F. M. BUDLONG.

DEEP WELL PUMP.

APPLICATION FILED FEB. 13, 1920.

1,373,712.

Patented Apr. 5, 1921

Fig. 2.

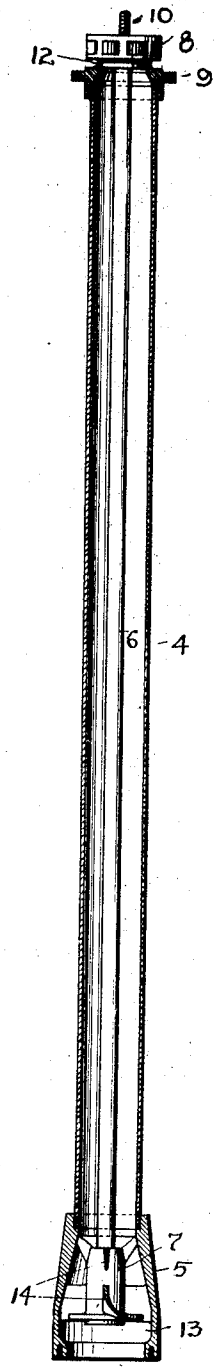


Fig. 1.

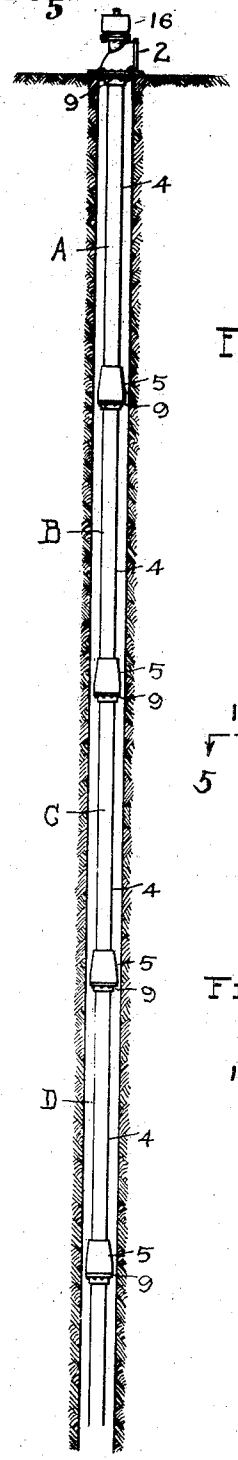


Fig. 3.

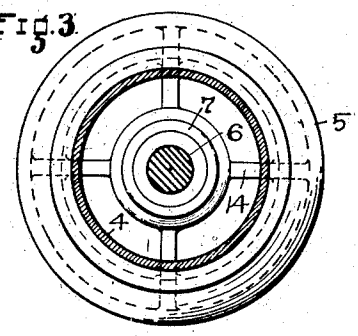


Fig. 4.

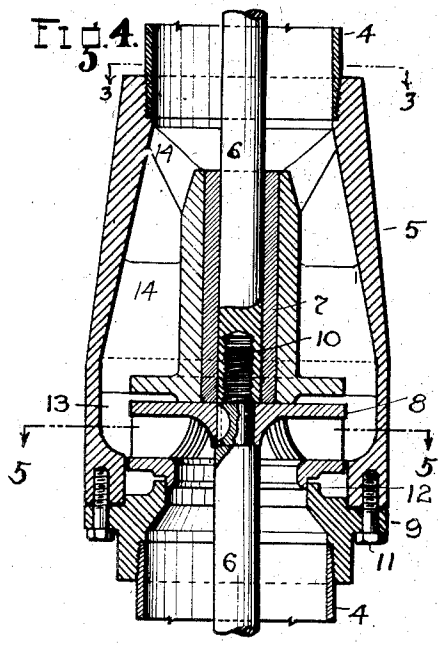
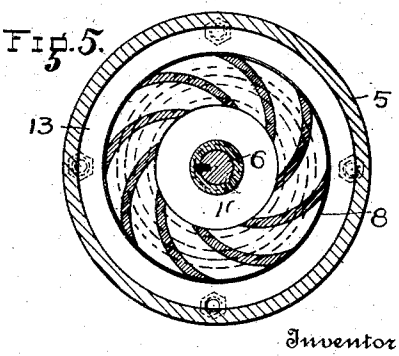


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DEEP-WELL PUMP.

1,373,712. Specification of Letters Patent. Patented Apr. 5, 1921.

Application filed February 13, 1920. Serial No. 358,347.

To all whom it may concern:

Be it known that I, FRANK M. BUDLONG, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Deep-Well Pumps, of which the following is a specification.

This invention relates to deep well pumps, and more particularly to a centrifugal turbine pump constructed to divide its maximum lifting force at spaced intervals throughout the length of a deep well tube. The general practice is to use one or a group of pump cylinders with rotors or runners therein at the bottom of a well tube made in sections and raise the water solely by such single or plural stage mechanism by centrifugal force generated at the extreme bottom of the well tube, and in this operation the weight of the entire column of water is placed upon the rotors or runners at the bottom. Such apparatus has its limitations in use and objectionable troubles arise therefrom all as hereinafter more fully pointed out.

The present invention, in contradistinction, embodies a sectional well tube having separate impellers at the bottom end of each section, whereby a column of water of great length may be handled and lifted by centrifugal action and pressure generated in each section at widely interspersed places in the column. Stated in another way, the maximum centrifugal force and pressure required to lift a given column of water at a specified speed is generated and divided and applied at uniformly spaced intervals in the column instead of having the full force and pressure all applied at the bottom of the column.

