M. T. CHAPMAN.

CENTRIFUGAL PUMP.

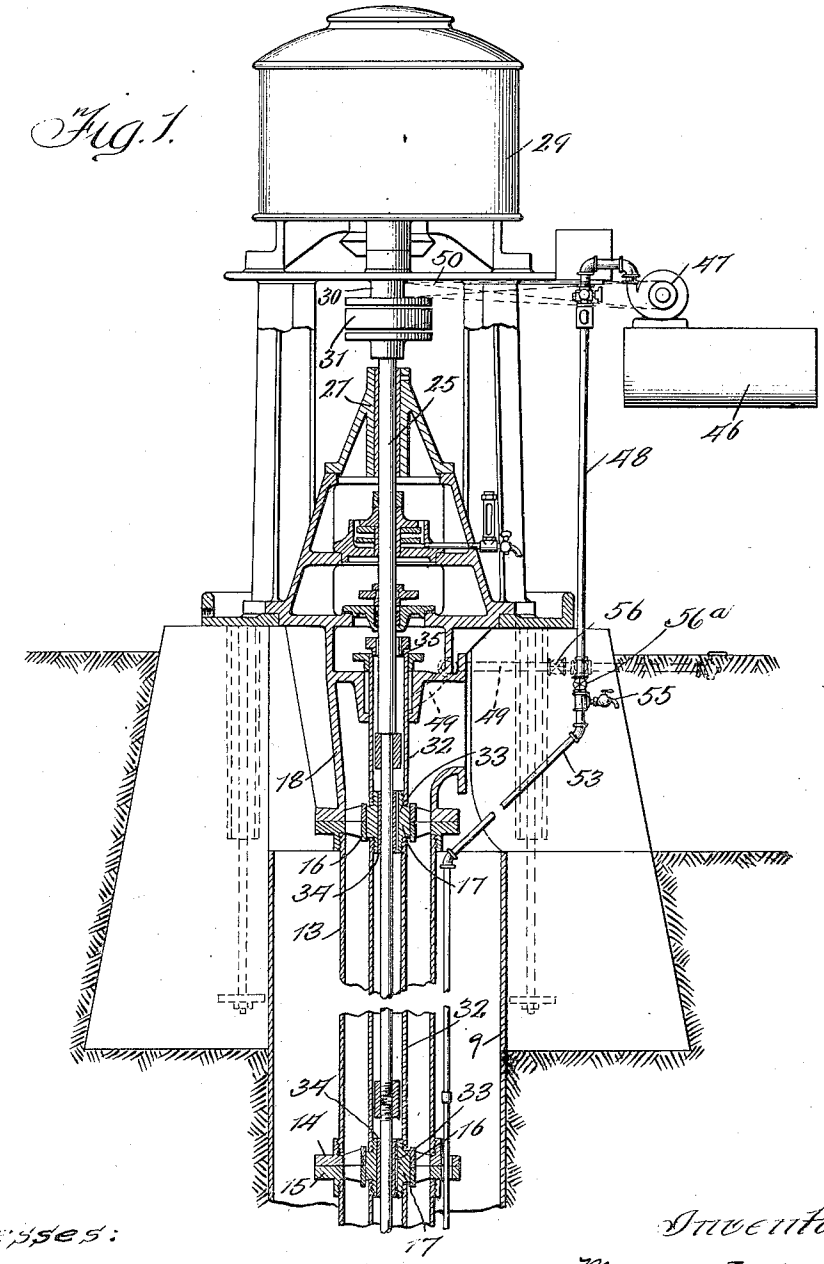
APPLICATION FILED JUNE 26, 1911.

1,179,802.

Patented Apr. 18, 1916.

4 SHEETS—SHEET 1.

Fig. 1.



