Oct. 18, 1927. 1,646,134

L. C. BLACK

MULTISTAGE PUMP PLUNGER

Filed Sept. 2, 1925

FIG. 1.

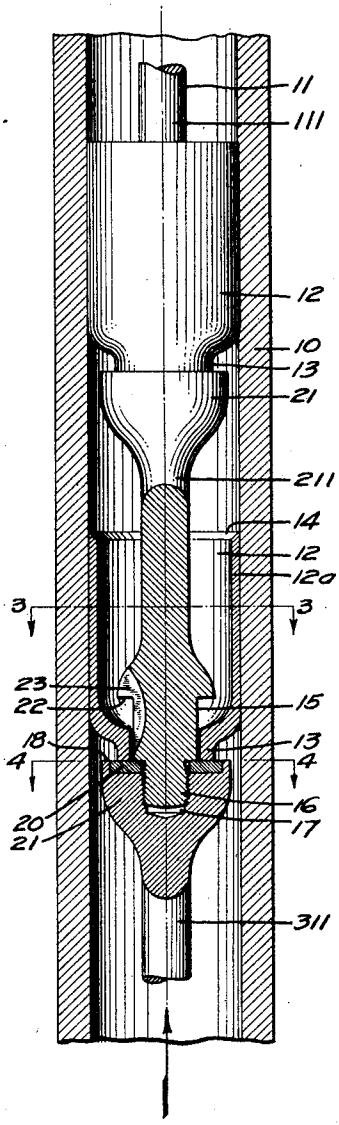


FIG. 2.

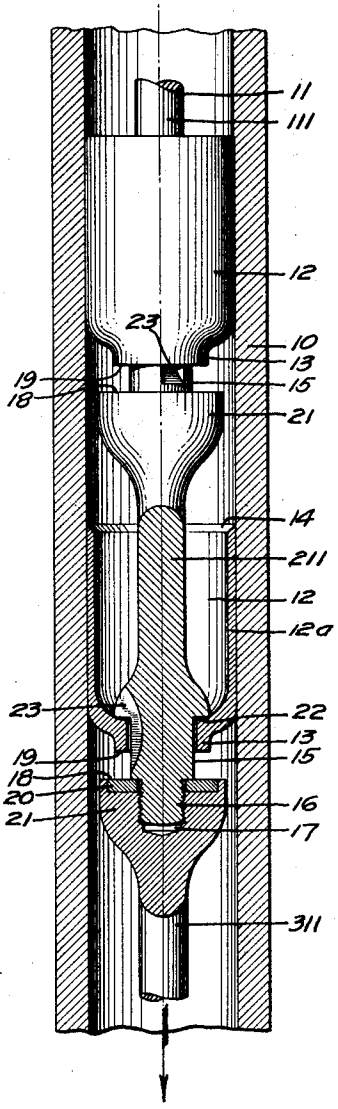


FIG. 3.

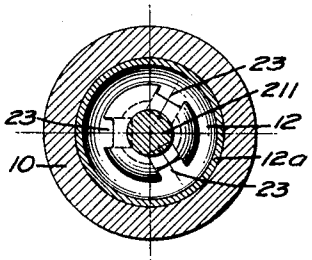


FIG. 4.

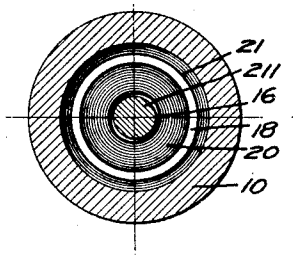
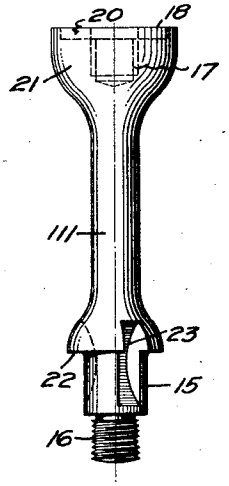


FIG. 5.



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UNITED STATES PATENT OFFICE.

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MULTISTAGE PUMP PLUNGER.

Application filed September 2, 1925. Serial No. 54,021.

This invention relates to pump plungers which are adapted to be used in multi-stage pumps. By multi-stage pumps is meant pumps in which the plunger is provided with a plurality of cups and a plurality of valves corresponding to the cups so that the pressure from the column of liquid above the plunger is distributed over a plurality of valves. It is an object of this invention to construct a plunger for such a pump in which a plurality of self-aligning cups is provided. It is further proposed to provide each of the cups with a valve located adjacent the bottom of the cups.

It is a further object of the invention to construct a plunger in which the wearing parts are especially adaptable to the use of manganese steel.

It is a further object of the invention to construct a plunger in a plurality of sections which may be readily assembled together to form a complete plunger and in which the parts of the different sections are identical.

It is a further object of the invention to construct a multi-stage plunger which is especially adapted for use in oil wells and which may be readily and cheaply manufactured, is simple in construction and will give a high pumping efficiency.

