

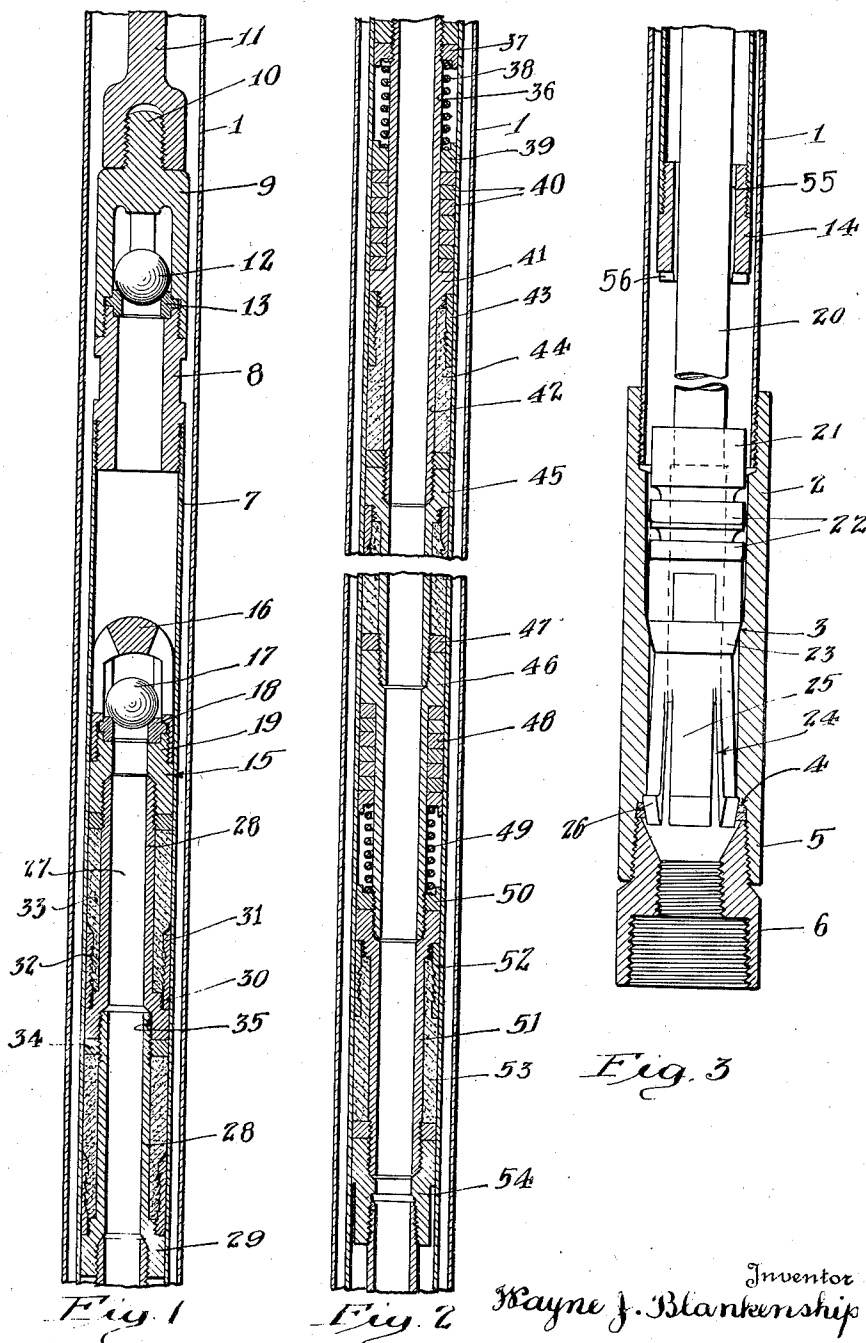
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OIL WELL PUMP

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OIL-WELL PUMP

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This invention relates to a reciprocating type of pump or sucker rod pump which is employed for elevating oil from oil wells.

An object of the present invention is to provide a reciprocating or sucker rod pump with an improved form of packing between the plunger and working barrel of the pump.