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Att'ys

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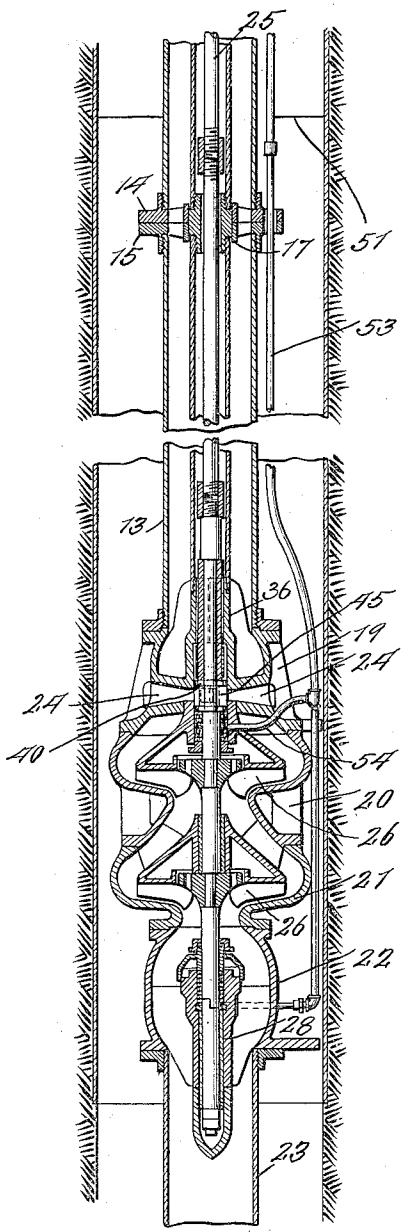
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

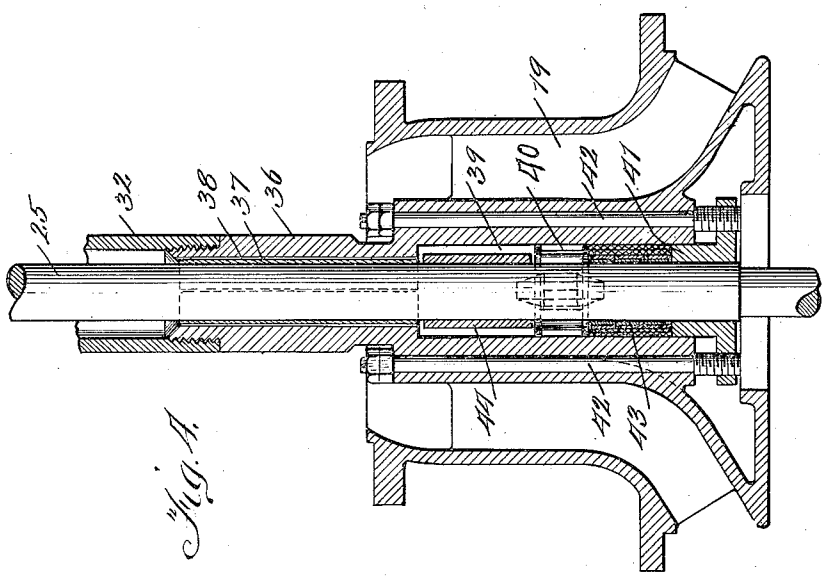


Fig. 4.

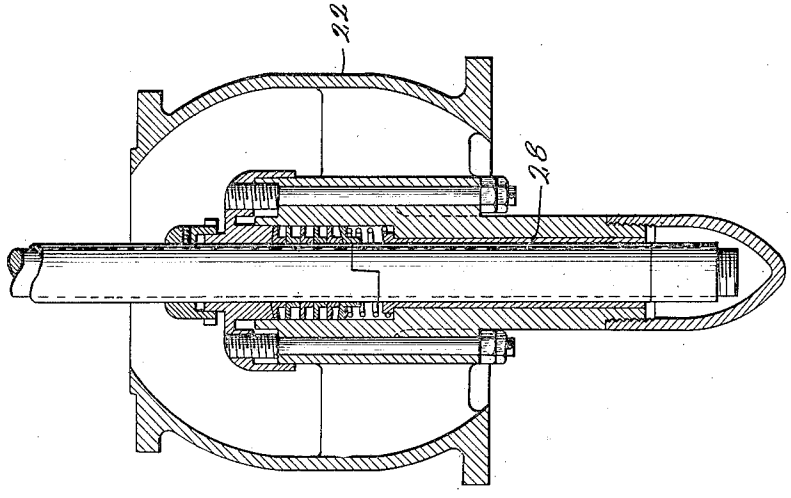


Fig. 3.

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CENTRIFUGAL PUMP.

