June 19, 1923.

1,459,453

A. J. TRIGWELL

PUMP

Filed July 5, 1921

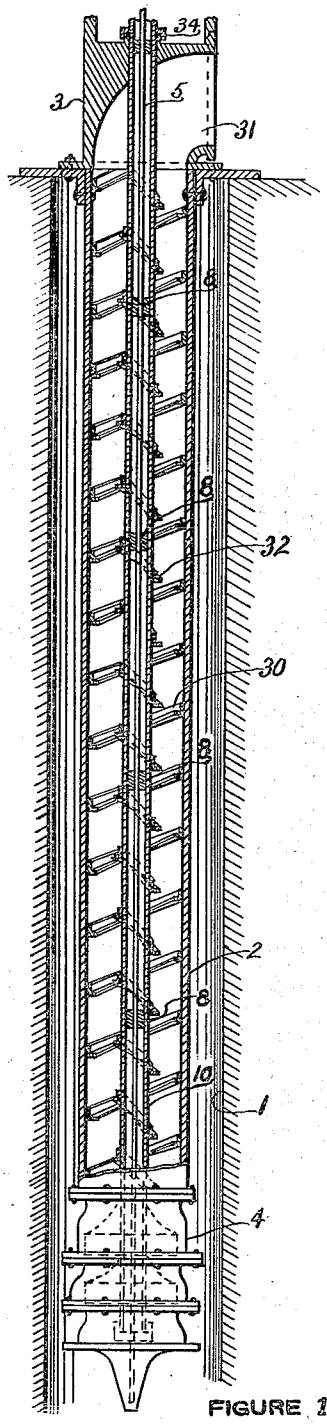

FIGURE 1

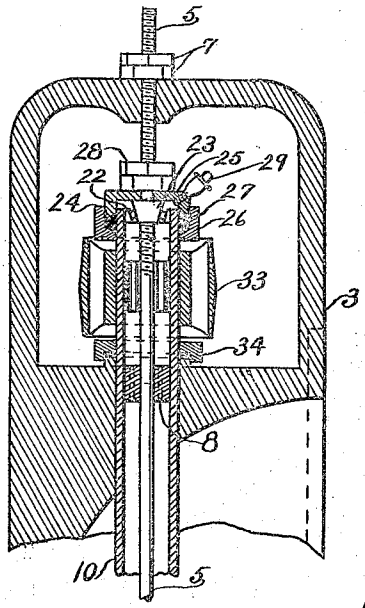

FIGURE 2

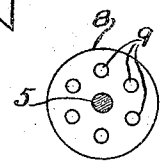

FIGURE 4

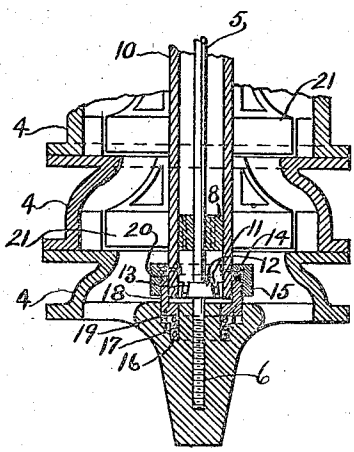

FIGURE 3

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UNITED STATES PATENT OFFICE.

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PUMP.

Application filed July 5, 1921. Serial No. 482,424.

To all whom it may concern:

Be it known that I, ALFRED J. TRIGWELL, a subject of the King of Great Britain, and a resident of San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention relates particularly to deep well centrifugal pumps, and it is the object of my invention to provide a pump of the nature indicated in which the drive shaft itself is revolved and so supported upon interiorly arranged guides as to be maintained in true vertical alignment and perfectly lubricated throughout its full length. Further objects are to provide a pump of the character indicated, in which the water in the well is completely closed off from the friction surfaces of the pump; in which novel construction is employed to prevent the entrance of water to the interior of the shaft; in which novel means is provided to cooperate with the centrifugal pump mechanism for raising the water out of the well; and in which the pump shaft itself is utilized to assist in propelling the water in addition to operating the centrifugal pump.

In the drawing,

Figure 1 is a vertical section through a portion of a pump structure embodying my invention.

Figure 2 is an enlarged section through the pump head.

Figure 3 is an enlarged section through the pump bowl.

Figure 4 is an enlarged plan view of one guide.

Referring more particularly to the drawing, 1 indicates a well bore, 2 a discharge casing suspended therein below a pump head 3 and carrying pump bowls 4. At 5 is shown a center supporting rod extending from the bottom bowl 4, into which it is screwed as at 6, to the head 3, in which it is securely fastened by lock-nuts 7. At 8 are shown a plurality of guide members arranged in spaced relation along and secured to rod 5 and slidably engaging shaft 10, and in the present case having conduits 9 formed therein.

Concentrically arranged about rod 5 is a tube or shaft 10 mounted in lower bowl 4 by means of a thrust bearing at 11 the inner ring 12 of the bearing being carried by rod 5 and the outer ring 13 by the shaft 10. At 14 is an annular member mounted on the outer surface of the shaft 10 at its lower end and carrying a downwardly extending flange 15. At 16 is shown a recess formed in the bottom of the lower bearing 4 concentric to rod 5 and having a spring 17 arranged therein operating against an annular sleeve 18 secured against rotating by dowel pins 19 and extending upwardly into the space between shaft 10 and flange 15 to engage a packing 20 placed therein. In each bowl 4 and on shaft 10 is mounted a runner as at 21.