Another object of the present invention is to provide a reciprocating or sucker rod pump with a plurality of successive stages of packing between the working barrel and plunger and to further provide a construction in which part of the packing in the series is a hard form while other packing in the series is a soft form, the packings being disposed to operate in an effective manner.

A further object of the present invention is to provide an improved construction of the plunger of the working barrel which will facilitate and render inexpensive the attachment of the various required packings.

Another object of the present invention is to provide a pump construction in which the plunger of the pump is maintained stationary and provided with the improved packing of the present invention while the working barrel is the moving part of the pump whereby the packing of the pump, by being maintained stationary, is subjected to a reduced wear.

Various further objects and advantages of the present invention will be apparent from a description of a preferred form or example of a reciprocating or sucker rod pump embodying the invention. For this purpose there is hereinafter described in considerable detail a form of reciprocating or sucker rod pump of a preferred form.

The description is given with reference to the accompanying drawings in which:

Figure 1 is an elevation mainly in vertical section of the upper portion of the pump;

Figure 2 is an elevation mainly in vertical section of the succeeding lower portion of the pump; and

Figure 3 is an elevation mainly in vertical section of the bottom portion of the pump.

Referring to the drawings,—1 indicates the well tubing or casing which extends from the surface of the ground down below the

pump. At the lower end of the wall casing 1 there is threaded a collar 2, the bore of which collar is indicated as having a tapered section 3 near its center which operates as the seat for packing and below the tapered seat 3 the collar 2 is indicated as provided with an annular shoulder 4. Below the annular shoulder 4 the collar 2 has a threaded socket 5 which is threaded to a coupling 6. In use the coupling 6 may be attached to one or more strings of casing which extend down below the pump and are provided with well screens for separating the fluid to be pumped from sand.

7 indicates the working barrel of the pump which is threaded at its upper end to a coupling 8 which in turn is threaded to a valve cage 9 having a threaded pin 10. The threaded pin 10 serves as a means by which the working barrel 7 may be attached to a string of sucker rods of which 11 indicates the lower end and the working barrel 7 thus reciprocated within the well hole. Within the valve cage 9 there is indicated a ball valve 12 engaging a seat 13 held between the upper end of coupling 8 and valve cage 9. Said ball valve 12 in use operates as the travelling valve of the pump. The lower end of the working barrel 7 is indicated as threaded to a bushing 14 which serves to contact with the plunger of the pump and provides a means by which the plunger of the pump may be withdrawn from the well hole when desired.

The plunger of the pump is generally indicated at 15 and is provided at its upper end with a cage 16 for a ball valve 17. Inasmuch as in the pump of the present invention the plunger 15 is stationary, the ball valve 17 operates as the lower standing valve of the pump. The valve 17 is indicated as resting upon a valve seat 18 held between the valve cage 16 and a coupling 19 threaded to the cage 16. The lower end of the plunger 15 is indicated as in the form of a long tube 20 which is threaded at its lower end to a sleeve 21 which is provided with one or more leather packing cups 22 at its upper end and at its center is provided with a ground seat 23 engaging the tapered seat 3 of the collar 2. Below the packing 23 the sleeve 21

is of spring metal and is slit upwardly in a plurality of places as indicated at 24 to provide spring segments 25 which are normally urged outward under the tension of the spring forming the same and said spring segments 25 are provided at their lower ends with enlargements 26 adapted to fit under the shoulder 4 on the collar 2 and thus lock the plunger 15 to the well tubing 1 so that the plunger 15 in operation will be held in a stationary position. It is understood that in place of the specific means described for the purpose of locking the plunger 15 in place, any other preferred means may be employed.