APPLICATION FILED JUNE 26, 1911.

1,179,802.

Patented Apr. 18, 1916.

4 SHEETS—SHEET 4.

Fig. 5.

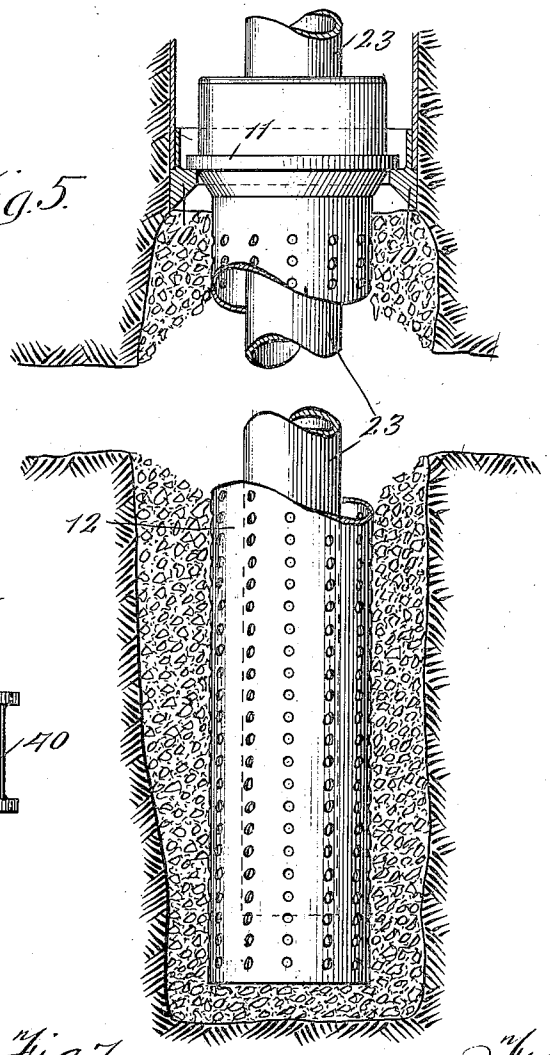


Fig. 6.

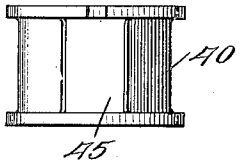


Fig. 7.

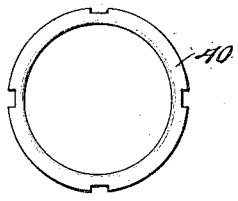
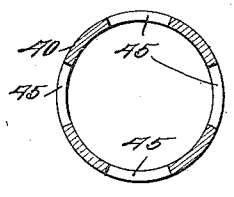


Fig. 8.



Witnesses:

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REISSUED

UNITED STATES PATENT OFFICE.

MATTHEW T. CHAPMAN, OF AURORA, ILLINOIS, ASSIGNOR TO THE AMERICAN WELL WORKS, OF AURORA, ILLINOIS, A CORPORATION OF ILLINOIS.

CENTRIFUGAL PUMP.

1,179,802. Specification of Letters Patent. Patented Apr. 18, 1916.

Application filed June 26, 1911. Serial No. 635,390.

To all whom it may concern:

Be it known that I, MATTHEW T. CHAPMAN, a citizen of the United States, residing at Aurora, in the county of Kane and State of Illinois, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to pumps for deep wells, and has to do more particularly with centrifugal pumps in which the water is elevated by means of rotary pumping mechanism operated by a shaft extending up out of the well and driven from any suitable source of power.

It has for its object to provide certain improvements in pumps of the type shown and described in the application of Lars W. Bodinson, Serial No. 624,018, filed April 29, 1911, such improvements relating more particularly to means for lubricating the shaft bearings and other parts of the pumping mechanism, and for protecting the bearings against the sand or other sediment carried by the water being pumped. I accomplish this object as illustrated in the drawings and as hereinafter described.

That which I believe to be new is set forth in the claims.

