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ADJUSTABLE ROD GUIDE FOR PUMPS

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FIG. 1.

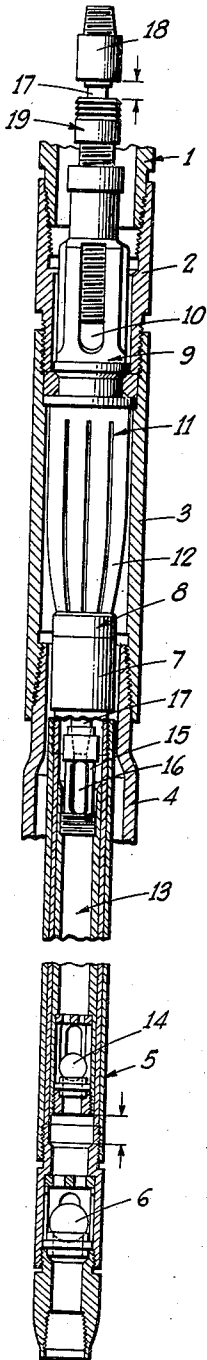
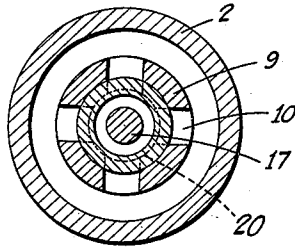
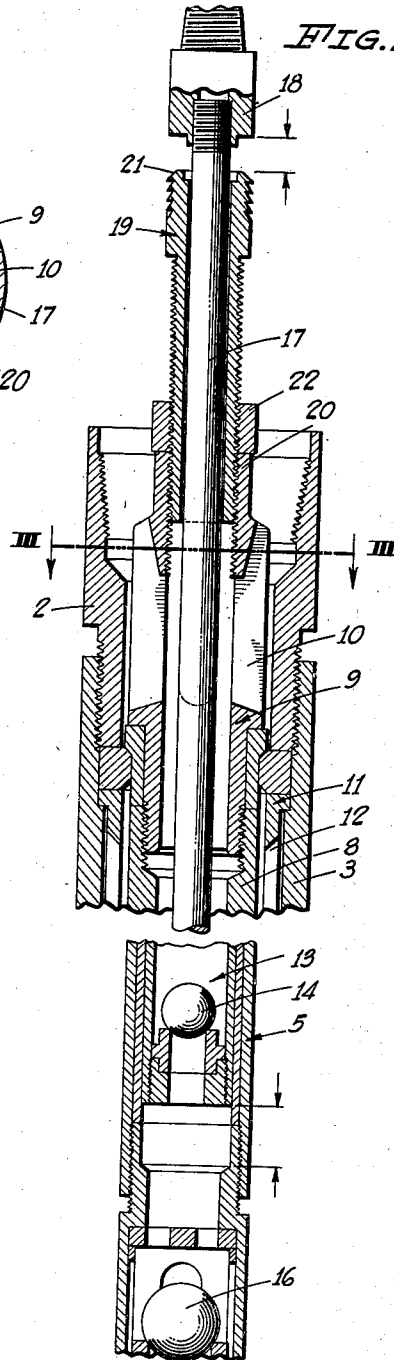


FIG. 3.

FIG. 2.



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ADJUSTABLE ROD GUIDE FOR PUMPS

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6 Claims. (Cl. 103—181)

My invention relates to oil well pumps and has particular reference to an adjustable rod guide readily adaptable to different pump lengths and different plunger and rod assemblies for pumps.

In oil well pumps it is the common practice to employ as a part of the pumping apparatus a barrel and a plunger reciprocable relative to each other to perform the pumping operations, either the barrel or the plunger being stationarily mounted in the lower end of pump tubing while the other of the members is adapted to be reciprocated by means of a string of sucker rods extending from the pump up to the ground surface.

In assembling pumps, even pumps of a given type produced by a single manufacturer, the assembly of the various parts necessary to make a particular pump produces an over-all length of pump structure which will vary between considerably wide limits depending upon the particular apparatus required in the pump. For example, the barrel may be assembled with a particular character of standing valve, a particular character of hold-down or lock mechanism for anchoring the barrel in the tubing, and it may contain sectional lining of predetermined lengths so that the assembled structure has a given over-all length. Another purchaser of the same character of pump may desire a different standing valve or a different type of hold-down device or a different type of sectional liner, the assembly of which will produce a pump having a different over-all length. Similarly, the plunger structure may be assembled from stock parts differing slightly in length from each other so that the assembled plunger for one type or character of pump may vary considerably from the length of a similar plunger assembled from slightly different parts.

Any pump of this character to be efficient must provide for a stroke of the plunger and barrel relative to each other such that upon the completion of the down stroke the plunger is as far down in the barrel as it is possible to achieve without striking the end of the barrel or the standing valve therein so that in order to permit the plunger and the bottom portions of the barrel assembly to come close to each other, the plunger rod employed to suspend the plunger from the sucker rod string has been required to be extremely accurate in length, necessitating the provision by the manufacturer of a great number of different lengths of plunger rods.

