Nov. 15, 1955 R. C. WILLIAMS 2,723,627

OIL WELL PUMP PLUNGER EXTENSION

Filed June 16, 1953

FIG. 1.

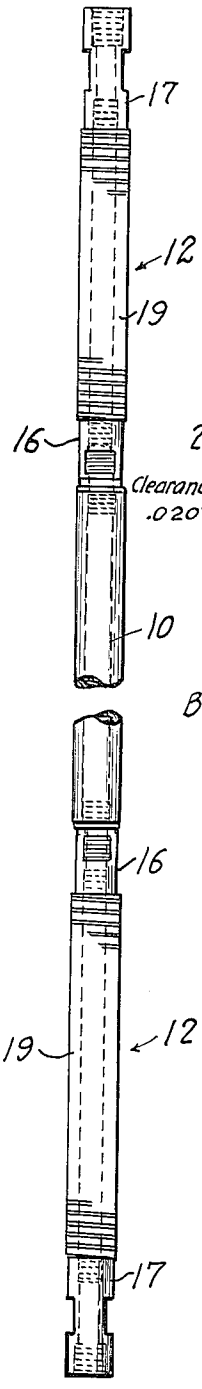


FIG. 3.

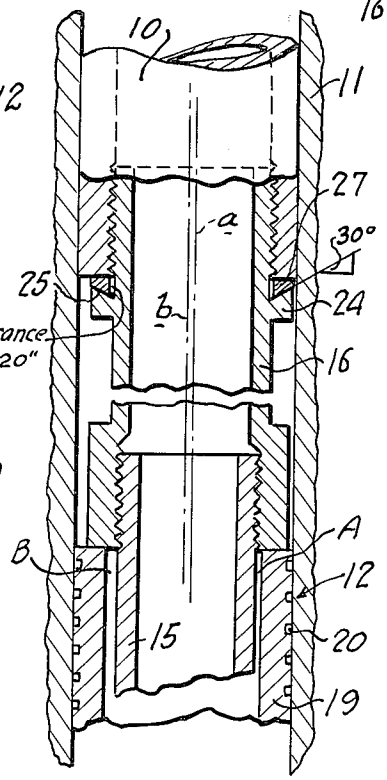
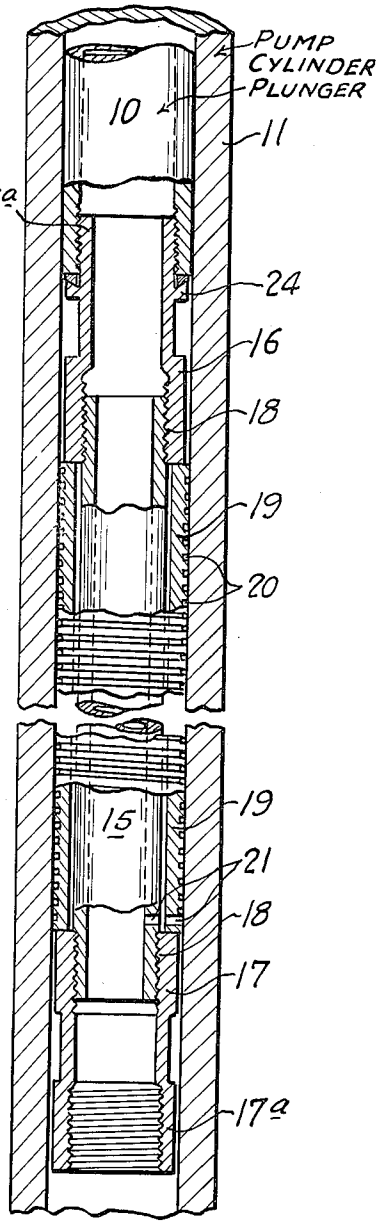


FIG. 2.



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OIL WELL PUMP PLUNGER EXTENSION

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4 Claims. (Cl. 103—220)

This invention relates to oil well pump plungers and particularly to a sand eliminating extension therefor and to means for axially centering the extension on the plunger.

In my previous Patent No. 2,539,000, dated January 23, 1951, I have provided an oil well pump plunger with an integrally connected member at one or both ends having external spiral grooves for catching sand particles contained within the oil being pumped and preventing them from entering between the coacting plunger and casing surfaces, thus materially prolonging the life and usefulness of the pump.