In the accompanying drawings,—Figure 1 is a vertical section of the upper portion of the well and pumping mechanism, some parts being in elevation; Fig. 2 is a vertical sectional view of the well and pumping mechanism, being a continuation downward of the parts shown in Fig. 1; Fig. 3 is an enlarged vertical sectional view of the lower end of the pump-shaft and adjacent parts; Fig. 4 is a vertical section illustrating one of the members of the upper pumping unit, the pump-shaft and adjacent parts; Fig. 5 is an enlarged detail illustrating the bottom of the well and the arrangement of the well-tube therein; Fig. 6 is an enlarged detail illustrating the slotted sleeve through which the oil escapes into the well; Fig. 7 is a plan view thereof; and Fig. 8 is a horizontal section thereof.

In using pumps of the type to which this invention relates the well is provided with a casing of large diameter to permit the pump to be passed down a considerable distance below the standing water in the well, and in my improved construction a smaller casing is also employed which is sunk farther down into the water bearing strata, the latter tube being perforated to admit water thereto. The well-tube to which the pumping units are attached and by which they are suspended in the well is lowered into the casing, and where quicksand is encountered a smaller well-tube is employed below the pumping units which extends down into the smaller casing above referred to so as to prevent the sand from getting into said well-tube extension and thence into the pumping mechanism. The pump-shaft extends down through the well-tube and is provided with suitable bearings at intervals to keep it properly centered. Near its lower end it is provided with runners which rotate with it and operate in suitable chambers suspended from the well-tube to lift the water and discharge it through the well-tube. For the purpose of preventing sand, grit, etc., from cutting out the bearings, the shaft and its bearings are inclosed in a tube of small diameter, which extends down through the well-tube. This tube also provides means for supplying oil or other lubricant to some of the shaft bearings; but as heretofore constructed no provision has been made for forcing a lubricant down into the lower bearings, and particularly those adjacent to the pumping mechanism, and it has therefore been difficult, if not impossible, to secure proper lubrication. To provide means by which this may be accomplished is the principal feature of my present invention.

Referring now to the drawings,—9 indicates a well casing, which extends down into the well to such a distance that when the pumping mechanism is in position it will be at a considerable distance below the normal level of the water in the well—*i. e.* the level at which the water stands when the pump is not in operation. At its lower end the casing 9 is provided with an inwardly-projecting collar or flange 10, which intercepts a flange 11 provided at the upper end of the smaller casing 12 hereinbefore referred to, which, as shown in Fig. 5, is perforated and by the means described is sus-

pended at the lower end of the casing 9. Ordinarily the lower casing 12 is lowered to such a point that it rests on the bottom of the well, as shown in Fig. 5.

13 indicates the well-tube, which forms a conduit through which the water pumped is discharged. Said well-tube is preferably made in sections screwed into coupling members 14—15, which also provide guides 16 for pipe-couplings 17, as shown in Figs. 1 and 2.

18 indicates an elbow, which connects with the upper end of the well-tube 13 and serves as an outlet for the water pumped.

19—20—21—22 indicate a series of castings, which, fitted together, form pumping chambers and a housing for the pumping mechanism, the lowermost member 22 being connected with an extension well-tube 23 preferably of the same diameter as the well-tube 13. Said extension well-tube projects into the casing 12, as shown in Fig. 5, preferably terminating near the lower end thereof, as indicated in dotted lines in said figure. The member 19 is provided with radial passages 24 extending from the center thereof outward and communicating with the interior of the well for permitting oil to escape into the well, as hereinafter described.

25 indicates a pump-shaft, which extends down through the well-tube 13 and near its lower end carries runners 26 which rotate in the members 20—21 and operate to lift the water. The construction of these runners need not be more particularly described, as they form no part of my present invention. It may be said, however, that as shown they are of the same type as those shown and described in the Bodinson application hereinbefore referred to. The pump-shaft 25 is provided with bearings 27—28 near its upper and lower ends, respectively, the latter being preferably of the type shown and described in said Bodinson application. The upper bearing 27 may be of any approved type.

29 indicates a motor, which is connected by a shaft 30 and flexible coupling 31 with the shaft 25 for rotating the same.