At 22 is shown a thrust bearing, the inner ring 23 of which is mounted on rod 5, and the outer ring 24 of which is mounted on the upper end of shaft 10. At 25 is a cap mounted on inner ring 23 and extending downwardly over the upper edge of hollow shaft 10 and threaded externally to engage a nut 26, packing 27 being inserted between nut 26 and cap 25. The inner ring 23 is adjusted with relation to outer ring 24 by means of lock nuts 28 on rod 5. Oil or grease of desired consistency is fed into the interior of shaft 10 by means of cup 29.

At 30 is shown an angle iron formed into a spiral of substantially the same diameter as the interior of casing 2 and inserted therein to extend from the upper bowl 4 to discharge pipe 31. At 32 is shown another angle iron formed into a spiral of substantially the same diameter as the exterior of hollow shaft 10 and inserted thereon to extend from the upper bowl 4 to the discharge pipe 31, this spiral being directed oppositely to spiral 30 in casing 2. A pulley 33 is shown mounted on hollow shaft 10, and a packing gland 34 is arranged between shaft 10 and head 3 where the former emerges from the latter.

In operation the hollow shaft 10 is properly adjusted on bearings 11 and 22 by means of lock nuts 28, and the shaft filled with grease through cup 29. The guides 8 are preferably made to fit loosely in shaft 10 so that the grease will readily work down past the same to the bottom of the shaft. These guides 8 may be made in any form as with conduits 9 therein to permit the grease to more readily work through to the bottom.

By means of this construction the interior of shaft 10 is thoroughly oiled at all times,

and water is effectually prevented from entering the same by means of packing glands 27 and 20. The spring supported element 18 permits the free rotation of shaft 10, prevents the ingress of water to shaft 10 and permits the egress of oil from said shaft if sufficient pressure is exerted thereon to cause the retraction of element 18 a sufficient distance to open a passage by packing 20. This feature is important because it permits grease to appear on the water when the shaft is filled at which time the filling operation is discontinued.

When the water is discharged from the uppermost bowl 4 it normally assumes a spiral motion. In this construction this motion is not immediately changed to a vertical motion as is commonly done, but the spiral motion is continued by spiral 32 on shaft 10 and spiral 30 in casing 2, the former applying a lifting force to the water throughout its travel through the discharge casing 2.

It may now readily be seen that in the structure disclosed the enlarged hollow shaft permits the use of additional water raising devices, and, the enlarged hollow shaft can be maintained in vertical alignment without undue friction and without the tendency to whipping that is common with a solid shaft.

In addition to the advantages above-set forth with regard to the construction disclosed, attention is particularly called to the fact that the hollow shaft extends clear to the bottom of the several bowls and the runners fixedly mounted thereon so that no runner bearings are exposed to the action of the water as in those constructions now in use.

It is to be understood, of course, that while I have herein shown and described one particular embodiment of my invention, changes in form, construction and method of operation may be made within the scope of the appended claims.

I claim:—

1. In combination, a pump bowl, a shaft supporting rod mounted therein, a tubular driving shaft encompassing said rod, a thrust bearing inserted between said rod and shaft, a packing gland element fixedly mounted on said shaft, packing gland element slidably mounted in said bowl to engage said first named element, and a resilient support for the second named element normally holding the same in close engagement with said first element.

2. In a pump, a discharge casing, a rotary pump operatively connected thereto, a shaft supporting rod concentrically arranged therein, a tubular driving shaft for the pump enclosing said rod and spaced a distance therefrom and spaced perforated guide members for said shaft mounted upon said rod and slidably engaging said shaft.

3. In a pump, a discharge casing, a rotary pump operatively mounted therein, a shaft supporting rod concentrically arranged therein, a tubular driving shaft for the pump enclosing said rod and spaced a distance therefrom and guide members for said shaft mounted upon said rod, and slidably engaging said shaft.

4. In a pump, a discharge casing, a rotary pump operatively mounted therein, a shaft supporting rod concentrically arranged therein, a tubular driving shaft for the pump enclosing said rod and spaced a distance therefrom and guide members for said shaft mounted upon said rod and loosely engaging the interior of said shaft to permit the passage of a lubricant thereby.

5. In a pump, a pump head, a discharge casing suspended therebelow, a bowl carried by said casing, a runner arranged in said bowl, a shaft supporting rod mounted in said bowl and head, a tubular driving shaft for said runner enclosing said rod and spaced a distance therefrom, a support for said shaft, a thrust bearing inserted between the lower end of said shaft and said support, a thrust bearing inserted between the upper end of said shaft and said supporting rod, and means for adjusting said upper bearing, said bearings being oppositely directed with relation to each other, and permitting the passage of lubricant therethrough.

6. In a pump, a pump head, a discharge casing suspended therebelow, a bowl carried by said casing, a runner arranged in said bowl, a shaft supporting rod mounted in said bowl and head, and a tubular driving shaft operatively mounted with relation to said head and runner and concentrically arranged with relation to said rod and spaced a distance therefrom, and a packing gland arranged at the lower end of said shaft, one element of said gland being resiliently mounted to open under pressure from within said shaft.

ALFRED J. TRIGWELL.