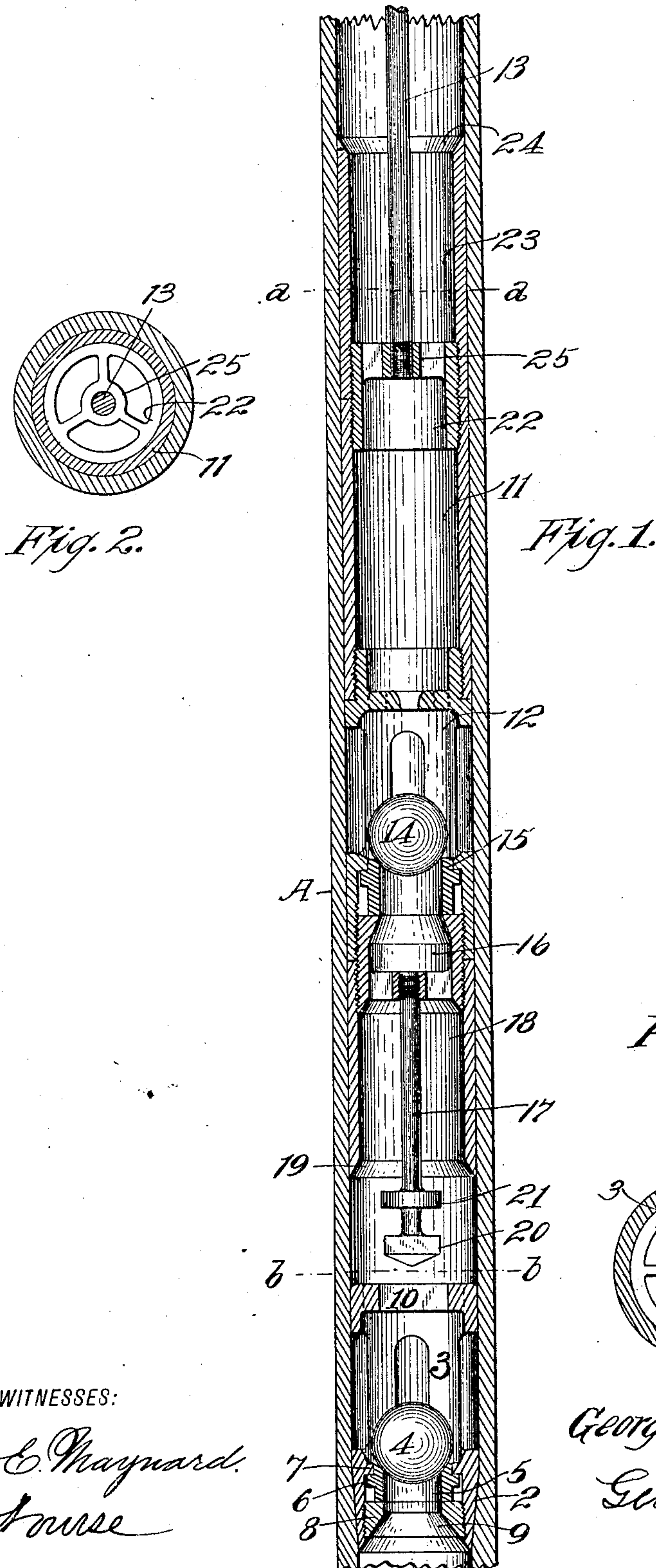


No. 871,185.

PATENTED NOV. 19, 1907.

G. C. RICHARDS.  
DEEP WELL PUMP.

APPLICATION FILED JULY 18, 1906.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

GEORGE C. RICHARDS, OF BERKELEY, CALIFORNIA, ASSIGNOR TO THE WESTERN MILL & MACHINE CO., A CORPORATION OF CALIFORNIA.

## DEEP-WELL PUMP.

No. 871,185.

Specification of Letters Patent.

Patented Nov. 19, 1907.

Application filed July 18, 1906. Serial No. 326,680.

