casing 25 and the filter plugs 40 when the casing 25 carries water as the lubricant, as is also shown in Fig. 1, though it is not essential that both said sources of lubricant-water be used, as either may be omitted if desired.

When the lubricant in the casing 25 is oil (or grease), I preferably provide a tight bearing 41 for the shaft 14 fairly closely above the runner 31 of the lubricant-water pump, to keep the oil from the casing 25 from being drawn into the runner 31. In this case, the lubricant-water pump must receive its supply of lubricant-water otherwise than through the casing 25. While the filter plugs 40 may be used for supplying lubricant-water from the main water-stream, when oil is used as the lubricant within the casing 25 the lubricant-water may be supplied by a special pipe 42 which leads from any suitable higher source of clear water, usually above the ground, to the space immediately above the runner 31 of the lubricant-water pump.

In any of these cases, the water supplied to the lubricant-water pump 30, whether through the casing 25, the filter plugs 40, the special pipe 42, or any two or more of these, is forced under pressure by said lubricant-water pump to the various bearings 20, 21, and 22, to keep such bearings lubricated under pressure and substantially wholly free from sand.

I claim as my invention:

1. In a deep-well pump, the combination of a shaft extending down into the well, a multi-stage rotary pump located in the well and having runners on said shaft, bearings for said shaft above and below said multi-stage pump and between the stages thereof, a lubricant-water pump mounted on said shaft and connections from the discharge side of said lubricant-water pump to all the aforesaid bearings.

2. In a deep-well pump, the combination

of a shaft extending down into the well, a main rotary pump located in the well and having one or more runners on said shaft, bearings for said shaft above and below said pump as a whole, a lubricant-water pump mounted on said shaft, and connections from the discharge side of said lubricant-water pump to both the aforesaid bearings.

3. The combination set forth in claim 1, with the addition that the last-named connections are all independent of one another.

4. The combination set forth in claim 2, with the addition that the last-named connections are independent of each other.

5. The combination set forth in claim 1, with the addition that the lubricant-water pump is located closely above said main pump.

6. The combination set forth in claim 2, with the addition that the lubricant-water pump is located closely above the main pump.

7. The combination set forth in claim 1, with the addition that the connections from the discharge side of said lubricant-water pump to said bearings constitute the only outlets from said lubricant-water pump.

8. The combination set forth in claim 2, with the addition that the connections from the discharge side of said lubricant-water pump to said bearings constitute the only outlets from said lubricant-water pump.

9. In a deep-well pump, the combination of a shaft extending down into the well, a rotary pump located in the well and having a runner on said shaft, one or more bearings for said main pump, a lubricant-water pump also located in said well and having a runner on said shaft, the discharge of said lubricant-water pump being connected to one or more bearings for said shaft and having no other outlet so that the full pressure of said lubricant-water pump is supplied to said bearing or bearings.

10. The combination set forth in claim 9, with the addition that the bearing or bearings for the shaft have one or more lubricant-escape points, and the connections to said bearing or bearings from the lubricant-water pump being to points on the bearing or bearings remote from said escape point or points.

11. In a deep-well pump, the combination of a shaft extending down into the well, a rotary pump located in the well and having a runner on said shaft, a lubricant-water pump also located in said well and having a runner on said shaft, a tail bearing for said main pump, and a connection from the discharge of said lubricant-water pump to said tail bearing at a point remote from any place thereon from which lubricant may escape.

12. In a deep-well pump, the combination of a shaft extending down into the well, a rotary pump located in the well and having a runner on said shaft, a lubricant-water pump also located in said well and having a runner on said shaft, a tail bearing for said main pump, and a connection from the discharge of said lubricant-water pump to said tail bearing.

13. In a deep-well pump, the combination of a shaft extending down into the well, a multi-stage rotary pump located in the well and having runners on said shaft, a lubricant-water pump also located in said well and having a runner on said shaft, an intermediate bearing for said main pump between stages thereof, and a connection from the discharge of said lubricant-water pump leading solely to said intermediate bearing at a point remote from any place thereon from which lubricant may escape.

14. In a deep-well pump, the combination of a shaft extending down into the well, a multi-stage rotary pump located in the well and having runners on said shaft, a lubricant-water pump also located in said well and having a runner on said shaft, an intermediate bearing for said main pump between stages thereof, and a connection from the discharge of said lubricant-water pump leading solely to said intermediate bearing,

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 13th day of February, A. D. one thousand nine hundred and twenty three.

VICTOR SCHLEYER.