May 18, 1937. J. D. NIXON ET AL 2,080,736

PACKER FOR WELLS

Filed Sept. 17, 1934 2 Sheets-Sheet 1

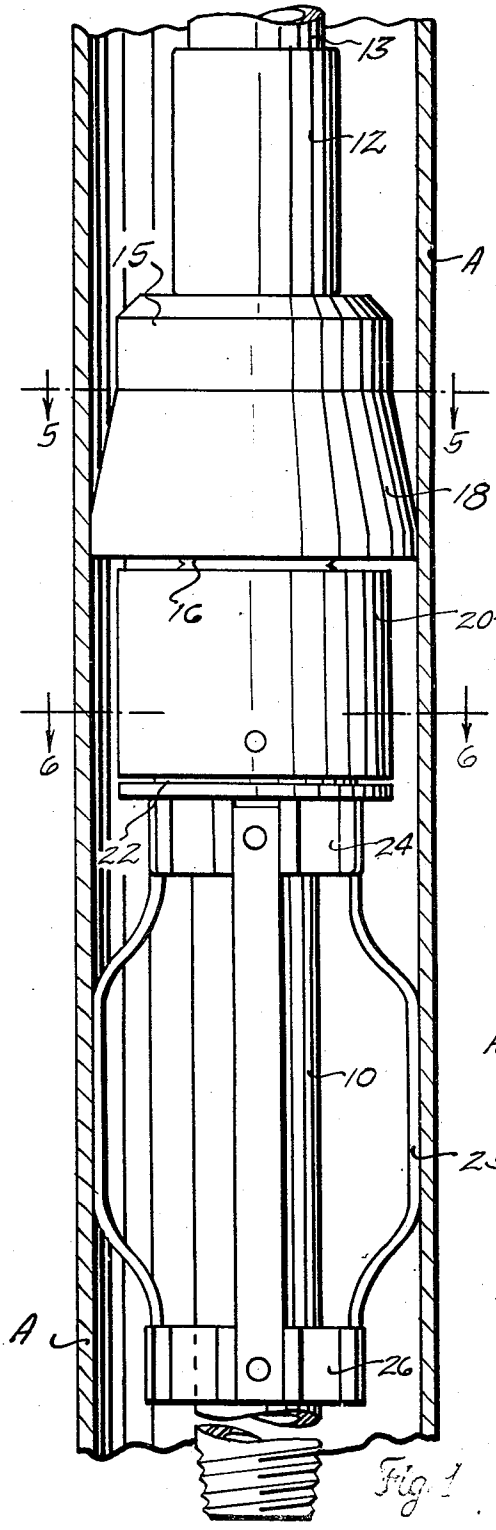


Fig. 1

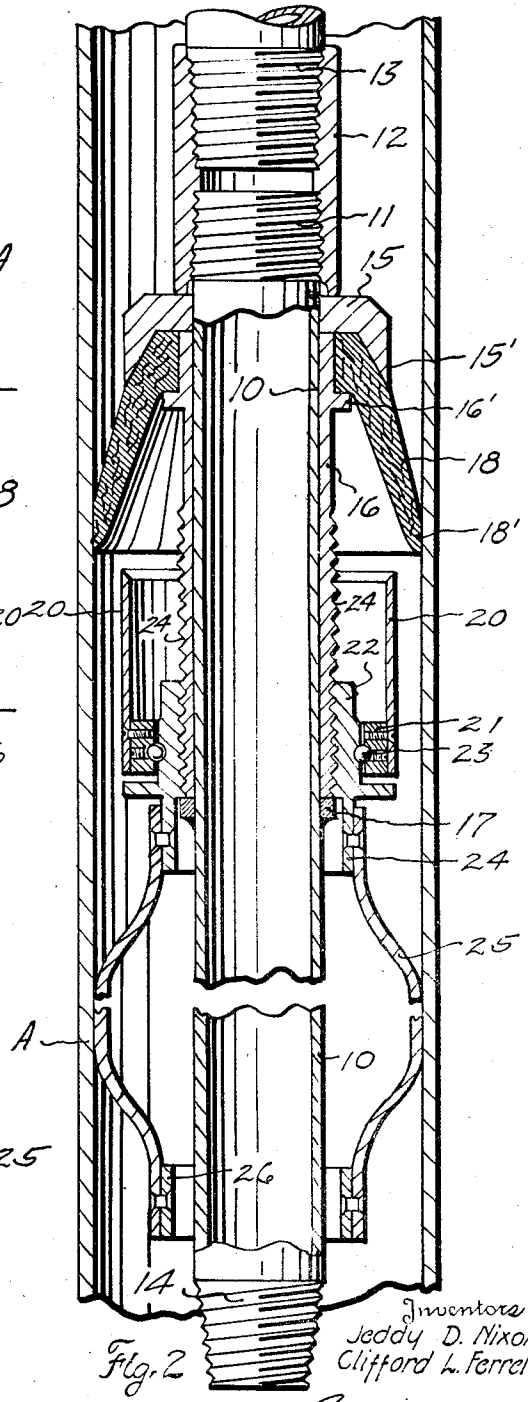


Fig. 2

Inventors
Jeddy D. Nixon
Clifford L. Ferrell

By

Attorney

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PACKER FOR WELLS

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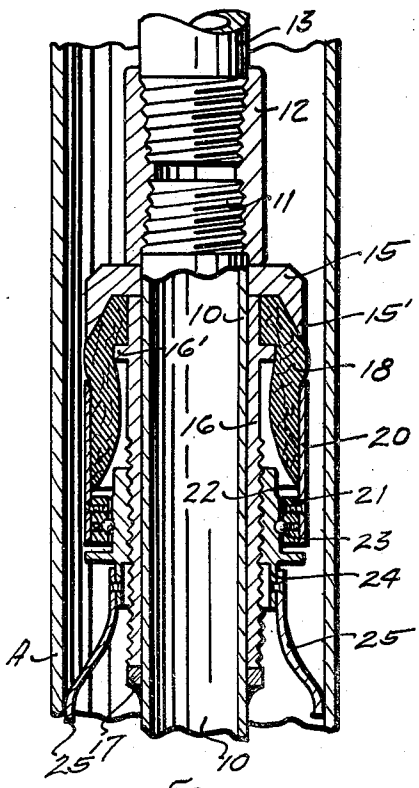