*To all whom it may concern:*

Be it known that I, GEORGE C. RICHARDS, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented new and useful Improvements in Deep-Well Pumps, of which the following is a specification.

My invention relates to deep-well pumps and especially to pumps for pumping water and heavy mineral oils carrying considerable sand and sediment in suspension. Its object is to provide a simple, desirable, practical pump of this character which will have few wearing parts and those readily replaceable; and which will overcome certain difficulties that have heretofore proven such a source of annoyance and expense to those interested in the oil mining industry.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical section of my pump. Fig. 2 is a section on line *a—b*. Fig. 3 is an end view of the key. Fig. 4 is a section on line *b—b*.

A represents a pump-barrel-section which is adapted to be inserted into and form part of the lower end of an Artesian or deep well casing. The perforated section, not shown, of the casing, is usually attached to the lower end of the pump-barrel; the entire casing and barrel being lowered into the well as the boring progresses.

The lower end of the pump barrel is formed with a contracted tapered portion 2, in which the correspondingly tapered valve cage 3 is adapted to be driven and seated. This valve cage has a snug sliding fit inside of the pump barrel. While it may be provided with any suitable sort of a valve, it is common and preferable to use a ball valve as 4. In conjunction with this valve I employ a removable and renewable annular valve seat 5, which is adapted to be inserted into the valve cage from the bottom and has an annular flange 6 to abut against the annular ledge 7 of the valve cage.

The portion of the valve cage below ledge 7 is threaded to receive a hollow nut 8, which latter when screwed up into the valve cage abuts against the valve seat 5 and holds the latter securely in position. In case the

valve seat 5 becomes very much worn, it is an easy matter after the cage is removed from the well to unscrew the hollow-nut 8 and replace the worn part. The lower edge of the nut 8 is tapered as shown at 9 to afford easy access for the liquid into the valve cage.

The upper end of the valve cage has an elongated opening 10 in which a suitable tool preferably carried by the pump plunger may be engaged for the purpose of removing the valve cage 3 from the well. The specific means for engaging the valve cage will be described shortly.

Operating in the barrel above the normally stationary valve cage 3, is the pump plunger. This plunger comprises a cylindrical section 11 carrying at its lower end the upper valve cage 12, and suitably connected at its upper end with the sucker or plunger rod 13.

The valve cage 12 houses the valve which is adapted to seat normally on the removable annular valve seat 15. This valve seat 15 is similar in construction to the valve seat 5 previously described, and it is held in position by means of a removable sleeve 16 which has an internal web forming a support for the rod or key 17 by which the valve cage 3 is inserted into and removed from the well.

The section 16 is exteriorly threaded, and a removable cylindrical shoe 18 is adapted to screw on over the sleeve 16 and abut against the lower end of the valve cage 12; the lower end of the shoe 18 being tapered as shown at 19 for the purpose of removing grit and other adherent particles from the sides of the pump barrel and directing them to the interior of the plunger, thence to be carried upward and removed by the pump operations.

The rod 17 has an elongated head 20 corresponding to the opening 10 in the lower cage 3 and also provided with a second head or enlargement 21. This head 21 is too large to pass through the opening 10 and affords a stop to limit the downward movement of the plunger and rod 17 when the head 20 is inserted through opening 10 and afterwards turned for the purpose of engaging the cage and allowing the latter to be withdrawn from the well.

The upper end of the plunger-cylinder 11



is connected by a sleeve-union 22 similar to union 16 with an upper shoe 23. The shoe 23 has a tapered end 24 co-acting with the barrel to keep the latter clean and prevent undue wear by reason of grit getting between the plunger and the barrel. The plunger rod 13 screws into a spider 25 formed integral with the sleeve-union 22. Suitable passages are provided in the sleeve-unions 22—16, and cages 12 and 3 for the ready upward flow of the liquid.