The use of such a sand eliminator in connection with oil well pump plungers has been so satisfactory in practice that a demand has arisen for the provision of a similar device for use in connection with or as an extension for old or separate pump plungers now in use. It has been found, however, that in connecting an extension of this character to either the pin or box end of a pump plunger, the axis of the threads of one may be and frequently are angularly out of axial alignment or offset one with respect to the other, thus causing the axes of the two members when tightened together to be either inclined one to the other or out of line, thereby causing binding of the extension when drawn into the pump cylinder.

An object of the present invention is the provision, in connection with a pump plunger, of an extension therefor having a helically grooved sand directing member that automatically adjusts itself to correct an eccentric, offline or angular condition thereof with respect to the plunger axis and thus permit the extension and plunger to work together in a pump cylinder without objectionable binding.

Another object of the invention is the provision of a connection between the joined threaded ends of a pump plunger and extension therefor, which corrects any tendency of tilting of one member relative to the other due to imperfect threads, and causes the members to be fixed in true axial alignment when tightened together, thereby preventing binding in a pump cylinder when inserted therein. Misalignment can be checked by installing the extension on a pump plunger and then pulling the assembly into a pump cylinder by hand. If the parts are in proper alignment, no noticeable binding should occur.

Other objects and advantages of the invention will be apparent from the following detailed description, and from the accompanying drawings forming one embodiment of the invention, and in which

Fig. 1 is a somewhat diagrammatic side elevation of a pump plunger having my new sand diverting extension at each end;

Fig. 2 is a central vertical sectional view, with parts in full, of an extension connected to a plunger within a pump barrel, and

Fig. 3 is a fragmentary view, exaggerated as to lateral scale, of an extension connected to a plunger having an eccentric thread.

Referring to the drawings, **10** designates a pump plunger operating in a pump barrel or cylinder **11**, and **12** an extension embodying a feature of the invention and having an end in threaded connection with an end of the plunger. In installing an extension on a plunger it is intended to be placed between an end thereof and the traveling check valve customarily disposed at such end. Pump plungers ordinarily have box or pin-receiving sockets at each end with which the threaded pin ends of an associated check valve may engage, therefore one end of an extension **12** constitutes the threaded pin member of a joint while its other end is provided with an internally threaded box member.

An extension **12** comprises, in the present instance, a central fluid passage tube **15**, coupling nipples **16** and **17** threaded on opposite ends of the tube, as shown at **18**, and a sleeve **19** mounted on the tube **15** between the shoulders formed by the box ends of said nipples. The plunger connecting coupling **16** has the outer threaded pin end **16a** for threading into the adjacent plunger end while the coupling **17**, in the present instance, has the outer threaded box end **17a** for receiving the pin end of the customary valve cage, not shown.

Each of the coupling nipples **16** and **17** is of slightly less diameter than the interior of the pump cylinder to provide a clearance of approximately .020 of an inch therebetween, while the sleeve **19** has a sliding fit in the cylinder and has its inside diameter approximately .040 of an inch greater than the outside diameter of the tube **15**. This permits a floating or lateral adjustment of the sleeve on the tube to compensate for any slight offsetting of the tube axis relative to that of the pump plunger to which the tube is fixedly attached by the connecting nipple, as shown in Fig. 3, wherein *a* and *b* are the axial lines, respectively, of the plunger and sleeve. The sleeve is held against axial movements on the tube by the loose fitting of the nipples **16** and **17** against its ends. This misalignment thread compensation is accomplished by automatically using the pump cylinder **11** as an alignment fixture.

The exterior of the floating sleeves **19** is spirally grooved preferably from one end to the other thereof to provide a channel **20** which at the end thereof adjacent to the plunger (particularly with respect to the top extension) has communication with the interior of the tube **15** through one or more registering perforations **21** through the sleeve and tube. This spiral groove serves, as pointed out in my said former patent, to divert from the exterior of the sleeve to the interior of the tube any sand particles which might otherwise pass between the pump plunger and cylinder wall, thus performing an important function in preventing injury to said parts and prolonging their usefulness.

It is preferable in practice to attach a sand diverting extension **12** to each end of a pump plunger, thus preventing sand particles from either working up or down the cylinder wall to the plunger.