Accordingly, with a sectional water tube having impellers at the bottom of each section we are enabled to eliminate separate shaft bearing couplings between the well tube sections; each section of the well tube is a working as well as a connecting unit; as many sections may be connected together as may be necessary to reach any given depth, or to raise the water from any given level in the well to the surface; and whenever the water recedes in the well additional working sections can be readily applied at the top of the column to submerge the lower intake section beneath the lowered water level, and in so doing the additional working unit at the top compensates for the added volume and weight of water to be lifted.

Thus with the present invention I overcome the expense and trouble heretofore experienced of removing the entire well tube to change the stages of pump mechanism at the bottom for different depths, and have also obviated the unscrewing of the pump shaft by a reverse movement of the impellers under the weight of the water when the power is shut off, thereby saving delays and expense in removing the well tube and reconnecting or repairing the disconnected parts.

Again, no obstructing matter can work downward below the bowl and impeller in the first pump section or unit below the discharge head, and whenever this happens it is only necessary to remove the first section or unit and not an entire well tube to get at the bottom as in other deep well pumps where the impellers are grouped together. I also find that a deep well pump constructed according to my invention is easy to install and to keep in perfect alinement; the number of shaft bearings and water obstructions and the friction of the water is reduced to a minimum, and the water which passes around the bearings in each bowl alone suffices as a lubricant for the bearings.

In the accompanying drawing Figure 1 is a reduced view of a plural number of my pump sections united together as in use. Fig. 2 is an enlarged sectional view of one of the pump sections or working units. Fig. 3 is an enlarged view, in section, of the well tube on line 3—3, Fig. 4. Fig. 4 is an enlarged view, in section, of a bowl and impeller and the connecting parts between two pipe sections. Fig. 5 is a plan view, in section, on line 5—5, Fig. 4.

Structurally considered the apparatus comprises a discharge head 2 and a plural number of tubular sections or units A, B, C, etc., in separable suspensory connection with the discharge head and with each other. Each pump section or unit A, B and C, considered in its entirety, is a separate connecting section and pumping unit, consisting of a relatively long pipe 4, a short pump bowl or casing 5, a long section of shaft 6 journaled at its lower end within a bearing 7 centrally within the bowl, a pump impeller or runner 8 keyed or otherwise affixed to the upper end of the shaft 6 in the subjacent section, and a connecting

ring or collar 9 which is arranged to close the lower end of the bowl or casing and serve as a pipe connection for the upper end of the pipe 4 of the working section next in line beneath the bowl. The lower end of each shaft 6 is bored and screw-threaded to couple and connect with the reduced screw-threaded extension 10 on the upper end of a corresponding shaft 6 in the adjoining section, and the collar or ring is secured to the bottom of the bowl by bolts 11 and has a reduced central opening surrounded by a raised boss or flange 12. The impeller 8 has a short annular neck adapted to extend into said reduced opening with a fairly snug fit and to rotate in close proximity to the side of the opening, and the diameter of the impeller is approximately of the same diameter as the bottom opening in the bowl or casing. An annular space or enlargement 13 is provided within the bowl or casing opposite the periphery of the impeller and the casing tapers from this enlargement to a smaller diameter at its upper end and has a corresponding tapered passage therein above the impeller, and a series of radial and curved ribs 14 support the inner journal or bearing 7 for the shaft within the bowl. The upper open end of the bowl or casing is screw-threaded internally to provide a screw connection for the lower end of pipe 4 of a given section of unit, and the length and diameter of this pipe is proportionate to the size of the impeller required to raise a given amount of water to a given height at a specified speed. Each succeeding pump section or unit picks up the water raised by the one below until it reaches the surface, and as the power applied to pulley 16 above is distributed uniformly to each of the impellers by the sectional shafts connected in tandem as disclosed, all of the impellers operate in unison and at the same speed and cause the same centrifugal action to take place in each bowl, and the torque and weight of water on the shaft is equally divided by spacing the impellers uniformly apart the full length of the well tube.

What I claim is:

1. An extensible deep well pump comprising an outer tubular column consisting of a series of tubes, a pump inclosing casing having the upper of said tubes secured to the top thereof, a coupling member fixed to the bottom of said casing and having the next lower tube engaged therewith, said casing having a shaft bearing in the center thereof and water passages about said bearing through said casing, a sectional shaft rotatably mounted in said bearings and having the sections thereof screwed one into the other at the bottom of said bearings, and a pump fixed on the lower of said shaft sections immediately beneath the union between said sections and next beneath said bearing.

2. An extensible deep well pump comprising a plurality of connecting and working units consisting each of a relatively long tube, a bowl affixed to the lower end of said tube provided with a shaft bearing centrally therein, an upper shaft section journaled in said bearing having screw-threaded portions at opposite ends thereof adapted to provide separable connections with corresponding sections of said shaft and a lower shaft section provided with a stem screwed into the lower end of said upper section, an impeller fixed upon the base portion of said stem and rotatable therewith, and a collar on the lower end of said bowl adapted to connect a tube therewith and provided with a neck in close working engagement with the bottom of said impeller.

Signed at San Jose, in the county of Santa Clara, and State of California, this 26 day of January, 1920.

FRANK M. BUDLONG