Fig. 3

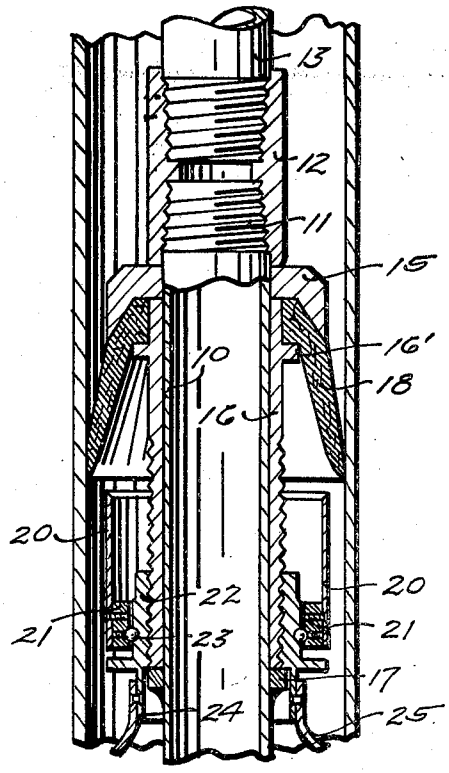


Fig. 4

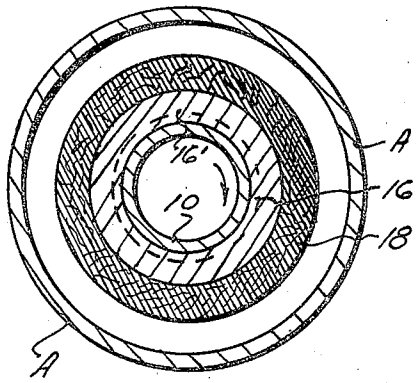


Fig. 5

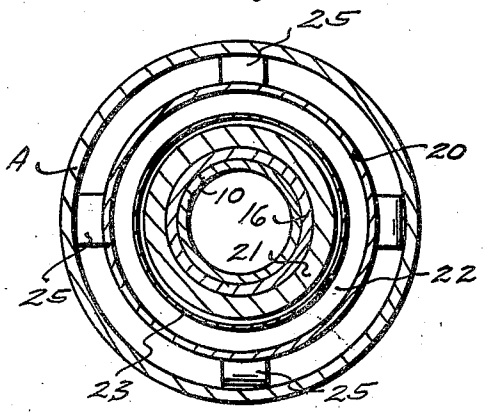


Fig. 6

Inventors
Jeddy D. Nixon,
Clifford L. Ferrell

By Jack Stanley

Attorney

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UNITED STATES PATENT OFFICE

2,080,736

PACKER FOR WELLS

Jeddy D. Nixon and Clifford L. Ferrell, Houston, Tex., assignors, by mesne assignments, of fifty per cent to said Nixon and fifty per cent to Wilson Supply Company

Application September 17, 1934, Serial No. 744,383

5 Claims. (Cl. 166—10)

This invention relates to new and useful improvements in packers for wells.

One object of the invention is to provide an improved packer which is particularly adapted for use in packing off the tubing inside a well casing.

An important object of the invention is to provide an improved packer which is arranged so that the packing member is protected against injury during the lowering operation into the casing and which may readily be set therein.

Another object of the invention is to provide an improved packer for a well including a packing member which is so constructed that when the packer is set within a casing, said member prevents upward flow of fluid through said casing but permits the downward flow of fluid therein; this construction permitting the use of gas or air forced downwardly from the upper end of the well casing to start the well flowing at any time after the packer is set. It also permits washing out the well at any desired time.

A further object of the invention is to provide an improved packer for a well casing which is so constructed that its packing is confined within a housing whereby said member is protected during the lowering operation, thereby preventing damage thereto, the packer having means for releasing the member to engage the walls of the casing when it is desired to set the packer within said casing.

Still another object of the invention is to provide an improved packer including a packing member composed of a mixture of flexible oil and gas resisting material, and short lengths of fibrous threads pressed into the flexible material in such a manner as not to break or sever said threads, whereby said threads when exposed to wear, become saturated with liquid and act to swell the body of the member so as to compensate its wear and maintain its working diameter; said material having such qualities as to prevent the member adhering or becoming vulcanized to the wall of the casing whereby easy removal of the packer may be accomplished at any time.

A construction designed to carry out the invention will be hereinafter described, together with the other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is an elevation of a packer constructed in accordance with the invention, set within a well casing which is shown in section,

Figure 2 is a transverse, vertical sectional view of the same,

Figure 3 is a partial reduced, transverse, vertical sectional view, showing the packing member confined during the lowering operation,

Figure 4 is a view similar to Figure 3, showing the packer set with the packing member engaging the well casing wall,

Figure 5 is a horizontal, cross-sectional view, taken on the line 5—5 of Figure 1, and

Figure 6 is a horizontal, cross-sectional view, taken on the line 6—6 of Figure 1.

In the drawings the numeral 10 designates a tubular mandrel which forms the main supporting body of the packer. The upper end of the mandrel is threaded at 11 and is connected by a coupling collar 12 to the tubing 13. The lower end of the mandrel is threaded at 14 so that it may be connected to the tubing in a similar way (not shown). It is obvious that the mandrel may be readily connected in the tubing string which is lowered within the well casing A.

Abutting the lower end of the collar 12 and surrounding the upper end of the mandrel, an inverted thimble 15 is provided. This thimble has a marginal annular flange 15' depending therefrom and is clamped in position between the lower end of said collar 12 and the upper end of a sleeve 16 which surrounds the upper portion of the mandrel. The lower end of the sleeve is supported on an annular ring 17 which is welded, or otherwise secured, to the mandrel. It is pointed out that the sleeve and thimble are frictionally clamped to the mandrel 10 between the collar 12 and ring 17, whereby rotation of the collar and mandrel will rotate the sleeve and thimble.

