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 DEEP WELL PUMP.
 APPLICATION FILED DEC. 7, 1920.

Patented Sept. 19, 1922.

1,429,487.

Fig. 1.

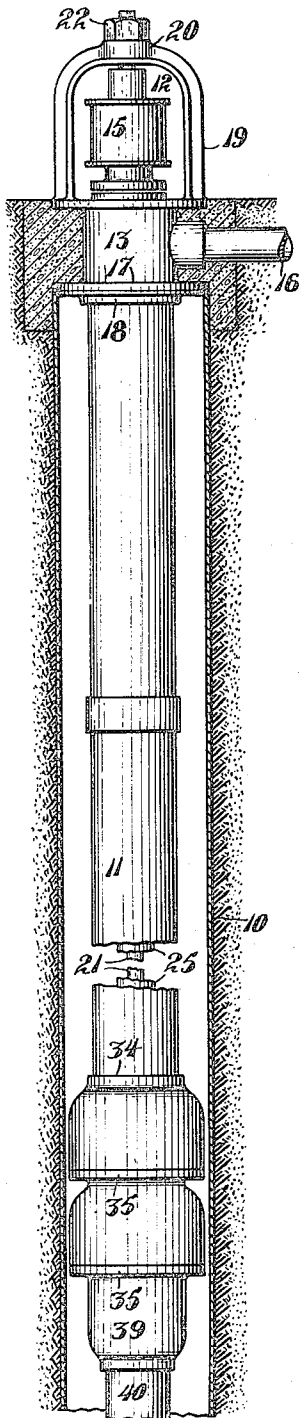


Fig. 2.

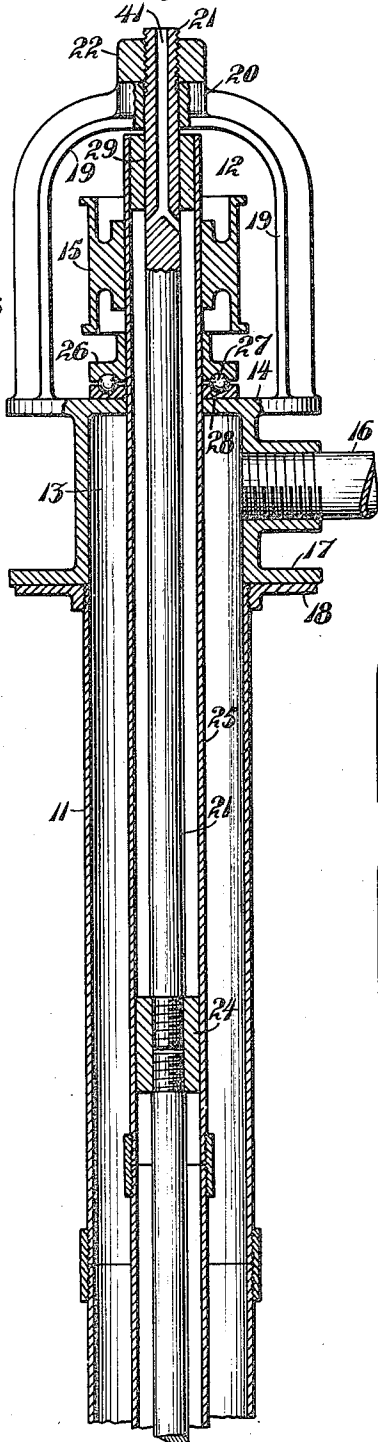
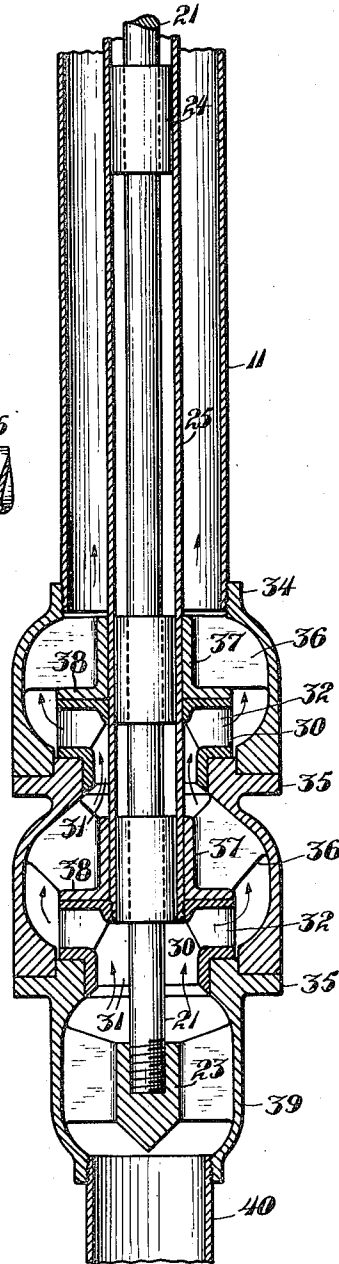


Fig. 3.