The body of the plunger 15 is formed so as to provide both an adequate central passage or bore 27 for the fluid being pumped and to provide adequate packing between the plunger 15 and the working barrel 7. For this purpose the coupling 19 is indicated as having a threaded socket threaded to the stem of a nipple 28. The stem of the nipple 28 is indicated as of considerably less external diameter than the internal diameter of the working barrel 7 so that there is provided an annular space between the nipple and working barrel for the reception of packing. The lower end of the nipple 28 is indicated as enlarged at 29 to substantially the size of the inner diameter of the working barrel 7 and said enlargement 28 is reduced as indicated at 30 and threaded to receive a packing retaining sleeve 31. The packing retaining sleeve 31 is indicated as provided with slips, teeth, or other roughenings on its interior as indicated at 32 in order to effectively hold a soft form of packing 33, such as flax or hemp standing in a vertical position, in the packing chamber provided by the nipple. The packing retaining sleeves 31 are considerably shorter than the packing chambers so that the upper portion of the packing is free to engage with the working barrel 7. At 34 there is indicated a lock nut threaded to the nipple 28 for securely locking the nipple 28 to the coupling 19.

The lower end of the nipple 28 is indicated as provided with a threaded socket 35 by which another similar nipple may be attached. The pump of the present invention may have one or any number of nipples similar to the nipple 28 attached in series to provide the desired amount of packing. In the present case there is indicated one other nipple 28 placed in the plunger below the upper nipple 28 and said nipples and their packings are indicated as formed of duplicate construction. Below the second nipple 28 the plunger of the pump is indicated as formed by a nipple 36 which likewise serves as a packing holder. Said nipple 36 at its upper end is threaded to the socket of the second nipple or adapter 28 and held thereto by the lock nut 37. Said lock nut 37 also serves as a seat for a compression spring 38. The compression

spring 38 is indicated in turn as engaging at its lower end a packing follower 39 which compresses a plurality of rings 40 of packing against a shoulder provided by an enlargement 41 of the nipple 36. The rings 40 provide a packing engaging the barrel 7 of the pump which is of harder composition than the packing 33 in the upper packing holding nipples and any desired or preferred form of ring packing may be employed. The lower end of the nipple 36 is of reduced size as indicated at 42 and serves as a holder for further soft form packing. For this purpose enlargement 41 is indicated as threaded to a packing retaining sleeve 43 similar to the retaining sleeves 31 and soft packing 44 is disposed between the nipple at 42 and the working barrel 7. The retaining sleeve for this portion of the soft packing is at the opposite end of the packing so that the packings may be said to be held from opposed directions. The lower end of the nipple 36 is indicated as threaded to a nipple 45 similar to the nipple 28 but faced downwardly and the nipple 45 is indicated as constructed similarly to the nipple 28 so as to hold a further section or step of soft packing. Any number of additional nipples may be joined together in the plunger to provide as much packing between the plunger and working barrel 7 as desired. The lower end of the nipple 45 is indicated as threaded into the upper end of a nipple 46 and held thereto by a lock nut 47. The nipple 46 has its enlarged end at the top and against said end ring packing 48 which is pressed by a spring 49. The ring packing 48 is similar to the packing 40 and of harder composition than the soft packings. The ring packing 48 is also compressed in an opposite direction to the ring packing 40. The lower end of the nipple 46 is threaded to a spring seat 50 which also serves as a lock nut for locking the nipple to the socket of a nipple 51. The nipple 51 is constructed similarly to the nipple 45 and also is provided with a packing retaining sleeve 52 at its upper end which retains soft packing 53 between the nipple and working barrel 7. The lower end of the nipple 51 is threaded to a coupling 54 which has a socket threaded to the tube 20 forming the lower end of the plunger.

In operation the sucker rods 11 are reciprocated and in each upward motion of the sucker rods the working barrel 7 is elevated providing a suction on the standing valve 17 of the plunger 15 to open the valve and thereby admit fluid to the space between said valve and the travelling valve 12. In each downward motion of the sucker rods 11 the fluid thus admitted is compressed until the travelling valve 12 is forced off its seat and said fluid forced out of said valve into the well tubing 1 wherein it is finally forced to the top of the well. The packing of the pump

plunger which engages the working barrel 7 is distributed and formed to best seal the plunger to the working barrel. By forming part of packing of hard packing material and retaining said packing stationary, it is found that the wear on the packing is greatly reduced. It is also found that by opposing different portions of the packings, the wear on the packing is further reduced.