Further objects will appear from the following specification in which I have described the preferred embodiment of my invention.

Referring to the drawing:

Figure 1 is a cross sectional elevation of the plunger inserted in a pump cylinder with the plunger in its raised position.

Figure 2 is similar to Fig. 1 but shows the plunger in its lower position.

Figure 3 is a cross sectional view taken along the line 3—3 of Fig. 1.

Figure 4 is a cross sectional view taken upon the line 4—4 of Fig. 1.

Figure 5 is a detail of one section of the plunger rod.

In Figs. 1 and 2 of the drawing, the plunger is shown as positioned within a pump cylinder or barrel 10. The plunger comprises generally a plunger rod 11 which is attached at its upper end to a suitable reciprocating pump rod. This plunger rod has disposed upon it at spaced points the plunger cups or collars 12 which are adapted to snugly fit into the pump barrel 10.

These cups 12 are preferably made of manganese steel alloy, although it is understood that the other novel features of the invention are applicable with plunger cups made of other materials, such as any suitable metal, leather, composition or fabric. Manganese steel has extraordinary wearing qualities and will maintain its original finish and dimensions, thus preventing sand from working between the cups and the pump barrel to score the working surface of the barrel. However manganese steel is very difficult to machine. This difficulty is minimized in this invention by making the plunger cups of very simple construction. Thus each of the cups comprises merely a cylindrical member 12^a, which fits the inner surface of the pump barrel, and a lower concentric sleeve 13. The lower portion 19 of the sleeve 13 also forms a portion of the valve element to be described presently. The cups 12 are positioned at spaced points along the plunger rod 11 and are preferably secured thereto by the sleeves 13 which have openings therein to receive the positioning or guide portions 15 of the plunger rod. The fit between the sleeves 13 and the positioning or guide portions 15 is a comparatively loose one so that the cups are free to align themselves separately to fit the pump barrel. The upper edges of these cups are preferably beveled as at 14 so as to prevent sand from getting in between the pump cylinder and the outer surfaces of the cups. This beveled edge also serves to direct sand down into the cup.

Each of the plunger cups or collars is provided with individual valves which are preferably located adjacent the bottoms of the cups so that sand will not accumulate in the interior of the cups. The construction of these valves will be described later together with the sections of the plunger rod.

It has been found preferable to construct the plunger rod in a plurality of sections such as 111, 211 and 311. It is also preferred to make these sections identical so that broken sections may be readily replaced. Fig. 5 shows the construction of one of these sections which comprises a rod having screw threaded attaching means 16 and 17 at its ends. The upper end of the rod section is provided with a valve seat 18 which is adapted to cooperate with the depending portion 19 of one of the cups 12. This valve seat 18 preferably comprises an annular ring 20 which is inserted in the enlarged end 21 of the end of the rod section. The annular ring 20 is preferably made of manganese steel or

any other metal or other material which will give a fluid-tight contact with the depending portion 19 of one of the cups 12. The lower end of each rod section is provided with a guide portion 15 previously referred to. This guide portion terminates with a shoulder 22 which is provided to limit the upward movement of the cup 12 on the guide portion 15. Each rod section is also provided with suitable ports for the passage of liquid which may be in the form of grooves 23 extending from a point above the shoulder 22 to a point adjacent the lower end of the guide portion 15. When the rod sections are assembled with a plunger cup 12 positioned on each one of the guide portions 15, the plunger cups will be free to have limited longitudinal movement with respect to the plunger rod upon reciprocation of the latter. Upon the up stroke of the plunger rod the depending portions 19 of the plunger cups will contact with the valve seats 18 to effectively seal the space between the plunger cups and the plunger rod. Upon the down stroke of the plunger rod as shown in Fig. 2 the plunger cups 12 will move upwardly with respect to the plunger rod and the depending portions 19 will be lifted clear of the valve seats 18, thus exposing the ports 23 and allowing free flow of liquid thru the valve.

Thus it is seen that there has been provided a plunger rod which is formed in a plurality of identical sections and these sections can be assembled or replaced at will. The number of these sections employed will of course depend upon the number of stages which it is desired to employ.

I claim:

1. A device of the class described comprising a plunger rod formed in at least two sections, means providing a screw threaded engagement between said sections, a flat annular valve seat formed on the lower section adjacent its upper end, a guide portion on the lower end of the upper section, a plunger cup surrounding the upper section, the lower end of the cup having a portion of reduced diameter to loosely fit said guide portion, a shoulder on the upper section to limit the upward movement of the plunger cup relative to the rod, and means on the lower end of the cup adapted to cooperate with the valve seat.

2. A multi-stage pump plunger comprising a rod formed of a plurality of identical sections, each section having a valve seat formed adjacent its upper end, an integral guide portion on its lower end, and an integral shoulder adjacent the guide portion, and a cup plunger cooperating with each section, each plunger having a lower portion of reduced diameter adapted to loosely fit a guide portion.

In testimony whereof, I have hereunto set my hand.

LESTER C. BLACK.