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WILBUR F. BUDLONG, DECEASED, LATE OF SAN JOSE, CALIFORNIA, BY EMMA I. BUDLONG, EXECUTRIX, OF SAN JOSE, CALIFORNIA, ASSIGNOR TO CAMPBELL & BUDLONG MACHINE WORKS, OF SAN JOSE, CALIFORNIA, A CORPORATION OF CALIFORNIA.

DEEP-WELL PUMP.

Application filed December 7, 1920. Serial No. 428,875.

To all whom it may concern:

Be it known that WILBUR F. BUDLONG, deceased, formerly a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, did invent a new and useful Improvement in Deep-Well Pumps, of which the following is a specification.

This invention relates to pumps, and particularly pertains to deep well pumps.

In the application and use of deep well pumps, considerable difficulty has been experienced in holding the vertical pump shaft in position, and in supplying a lubricant to all the bearings thereof. It is the principal object of the present invention, therefore, to provide a pump structure in which the drive shaft for the rotor will be given sufficient stability to prevent it from excessively vibrating within the pump casing, and furthermore providing means by which a continuous stream of lubricating oil will be automatically circulated through the bearings of the shaft and the pump rotor.

The present invention contemplates the use of the usual tubular pump casing, within which a central fixed mandrel is mounted, and to the lower end of which pump units may be attached said units having rotors driven by a tubular shaft disposed over the central fixed mandrel, and rotating therearound.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a view in vertical section and elevation, showing the application of the present invention.

Fig. 2 is an enlarged view in vertical section and elevation, showing the upper end of the structure with which the present invention is concerned.

Fig. 3 is an enlarged view in section and elevation, showing the lower end of the structure, more particularly disclosing the pump rotors and their housings.

Referring more particularly to the draw-

ings, 10 indicates a well casing of any desired length, and through which a liquid is elevated. Mounted in this well casing is a pump casing 11, the upper end of which is suitably anchored, and receives a pump driving unit 12. This unit comprises an outlet connection 13, a bearing frame 14, and a driving pulley 15. The outlet connection is fitted with an overflow pipe 16, through which liquid may be conducted from the casing. The portion 13 is preferably formed with a flange 17, by which it may be rigidly secured to a bolting flange 18, threaded to the upper end of the casing 11. The bearing structure comprises a plurality of upright arms 19, at the upper end of which a vertical bearing 20 is disposed. This bearing receives the end of a central mandrel 21, which is rigidly and non-rotatably positioned within the pump casing 10. The upper end of this mandrel is threaded and fitted with a tensioning nut 22, which nut rests upon the upper flat face of the bearing 20.

The mandrel 21 is suspended from the nut 22, and is secured within a threaded bearing 23 at its lower end. As shown in Fig. 2, the mandrel consists of a plurality of sections which are connected by threaded bushings 24. These bushings are of uniform diameter, and act as cylindrical bearings around which a tubular pump drive shaft 25 may rotate. It is also to be understood that bushings similar to the one by which the sections are connected may be disposed upon the mandrel at any desired points throughout its length, for the purpose of supplying additional bearing surface for the shaft 25.

The shaft 25 is fitted with a bearing collar 26 near its upper end, and which collar is formed with ball race to receive ball bearings 27, which members are supported upon a lower bearing plate 28. This plate is carried by the frame 14. The pulley 15 is keyed to the tubular shaft 25, and affords means for its rotation. The upper end of the shaft is fitted with a bearing 29, through which the mandrel 21 extends. It is to be under-