The sleeve is provided with an outwardly extending annular flange 16' near its upper end and an annular flexible packing cup or member 18 is supported on this flange, being confined within the thimble 15, as clearly shown in Figure 2. The flange 15' of the inverted thimble engages the upper end of the cup and said cup is flared outwardly at its lower end, whereby this lower end engages the wall of the casing A when the packer is set. The wall of the body of said cup is tapered toward its lower end so that a reduced lip 18' is provided at the lower end of said cup. This lip engages the wall of said casing when the packer is set, thereby affording an effective seal.

It is obvious that the particular flared structure of the cup will permit fluid from above the cup to force said cup inwardly toward the mandrel 10 and will escape downwardly thereby. However, fluid passing upwardly in the casing will

enter within the cup and force the same outwardly against the casing wall thereby affecting a more perfect seal. This construction permits entering gas or air into the top of the casing and this air or gas will bypass the cup and act to start the well flowing upwardly through the tubing 13. Further, if it is desired to wash out the well at any time after the packer is set this may be done without affecting the seal, which prevents upward passage of fluids in the well casing at all times.

Although the cup may be made of any suitable material, we prefer to construct it by employing a base of synthetic rubber, or other suitable material possessing oil and gas resisting qualities, such as "duprine" compound. Duprine is a trade name for a product sold in the open market and made under Patents 1,950,430 and 1,967,863. "Duprine" compound, being high in oil and gas resisting qualities, is comparatively low in tensile strength. To build up the tensile strength of this compound, the latter is rolled into sheets and these sheets are passed between heavy rollers rotating at the same rate of speed. Short lengths of fibrous thread are scattered over the sheets before they enter between these rollers and these threads are suitably pressed into the compound. This method is described in our co-pending application, Serial No. 734,764, filed July 12, 1934. The threads build up the tensile strength of the compound so that it will not only possess the usual wearing qualities of the usual rubber compound, but in addition will possess high oil and gas resisting properties, as well as the feature of not adhering or vulcanizing to the casing A when left standing therein.

Normally, the cup 18 is flared outwardly, as is shown in Figure 2, with its lip 18' engaging the casing wall. It is obvious that if the cup were in this position during the lowering of the packer into the casing, said cup would be exposed to damage from the many coupling collars in the well casing. This would be especially true where lowering into a deep well. For protecting the cup during this lowering operation, an annular housing or sleeve 20 is provided.

This housing is secured to an annular ring 21 which is rotatably mounted on an internally screw-threaded collar 22. Ball bearings 23 are positioned between the ring and collar to make for easy rotation. The collar surrounds the sleeve 16 and its internal screw threads engage threads 24 on said sleeve. The threads of both the collar and sleeve are rather coarse and are left-handed threads, which is opposite to the standard threads making the other connections in the tubing string. For holding the collar stationary, said collar is provided with a depending annular apron 24. Flat bow springs 25 have their upper ends secured to the apron and their lower ends secured to an annular ring 26 surrounding the mandrel. When the packer is within the casing A, these springs frictionally engage the wall of said casing to hold the collar 22 against rotation.

In using the device, the cup 18 is gathered inwardly and the collar 22 screwed upwardly on the sleeve 16 until the housing 20 surrounds the cup which is confined therein, as is shown in Figure 3. This is done manually before the packer and tubing string are lowered into the well casing A. The tubing and packer are then lowered in the well in the usual way and it is obvious that the housing 20 completely encircles the cup and prevents its engagement with the wall of the casing, thereby eliminating the danger of said cup being damaged or injured during the lowering operation.

When the point where the packer is to be set is reached, the lowering is stopped and the tubing 13 and mandrel 10 are turned to the right (direction of arrow, Figure 5). This causes rotation of the sleeve 16 and thimble 15 clamped on the mandrel, and also rotation of the cup 18 secured to the thimble. Since the housing 20 is holding the cup inwardly, the frictional engagement of the cup will rotate the housing around the collar 22 on the bearings 23. During this time said collar 22 is held against rotation by the engagement of the friction springs 25 with the casing A.