32 indicates a pipe of small diameter, which incloses that part of the pump-shaft which lies between the upper pumping unit and the surface of the ground, as shown in Figs. 1 and 2. Said pipe is made in sections united by the pipe couplings 17, which also form bearings for the shaft 25 and are provided with longitudinal passages 33 through which oil may pass downward to the lower end of the pipe. The couplings 17 are fitted in the guides 16 and so properly centered in the well-tube. In the drawings I have shown the bearings 17 as being provided with suitable bushings 34 to take the wear, but this is not essential to my invention. The upper end of the pipe 32 is closed by means of a stuffing-box 35, as shown in Fig. 1, and the lower end thereof is tightly connected, preferably by screwing, with the upper end of a sleeve 36 which forms the hub of the member 19, as shown in Fig. 2. Thus a closed conduit is provided around the pump-shaft 25 leading practically from the surface of the ground down to the pumping units. The construction of the member 19 is more clearly shown in Fig. 4, from which it will be seen that the sleeve 36 contains a bushing 37 to take the wear of the shaft 25, and with longitudinal passages 38 through which oil may flow down to a recess 39 provided in said sleeve immediately above the passages 24. Opposite said passages I employ a slotted sleeve or cage 40, best shown in Figs. 6, 7 and 8, which is supported in the sleeve 36 by a gland 41 fitted tightly in the lower end thereof and held in place by bolts 42. Packing 43 is provided between the sleeve or cage 40 and the gland 41. A sleeve 44 is provided above the sleeve 40 to hold it in place and permit the packing 43 to be compressed against the sleeve 40, thereby making a tight joint. The slots 45 in the sleeve 40 permit oil passing down through the passage 38 in the sleeve 36 to escape into the passages 24.

From the foregoing it will be seen that the pipe 32 being closed at its upper end provides means by which oil may be forced under pressure through said pipe down through the several shaft bearings and out into the well through the passages 24. In order to supply oil under pressure to the upper end of said pipe, I provide an oil reservoir 46, a pump 47 communicating therewith and connected by pipes 48—49 with the upper end of said pipe 32, as shown in Fig. 1, the pipe 49 being indicated by dotted lines. The pump 47 may be operated in any suitable way, but is preferably driven from the motor-shaft 30 by a belt 50. When the pump is not in operation the water rises in the pipe 32 to the level at which it stands in the well-casing, as indicated at 51 in Fig. 2, but when oil under pressure is forced down into said pipe 32 it rests on the surface of the water, and as it is forced down carries the water down ahead of it and out through the passages 24 into the well. The oil is thus carried down through the several bearings, thereby lubricating them. A further advantage of my improved construction is that it provides means by which cleaning material, such as gasolene or kerosene, may be forced down into the pipe 32 and through the several bearings to wash them out, thus providing for the removal of iron scale and other injurious materials. Whenever the pump is started the level of the water in the casing is lowered and consequently the water level

in the pipe 32 also is lowered, thus carrying the oil down through the bearings and cleaning them whenever the pump is started.

53 indicates a pipe, which forms an extension of the pipe 48 and connects with the lower shaft bearing 28 for supplying oil thereto. Said pipe is also provided with a branch pipe 54 for supplying oil to the bearing formed by the gland 41, as shown in Fig. 2. A cock 55 is provided in the pipe 53 for drawing off oil therefrom, as occasion may require. Stop-valves 56—56ª are provided for shutting off oil, as desired, from the pipes 49—53, respectively.

The salient features of my present invention are the provision of means by which oil may be forced down around the pump-shaft to lubricate the bearings thereof above and adjacent to the pumping units and by which said bearings may be washed out from time to time. These features are therefore claimed generically.

While I prefer to use oil for lubricating purposes as above described, I do not desire to be restricted in this particular except as hereinafter specifically claimed, for the reason that it is sometimes impractical to use oil for lubricating in cases where the water pumped is to be used for drinking purposes. My claims which call for means suitable for use with oil are therefore to be construed to cover the use of the same means used with water or any other suitable lubricant.

That which I claim as my invention, and desire to secure by Letters Patent, is, —

1. In a deep-well pump, the combination of a vertical rotary pump-shaft, pumping mechanism operated thereby below the normal level of the water in the well, a bearing for said shaft below the normal level of the water in the well, and auxiliary pumping means adapted to force a suitable lubricant to and through said bearing for lubricating the bearing and for preventing the well water from entering said bearing.

2. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby below the normal level of the water in the well, a pipe inclosing said pump-shaft above said pumping mechanism, bearings carried by said pipe below the normal level of the water in the well, and auxiliary pumping means adapted to force a suitable lubricant downward through said pipe for lubricating the said bearings and for preventing the well water from entering said pipe.

3. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby below the normal level of the water in the well, a pipe inclosing said pump-shaft above said pumping mechanism, a bearing for said shaft within said pipe below the normal level of the water in the well, and means for forcing a suitable lubricant into the upper end of said pipe for passage through the pipe and through the bearing for lubricating the bearing and preventing the well water from entering the pipe.

4. In a deep-well pump, the combination of a rotary pump-shaft extending downward into the well, pumping mechanism operated by said shaft adapted to force water upward from said well, a pipe inclosing said pump-shaft from the water pumped, a bearing for the shaft through which lubricant can escape from the lower end of the pipe below the normal level of the water in the well, and means for forcing a suitable lubricant into the upper end of said pipe for lubricating the said bearing and for flushing from said bearing any grit or other foreign matter.

5. In a deep-well pump, the combination of a rotary pump-shaft extending downward into the well, pumping mechanism operated by said shaft adapted to force water upward from said well, a pipe inclosing said pump-shaft from the water pumped but having an opening at its lower end below the normal level of the water in the well through which water can pass, and means for emptying said pipe through the opening at its lower end against the pressure of the water in the well.

6. In a deep-well pump, the combination of a rotary pump-shaft extending downward into the well, pumping mechanism operated by said shaft adapted to force water upward from said well, a pipe inclosing said pump-shaft from the water pumped but having an opening at its lower end below the normal level of the water in the well through which water can pass, and means for applying pressure through said pipe from its upper end for emptying the pipe through the opening at its lower end against the pressure of the water in the well.

7. In a deep-well pump, the combination of a rotary pump-shaft extending downward into the well, pumping mechanism operated by said shaft adapted to force water upward from said well, a pipe inclosing said pump-shaft from the water pumped but having an opening at its lower end below the normal level of the water in the well through which water can pass, and pumping means connected with the upper end of said pipe for emptying the pipe through the opening at its lower end against the pressure of the water in the well.

8. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby, a pipe inclosing said pump-shaft above said pumping mechanism a packing about said shaft above said pumping mech-

anism, and auxiliary pumping means for forcing fluid under pressure through said pipe for preventing the water being pumped from working up through said packing into the lower end of said pipe.

9. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby, a pipe inclosing said pump-shaft above said pumping mechanism and effectively closed at its upper end, a packing about said shaft above said pumping mechanism, and means for forcing fluid under pressure into the said pipe at its upper end for preventing the water being pumped from working up through said packing into the lower end of said pipe.

10. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby, a pipe inclosing said pump-shaft above said pumping mechanism and effectively closed at its upper end, a packing about said shaft above said pumping mechanism, means for forcing fluid under pressure into the said pipe at its upper end for preventing the water being pumped from working up through said packing into the lower end of said pipe, a port leading to said shaft being provided below the lower end of the pipe above said packing whereby the water that works its way out through said packing along the shaft from the pumping mechanism is free to pass out of contact with the shaft without entering the pipe against the pressure of the fluid therein.

11. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby, a pipe inclosing said pump-shaft above said pumping mechanism and effectively closed at its upper end, a bearing for said shaft in said pipe above said pumping mechanism, a packing about said shaft above said pumping mechanism below said bearing, and means for forcing fluid under pressure into said pipe at its upper end for preventing the water being pumped from working up through said packing into said bearing.

12. In a deep-well pump, the combination of a rotary pump-shaft extending down into the well, pumping mechanism operated thereby, a pipe inclosing said pump-shaft above said pumping mechanism and effectively closed at its upper end, a bearing for said shaft in said pipe above said pumping mechanism, a packing about said shaft above said pumping mechanism below said bearing, and means for forcing fluid under pressure into said pipe at its upper end for preventing the water being pumped from working up through said packing into said bearing, a port leading to said shaft being provided below the bearing but above said packing whereby the water that works its way out through said packing along the shaft from the pumping mechanism is free to pass out of contact with the shaft without entering the bearing against the pressure of the fluid in said pipe.

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