stood that there is a running fit between bearing 29 and the tubular shaft, as well as between the various bearings 24 and the shaft. The lower end of the tubular shaft 5 25 is equipped with one or more rotary impellers 30. In Fig. 3, two of these members are shown superimposed, one above the other. These impellers are of common construction, having a central induction opening 31, and circumferential eduction openings 32, occurring between the blades of the impellers. Pump housings are disposed 10 around the impellers, and are suspended from the lower end of the well casing 11. The uppermost of these housings are formed with threaded collars 34 to receive the lower end of the pump casing. The body of the housing is enlarged to provide the desired liquid circulating space, and to receive the 15 impeller 32. The lowermost pump housings are each formed with bolting flanges 35, by which the next succeeding housing may be secured thereto. Radial webs 36 are formed within each housing, and are cast integral 20 with guide bearings 37, through which the tubular drive shaft extends. Each of these guide bearings is formed with an enlarged flange 38 at its lower end, to prevent vertical movement of the drive shaft and its rotors. 25 The lower pump housing is mounted upon a suction end casting 39, within which the threaded bearing 23 is formed. This suction casting in turn may be equipped with a suction pipe 40.

35 Attention is directed to the fact that the tubular drive shaft extends entirely through the lowermost runner 37, thereby insuring that a lubricant passing down the interior surface of the shaft and around the various 40 bearings 24, will have an opportunity to readily pass out through the lower end of the shaft. This action will, of course, be influenced by the suction action produced by the upward flow of the liquid, thereby auto- 45 matically creating a circulation of the lubricant throughout the pump system.

It is to be understood that a liquid lubricant may be supplied the various bearings 24 by any desired means, although in the 50 present instance a feed duct 41 is formed longitudinally of the upper end of the mandrel 21, and communicates with the interior of the drive shaft 25 at points below the upper bearing 29.

55 In operation of the present invention, the structure is assembled as shown in the drawings. It is to be understood that the pump casing, pump housings, tubular drive shaft, and central mandrel may be progressively 60 assembled in sections until the pump rotors have been lowered to a desired depth. The driving structure at the upper end of the shaft 25 may then be assembled and power suitably applied to the pulley 15. This will

cause rotation of the drive shaft 25, with a 65 simultaneous rotation of the impellers. The liquid will thus be elevated. In the event that there is any particular "weaving" of the drive shaft and mandrel, it is possible to tension the mandrel by tightening the nut 70 22. This will act to draw the mandrel tight between the bearings 23 and 20, and will stabilize the rotary movement of the shaft. It will also be evident that due to the tubular formation of the drive shaft, considerable 75 conservation of material may be made without sacrificing strength. As the shaft rotates, lubricant will be continuously delivered through the duct 41, and will thus gradually gravitate around the various bearings and 80 into the lower pump housing. This gravity action will insure that all the bearings will be continuously and uniformly lubricated, and that a downward pressure will be exerted, sufficient to exclude an upward pressure 85 of liquid from the well.

It will thus be seen that the pump structure here disclosed provides means for rigidly supporting a pump shaft without the use of an elaborate system of bearings, and 90 that at the same time the shaft will be adequately lubricated.

While I have shown the preferred form of my invention, as now known to me, it will be understood that various changes 95 might be made in the combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what 100 I claim and desire to secure by Letters Patent, is:

1. A deep well pump comprising a tubular pump casing, a pump structure supporting the lower end thereof, a suction end casting disposed at the lower end of the pump 105 structure, a driving unit at the upper end of the pump casing, a sectional non-rotating mandrel extending from the driving unit to the suction end casting, a sectional tubular 110 pump shaft adapted to rotate around said mandrel, and bushings connecting the sections of the mandrel and forming bearing members thereon and around which the pump shaft has a running fit.

115 2. A well pump comprising a pump casing, a fixed sectional mandrel, a tubular pump shaft rotatable around the mandrel and spaced therefrom, bushings for connecting the sections of the mandrel and forming 120 bearings contacting with the interior of the tubular pump shaft, the said mandrel having means therein for supplying a lubricant to the interior of the pump shaft whereby the bushings will retard the flow of lubri- 125 cant at the point to be lubricated.

3. A deep well pump comprising a fixed mandrel, a tubular pump shaft rotating

around said mandrel, and an upper and lower impeller carried by the tubular pump shaft, means for supplying a lubricant to the interior of the pump shaft, the said pump shaft terminating in the same plane with the lower impeller, whereby suction is produced to draw the lubricant through the pump shaft.

In testimony whereof, I have hereunto set

my hand in the presence of two subscribing witnesses.

EMMA I. BUDLONG,
*Executrix of the estate of Wilbur F. Bud-
long, deceased.*

Witnesses:

BERNICE BUDLONG,
F. J. ALLENDER.