Since the sleeve 16 is rotated with the mandrel and the collar 22 held against rotation, it is obvious that the threads, being left-handed, will cause the collar 22 to travel downwardly on the sleeve, the springs sliding down the casing. These threads are coarse, whereby the travel of the collar will be rapid. As said collar moves downwardly, the housing 20 will disengage from the cup 18, permitting said cup to expand to its normal position with the lip 18' engaging the wall of the casing A. As the cup wears, the thread pressed therein will become saturated with the liquid within the casing and will swell the body of the cup, thereby maintaining its working diameter.

The advantages of the packer are obvious. The use of the "duprine" compound having short lengths of thread therein, produces a long-wearing oil and gas resisting material which is incapable of becoming vulcanized to the wall of the casing A, whereby removal of the packer is at all times easily accomplished. The particular flared structure permits passage of the fluid from above the cup but positively prevents upward passage thereby. This allows the well to be washed or "flowing" started at any necessary time. Further, this structure will permit the fluid in the well to automatically lower to a level in the casing equal to the bottom hole pressure of the well, and the greater this bottom hole pressure is the tighter the seal of the cup against the casing wall becomes. The left-handed thread and the traveling collar 22 and housing 20 provide for a positive protection of the cup during the lowering operation. The entire packer is simple and cheap in construction, and the packing cup 18 may readily be removed for replacement from the thimble and sleeve by merely unscrewing the collar 12 from the mandrel and dissembling the parts.

What we claim and desire to secure by Letters Patent, is:

1. A packer for a well comprising, a support, a flexible packing cup mounted on said support and arranged to engage the wall of a well casing, a collar threaded on said support, a housing rotatable on said collar for confining the flexible member therein to prevent its contact with a casing wall during the lowering operation, and means for holding the collar against rotation when the support and housing are rotated so as to cause the collar and housing to travel downwardly on the support to release the cup and permit it to engage a casing wall when it is desired to set the packer.

2. A packer for a well comprising, a mandrel arranged to be connected in a tubing string, a threaded sleeve on the mandrel, an annular flexible packing member mounted on said sleeve arranged to engage the wall of a well casing, a collar threaded on the sleeve, an annular housing

rotatably mounted on the collar and extending upwardly therefrom for surrounding the packing member when the collar is screwed upwardly on the sleeve, whereby said member is prevented from contacting a casing wall during the lowering of the device into the well, and means for holding the collar against rotation when the mandrel and housing and sleeve are rotated, whereby the collar and housing travel downwardly on the sleeve to release the member and permit it to engage a casing wall.

3. A well packer including, a support, a flexible packing cup secured on said support, a housing rotatably mounted on said support and having one end open to receive the open end of the cup for confining the latter therein, means on the support for moving the housing longitudinally thereof to confine and release said cup without rotating said housing, and means adapted to frictionally engage a well wall and connected to said moving means for holding said moving means stationary when the support is rotated.

4. A well packer including, a support, a sleeve surrounding the support and fastened thereto, a flexible packing cup mounted at the upper end of the sleeve, a collar threaded on the lower portion of the sleeve, an elongated housing rotatably mounted on the collar and having one end open to receive the open end of the cup for confining the latter therein, screwing of the collar vertically on the sleeve serving to move the housing longitudinally of the support to confine and release the cup without rotating said housing around said cup, and means adapted to frictionally engage a well wall and connected to the collar for holding the collar stationary when the support and sleeve are rotated.

5. A well packer including, a support, a sleeve surrounding the support and fastened thereto, a flexible packing cup mounted at the upper end of the sleeve, a collar threaded on the lower portion of the sleeve, resilient means adapted to frictionally engage a well wall and connected with the collar for holding the same stationary when the support and sleeve are rotated whereby a positive longitudinal movement of said collar with relation to said sleeve and support is had, and a housing rotatably mounted on the collar and having one end open to receive the open end of the cup for confining the latter therein, longitudinal movement of the collar on the sleeve serving to move the housing longitudinally of the support to confine and release the cup without rotating the housing around said cup.

JEDDY D. NIXON.
CLIFFORD L. FERRELL.