Another feature of the invention is the provision of means for correcting an angular misalignment of the axes of the extension **12** and plunger **10** when coupled together, which error is frequently found to be present in coupling an extension to a separate plunger. This misalignment may be due to the threads on the plunger-end socket being cut with its axis out of true parallel relation with that of its member. Any slight misalignment in this respect causes a binding in the cylinder due to the close fitting of the spirally grooved sleeve **19** and the pump plunger **10** therein. To correct this the shoulder **24** on the coupling **16** has its outer face, or that opposed to the attached plunger end, specially formed to permit a slight floating of an adjusting washer. The face may be made spherical, for example, or undercut on aproximately a 30°

angle to a diametric plane, as shown at **25** (Fig. 3). A washer **27** is mounted on the base portion of the threaded stud **16a**, between the inclined shoulder **25** and the adjacent plunger end, and has the shoulder seating face thereof formed on a corresponding angle to that of the shoulder. The base portion of the stud on which the washer is disposed is left free of threads and the washer has a clearance thereon of approximately .020 of an inch, thus permitting a limited transverse movement of the washer thereon with its tapered side resting on the tapered seat **25**.

During a tightening of an extension end against a plunger end, the axis of the latter is held aligned with that of the extension, and if there is any error in the connecting thread of either, tending to cause an angular misalignment of the parts, the washer **27** will shift laterally on the spherically formed or tapered seat **25** sufficient to correct the error. At the same time the washer will fit tightly all around between the opposed surfaces of the joined parts. The customary looseness of the thread fit permits this correcting action. It is thus apparent that a simple, economical and easily applied means is provided for correcting this misalignment and preventing objectionable binding in the pump cylinder.

In practice, the extensions and plunger are preferably installed by loosely attaching an end of each extension to the respective plunger end with the extension parts loosely fitted to permit free lateral adjusting movements of the washers **27** as well as the extension sleeves **19**. The assembly is then placed in a pump cylinder and if the connecting threads of the plunger and either extension have their axes offset or otherwise out-of-true axis alignment, the sleeves **19** will automatically assume an axially aligned position with respect to the plunger so that binding will not occur. The extension parts are then tightened by an inward turning of the outer end nipples, **17** in the present instance, thereof. This may be accomplished by attaching a plug or other turning tool (not shown) to the outer end nipple of the extension first inserted into the cylinder and applying a turning force to the nipple at the outer end of the other extension, which partially projects from the cylinder. All threaded connections of the assembly are such that an opposed turning of said outer nipples will tighten all joints. During this assembling action, the tapered washers **27** also automatically adjust themselves on the tapered seats **25** to compensate for any misalignment of the inner extension couplings, **16** in the present instance, with the plunger ends.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

What I claim is:

1. The combination with a pump plunger for an oil well or the like, of an extension therefor adapted to be threaded to an end of the plunger for operation in a well casing therewith, said extension comprising a center fluid passage tube, end coupling nipples thereon, one of which is adapted to have threaded connection with an end of the plunger, a sleeve surrounding said tube between said nipples in sliding shouldering engagement with the nipples and having an outside diameter corresponding to that of the plunger and an inside diameter greater than the outside diameter of said tube whereby the sleeve may have limited lateral shifting movements on the tube to permit the sleeve to accommodate itself to the axial line of the plunger to prevent binding of the sleeve and plunger in a pump well in which placed.

2. A combination as called for in claim 1, wherein said sleeve is provided on its outer surface with a spiral groove having communication at one end with the interior of said tube, and for receiving and preventing the passage of sand particles to the working surface of the plunger.

3. A combination as called for in claim 2, wherein said groove leads away from the plunger and has communication at its outer end with the interior of said tube.

4. An extension for threading connection with an end of an oil well pump plunger or the like, comprising a lengthwise extending fluid passage tube, a coupling nipple on each end of the tube forming an inwardly facing shoulder therearound, a sleeve surrounding said tube for limited transverse floating movements thereon with its ends in transverse sliding abutment with said shoulders, said sleeve having an outside diameter corresponding to the plunger to which it may be attached and an inside diameter greater than the tube diameter and having a spiral groove in its outer circumferential surface for directing entrapped sand particles toward one end thereof.

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