Even in assembling a series of pumps from identical parts, the manufacturing tolerances

allowed in the various parts may be so cumulated in the assembled structures as to cause supposedly identical assemblies to vary in length to a considerable extent. Thus when the plungers are connected to a plunger rod considered to be standard for such assemblies, it frequently occurs that the plunger is permitted to strike the bottom assembly of the barrel or the plunger does not move into sufficiently close relation to the bottom of the barrel. Hence it has been necessary for the manufacturer to alter the lengths of the plunger rods to fit the particular pump assembly with which it is to be associated.

It is therefore an object of my invention to provide a pump assembly in which the barrel and plunger mechanisms may be assembled together from stock parts to produce the particular type and character of pump desired by a purchaser and in which the plunger rods may be so assembled with such structures as to permit of adjustment of the effective lengths of the assemblies.

Another object of my invention is to provide a pump assembly of the character set forth wherein an adjustable rod guide is provided adapted to vary the effective lengths of the pump and barrel mechanisms to permit the use therewith of standard stock lengths of plunger rods.

Another object of my invention is to provide a pump assembly of the character set forth in which the stationary member of the pump is provided with a guide surrounding the plunger rod and in which such guide is adjustable longitudinally with respect to the pump structure to constitute an adjustable abutment limiting the downward movement of the plunger rod relative to the stationary member of the pump.

Another object of my invention is to provide a pump assembly of the character set forth wherein the barrel of the pump is provided with an elongated nipple surrounding the plunger rod and in which the nipple may be readily adjusted longitudinally with respect to the barrel to provide an adjustable abutment engageable by the plunger rod to limit the extent of the downward movement of the plunger in the barrel.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawing, wherein

Fig. 1 is a vertical sectional view taken through a portion of the pump tubing and illustrating a plunger and barrel pump embodying my invention assembled therein;

Fig. 2 is an enlarged sectional view similar to

Fig. 1 and illustrating the rod guide and plunger rod assembly in detail; and

Fig. 3 is a horizontal sectional view taken along section III—III of Fig. 2.

Referring to the drawing, I have illustrated in Fig. 1 the lower end of a string of pump tubing or flow tubing 1, to which is secured the housing structure for receiving an insert type of pump, such housing structure including an adaptor collar 2 secured directly on the end of the tubing string 1 and having an anchor shoe 3 extending downwardly therefrom to connect with an elongated tubular member 4 within which the pump proper is to be located. The pump illustrated is of the stationary barrel reciprocating plunger type and includes a barrel 5 comprising an elongated tubular jacket at one end of which is secured the standing valve 6 and the other end of which is secured to suitable anchoring or hold-down mechanism including a collar 7, an anchor lock 8 and a ported cap 9 provided with a plurality of ports 10 through which oil pumped by the pumping mechanism may flow from the pump to the interior of the flow tubing 1. The barrel is adapted to be held stationarily in the tubing string 1 by any of the anchor mechanisms well known in this art, the particular anchor mechanism illustrated herein including an anchor sleeve 11 secured in the anchor shoe 3 and having a plurality of fingers 12 adapted to engage the anchor lock member 8 of the barrel assembly.

The plunger may comprise a tubular plunger body 13 in the lower end of which is located a working valve 14 and to the upper end of which is secured a ported cap 15 provided with ports 16 through which oil entering the plunger body 13 may escape outwardly into the upper end of the barrel 5. A plunger rod 17 is secured directly to the cap 15 and extends upwardly through the barrel cap 5 and is provided upon its upper end with a coupling 18 to which a string of sucker rods extending from the ground surface may be connected.

From the foregoing it will be noted that the barrel assembly 5 includes a number of parts such as a standing valve, collar, anchor lock and cap, each of which may be selected of any desired length depending upon the particular characteristics desired for the pump. Similarly the plunger assembly includes the body 13, working valve and cap which may be selected of any desired length depending upon the characteristics desired for the pump, so that the particular length of plunger rod 17 which is required for any given assembly must correspond to the length of the barrel assembly. As will be observed from an inspection of Fig. 1, it is desired that upon the down stroke of the sucker rods the lower end of the plunger should approach as closely as possible to the lower end of the barrel assembly 5, that is, it should approach as closely as possible to the standing valve 6 without actually striking any of the bottom assembly members of the barrel 5.

To prevent the plunger from so striking the bottom of the barrel assembly, a rod guide 19 is provided upon the upper end of the barrel assembly. The form of rod guide illustrated herein comprises an elongated threaded nipple screwed into a threaded bore 20 in the cap member 9, the upper end of the nipple 19 being preferably enlarged as indicated at 21 to constitute an abutment against which the coupling 18 for the plunger rod may strike. The coupling 18

and rod guide 19 therefore constitute abutments which will limit the downward movement of the plunger assembly.

In the manufacture of pumps the length of the plunger rod 17 selected for any pump assembly is such that the collar 18 will engage the rod guide 19 before the lower end of the pump plunger can possibly strike any of the parts of the barrel and then when the pump is located in the well ready for pumping operations the stroke of the sucker rods is preferably arranged such that the limit of the downward stroke of the sucker rods will be such that the coupling 18 will be brought closely to but not into engagement with the rod guide 19.