In operation, the well having been sunk to the desired depth, the casing is driven down with the pump-barrel in proper position. Afterwards the cage 3 being connected to the key 17 between the heads 20—21 together with the plunger and its various appurtenances, is lowered into the casing, and the cage 3 forced firmly into its tapered seat 2 in the barrel. The sucker rod and plunger is then given a quarter turn to permit the key 17 to be withdrawn through opening 10 in the cage 3. The plunger rod is then connected to the plunger-operating means in such a way that the head 20 will just clear the cage 3 by a couple of inches on the reciprocation of the plunger in the barrel. At each upward movement of the plunger, valve 14 being closed, the valve 4 opens to admit a fresh charge of liquid; on the downward movement of the plunger, valve 4 is closed and valve 14 opens to allow the charge just drawn in to flow into the space above valve 14, thence to be lifted to the surface on the succeeding strokes of the plunger.

By providing the wearing shoes 18 and 23 below and above the plunger, the latter and the pump-barrel are saved very much undue wear.

Another feature which is to be noted in regard to this pump, is the fact that the sucker-rod does not connect directly with the upper valve casing, as is usual in most pumps of this character. My construction is advantageous, for the reason that in case of very heavy lifts, there is no danger of the legs of the valve-cage straightening and becoming so contracted as to prevent the proper operation of the valve, as I have seen occur in pumps where the sucker rod is connected direct with the valve cage.

Other important features are the specific form of removable valve seats with means for holding them in position; the means for inserting and removing the lower valve cage; and the sleeves 16 and 22 which have the combined function of forming a union for various parts of the plunger and an anchor-age respectively for the key 17 and the sucker-rod 13.

In case it is desired to remove or replace a lower valve cage, or to take the pumping mechanism out of the well, the sucker-rod is lowered to permit the head 20 to pass through

the opening 10, and is then given a quarter turn, by lifting on the rod, the lower valve and the cage may be withdrawn simultaneously with the plunger from the well.

The tops of both cages 3—12 are open in the center so that the oil may act directly on top of each valve and cause it to close quickly. In valve cages where the oil outlets are only around the sides of the top, the oil gets under the valve and retards its seating. In my construction the weight of the incumbent column of liquid assists in the rapid seating of the valve.

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

1. In a pump, the combination of a barrel and a plunger therein, said plunger comprising a tubular section, a valve cage connected with the lower end of the section, an annular shoe below the cage, said shoe having an upper end abutting the end of the cage and having its remaining portion forming a vertical prolongation of said cage, a threaded interior sleeve union connecting the said lower shoe and cage, an annular shoe above the upper end of said section, a separate threaded interior sleeve union connecting said last-named shoe with said section, and a sucker-rod connected with the last-named sleeve-union.

2. In a pump, the combination of a pump-barrel and plunger, said plunger comprising a tubular section, a sucker-rod connected with the upper end of the section, a valve-cage connected with the lower-end thereof, said valve-cage having an interiorly threaded portion, an annular valve-seat fitting said threaded portion, an annular shoe below the cage, and a threaded inside sleeve-union connecting said shoe and cage and supporting said valve-seat in position.

3. In a pump, the combination of a pump-barrel, a plunger consisting of a cylindrical section, a sucker-rod connected with the upper end of said section, a valve-cage connected with the lower end of the section, a valve in said cage, an annular shoe below the cage and having its upper end abutting the lower end thereof, the adjacent ends of said cage and shoe being interiorly threaded, and an exteriorly threaded sleeve-union connecting the said threaded ends of the sleeve and shoe and being made separate from the cage.

4. In a pump, the combination of a pump-barrel, a plunger consisting of a cylindrical section, a sucker-rod connected with the upper end of said section, a valve cage connected with the lower-end of the section, a valve in said cage, an annular shoe below the cage, the adjacent ends of said cage and shoe being interiorly threaded, an exteriorly threaded sleeve-union connecting the said threaded ends of the sleeve and shoe, a key-

member carried by said union, and a valve-cage supported below and normally independent of the plunger and having a key-way engageable by said key, whereby said last-  
5 named cage may be removed from the well with the plunger.

In testimony whereof I have hereunto set

my hand in presence of two subscribing witnesses.

GEORGE C. RICHARDS.

Witnesses:

C. H. HARVEY,  
E. G. KNAPP.