An improved feature of the present invention resides in the construction of the pump plunger of a plurality of nipples which both provide a hollow bore for the plunger and also serve directly as holders and retainers for the necessary packing of the pump. In this way the necessity of attaching a packing holder to the parts forming the plunger bore which is experienced in ordinary plungers is eliminated and the construction made both more economical and more durable.

Preferably the lower end of the bushing 14 is corrugated as indicated at 56 or otherwise shaped so that it is adapted to cut up any settlings which may pack upon the top of the sleeve 21. There is a passage for fluid by the bushing 14 shown at 55 by means of which a circulation of fluid around the bushing may take place during the pumping operation so that any material otherwise tending to settle out of the pumping apparatus may, by such circulation, be held in suspension.

The term "soft packing" as employed herein is intended to differentiate from that form of packing such as made of stiff rubber or leather which is capable of substantially holding its position unaided by a supporting means and, in place, to cover the use of that form of packing which has insufficient rigidity to hold itself in any particular shape in operating conditions.

While the pump herein described is well adapted to carry out the objects of the present invention, it is understood that various changes, modifications and substitutions may be made without departing from the principals of the present invention, and the present invention includes all such modifications, changes and substitutions as come within the scope of the following appended claims.

I claim:

1. A pump plunger comprising a plurality of packing holding nipples which also form the bore of the plunger, packing carried by said nipples, certain of said nipples being opposed to other of the nipples.

2. A pump plunger formed of a plurality of packing holding nipples which also form the bore of the plunger, some of said nipples holding ring packing and spring for compressing said packing and other of said nipples holding a soft pliable packing.

3. In means of the class described, a hollow nipple having a threaded end, an enlargement

for said nipple, a packing retaining sleeve threaded to said enlargement and spaced from the reduced portion of the nipple and of less length than said reduced portion of the nipple, and soft pliable packing around the reduced portion of the nipple and extending up into said packing retaining sleeve, and having a free end.

4. A pump plunger comprising a plurality of nipples threaded together and forming annular packing spaces and further forming the bore of the plunger, certain of said nipples being threaded to packing retaining sleeves, soft pliable packing in the packing spaces of said latter nipples and extending into said packing retaining sleeve, other of said nipples carrying ring packing and spring means for compressing the same.

5. A pump plunger comprising a plurality of nipples threaded together and forming annular packing spaces and further forming the bore of the plunger, certain of said nipples being threaded to packing retaining sleeves, soft pliable packing in the packing spaces of said latter nipples and extending into said packing retaining sleeve, other of said nipples carrying ring packing and spring means for compressing the same, certain of the nipples holding the soft pliable packing having their packing retaining sleeves at their upper end and certain of the nipples holding the soft pliable packing having the packing retaining sleeves at their lower ends.

6. A pump plunger comprising a plurality of nipples threaded together and forming annular packing spaces and further forming the bore of the plunger, certain of said nipples being threaded to packing retaining sleeves, soft pliable packing in the packing spaces of said latter nipples and extending into said packing retaining sleeve, other of said nipples carrying ring packing and spring means for compressing the same, certain of the nipples carrying a spring pressed packing having the springs pressing the packing in the upward direction and certain of the nipples carrying the spring pressed packing having the packing pressed downwardly.

7. A pump plunger comprising a plurality of nipples threaded together and forming annular packing spaces and further forming the bore of the plunger, certain of said nipples being threaded to packing retaining sleeves, soft pliable packing in the packing spaces of said latter nipples and extending into said packing retaining sleeve, other of said nipples carrying ring packing and spring means for compressing the same, certain of the nipples carrying the soft pliable packing having their packing retaining sleeves at their upper end and certain of the same having their packing retaining sleeves at their lower end, certain of the nipples carrying the spring pressed packing having the packing pressed upwardly by the springs and certain of said nipples

having their packing pressed downwardly by the springs.

8. A pump of the class described comprising a stationary plunger, a travelling working barrel, a plunger being formed of a plurality of packing carrying nipples, certain of said nipples having packing retaining sleeves attached thereto and soft pliable packing held between said sleeves and nipples and engaging said working barrel, other of said nipples carrying relatively harder packing, and spring means for compressing said packing.

Signed at Los Angeles, Calif., this 26 day of Sept., 1927.

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