By constructing the rod guide 19 as an elongated nipple threaded through substantially its entire length and forming the rod guide as a part separate from the cap 9, it will be apparent that in assembling the pump structure at the factory any minor variations in the assembled lengths of the plunger and barrel assemblies may be compensated for by screwing the rod guide nipple 19 downwardly or upwardly relative to the cap 9 until abutment between the coupling 18 and the rod guide 19 will occur when the lower end of the plunger and the lower end of the barrel are in proper spaced relation. When such adjustment has been made, a lock nut 22 threaded upon the rod guide 19 may be tightened to hold the rod guide in its adjusted position relative to the cap 9. Such adjustment, though preferably made in the factory, may also be made in the field if it is found that there is any danger of the pump and plunger assemblies striking each other.

Moreover, by constructing the rod guide nipple 19 of considerable length, rather wide limits of variation may be provided, permitting the use of the same stock parts of cap, jacket, anchor lock or other assemblies desired to be put together to comprise a pump barrel, and any suitable assembly of plunger body, working valve and cap may be assembled to work in such barrel. Plunger rods may be provided in stock varying in length in increments determined by the limits of adjustment of the rod guide 19. For example, if the rod guide is provided with a limit of adjustment up and down relative to the cap 9, of three inches, then a series of plunger rods may be maintained in stock varying in lengths by increments of three inches. Employing this construction permits the ready assembly from stock parts of different characters of pumps without necessitating the careful and accurate machining of the plunger rods to a particular length adapting them to a particular pump assembly.

Any minor variations in the lengths of the several pump parts may be compensated for by a simple adjustment of the rod guide relative to the barrel assembly and the plunger is permitted to approach so closely to the end of the barrel as to assure maximum efficiency of operation of the pump while insuring that the rod abutment 18 will engage the guide abutment 21 before the lower end of the plunger can strike the lower end of the barrel.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of construction shown or described herein, except as defined in the appended claims.

I claim:

1. In a pump assembly, a barrel, a plunger reciprocable in said barrel, a plunger rod extend-

ing into said barrel and connected to said plunger, an abutment on said plunger rod, a guide having an abutment thereon engageable with the plunger rod abutment, and means mounting
 5 said rod guide on said barrel for adjustment longitudinally of said barrel to adjustably limit the movement of said plunger in said barrel.

2. In a pump assembly, a barrel, a plunger reciprocable in said barrel, a plunger rod extending
 10 ing into said barrel and connected to said plunger, an abutment on said plunger rod, a guide surrounding said rod and having an abutment thereon engageable with the plunger rod abutment, and means mounting said rod guide on said barrel
 15 for adjustment longitudinally of said barrel to adjustably limit the movement of the said plunger in said barrel.

3. In a pump assembly, a barrel having a cap at one end thereof, a plunger reciprocable in
 20 said barrel, a plunger rod extending through said cap and connected to said plunger, an abutment on said rod, a rod guide having an abutment thereon engageable with the rod abutment, said guide comprising a nipple surrounding
 25 ing said rod and threaded into said cap to dispose said rod abutment in adjustably spaced relation to said cap to thereby adjustably limit the extent of movement of said plunger in said barrel.

30 4. In a pump assembly, a barrel having a cap at the upper end thereof, a plunger reciprocable in said barrel, a plunger rod extending through said cap and connected to said plunger, an abutment on said rod, a rod guide comprising an
 35 elongated nipple surrounding said rod and having an abutment formed upon one end thereof disposed toward said rod abutment for engage-

ment therewith, said nipple having threads extending along a major portion of its length, a threaded bore in said cap adapted to threadedly receive said nipple whereby threading of said nipple into and out of said bore adjustably dis-
 5 poses said rod guide abutment relative to said barrel to adjustably limit the extent of movement of said plunger in said barrel.

5. In a pump assembly, a barrel having a cap at the upper end thereof, a plunger reciprocable
 10 in said barrel, a plunger rod extending through said cap and connected to said plunger, an abutment on said rod, a rod guide comprising an elongated nipple surrounding said rod and having an abutment formed upon one end there-
 15 of disposed toward said rod abutment for engagement therewith, said nipple having threads extending along the major portion of its length, a threaded bore in said cap adapted to threadedly receive said nipple whereby threading of said
 20 nipple into and out of said bore adjustably disposes said rod guide abutment relative to said barrel to adjustably limit the extent of movement of said plunger in said barrel, and means
 25 for locking said nipple in any adjusted position.

6. In a rod guide assembly for use with pumps having a reciprocating plunger operating in a
 barrel, a cap to be connected to the barrel of the pump and having a threaded plunger rod opening therein, a rod guide nipple having a thread
 30 extending along the major portion of its length receivable in said cap opening for adjustment longitudinally of said cap to dispose the end of said rod guide nipple in adjustable predetermined
 35 spaced relation to said cap.

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