Aug. 29, 1933. W. T. WELLS 1,925,016

PACKER FOR OIL WELLS

Filed June 1, 1932

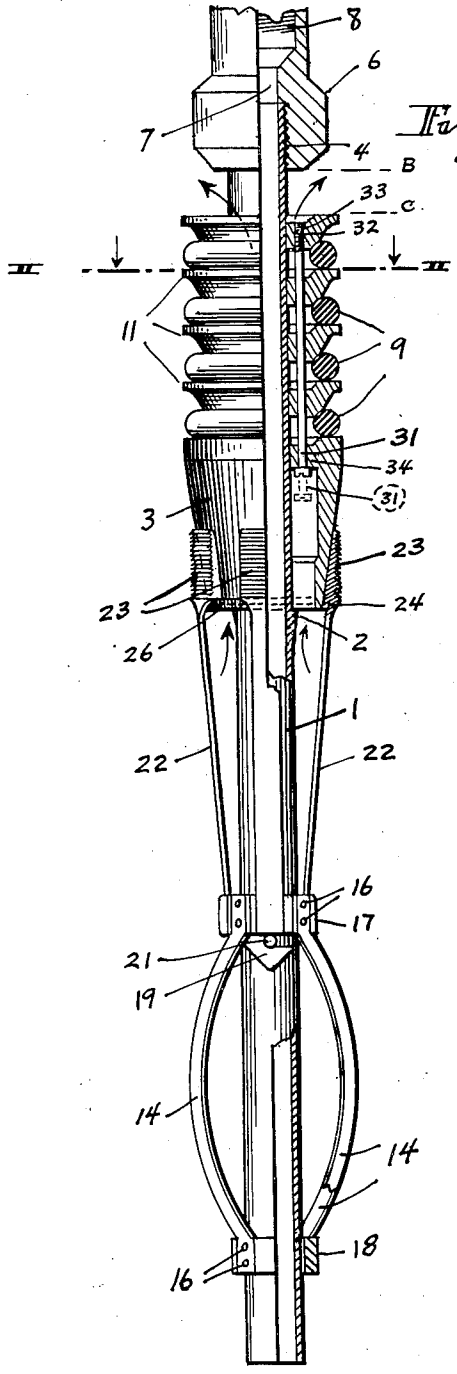


Fig. 1.

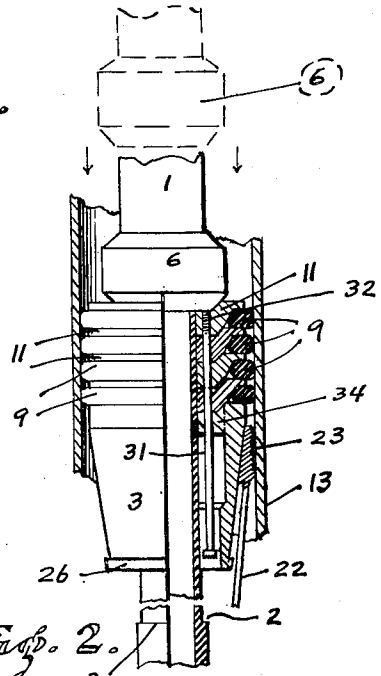


Fig. 2.

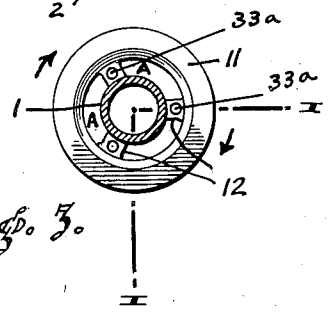


Fig. 3.

INVENTOR.

Walter T. Wells

Patented Aug. 29, 1933 1,925,016

UNITED STATES PATENT OFFICE

1,925,016

PACKER FOR OIL WELLS

Walter T. Wells, Glendale, Calif.

Application June 1, 1932. Serial No. 614,731

11 Claims. (Cl. 166—12)

The present invention is an improvement in packers and relates to that class of multiple-ring packing devices disclosed in United States patent, Number 1,859,744, issued to Gerhard Meyer, bearing date of May 24, 1932.

The object of the present invention is to remedy certain defects in the Meyer structure which become apparent only under working conditions, said defects, in some instances, rendering the device inoperative, in other instances and under certain circumstances, rendering it prematurely operative.

In the structure hereinafter described means are provided which restrain the packing elements and maintain a uniform alinement thereof, before, during, and after their deformation without in any way impeding the proper performance of any packer member when the packer is set.

In the accompanying drawing Figure 1 is a side view of my device, partly in section, said section being made as indicated by the dotted line I—I of Figure 3,

Figure 2 is a fragmentary view, partly in section, illustrating the relative positions of the packing members and associated parts as they would appear when the packer is set, and,

Figure 3 is a section of Figure 1 taken on the line II—II of said figure.

Referring to the drawing the numeral 1 indicates a tubular member which is reduced in diameter to form a shoulder 2 which serves as a stop to limit the movement, on said reduced part, of a cone member 3, slidable thereon.

Member 1 is threaded at 4 to engage a head member 6 having a passage 7 therethrough. Said head is also threaded at 8 for engagement with a tube or pipe line from which my device is suspended when lowered into a casing.

A plurality of packing rings 9 surround the tube 1 and are spaced in axial alinement with said tube by alternately disposed spacing rings 11, the lower tapered surfaces of said spacing rings engaging the inner periphery of said packing rings.

The structure of the spacing rings 11 is shown in Figure 3, this being a top view of said ring. Each ring is provided with radially disposed guides 12, integral therewith, which bear slidably against tube 1 as a centering means for said ring. The spaces A between said guides serving as a by-pass for liquid as the tool is run in or out of a casing 13.

At 14, Figure 1, I show quadrilaterally disposed springs 14, secured at their ends, by screws 16, to collars 17 and 18. When so attached the parts form a cage structure slidable on tube 1 and normally held from sliding thereon by hooks 19 integrally formed with collar 17. Each hook engages a stud 21 extending outwardly from tube 1.

To collar 17 are secured ends of slip members 22 each provided with serrated portions 23 adapted to bite into the wall of casing 13 when spread by downward movement of cone 3.

Each slip 22 is provided with an arcuate groove 24 which engages and interlocks with an annular flange 26 on cone 3. Said slips are formed of resilient material and normally press inwardly on cone 3, said interlock being an automatic action.

The spring cage frictionally engages the inner wall of casing 13 while the packer is being run in or out. When the device has reached the desired depth, the packer is set as follows:—The tubing string to which the packer is secured is turned in the direction opposite that indicated by arrows in Figure 3. Because of the frictional resistance of springs 14, the cage (collars 17 and 18) do not rotate as readily as the tubing 1, and the hooks 19, integral with said cage collar 17, disengage from studs 21, leaving the tube free to move downwardly with respect to the frictionally retarded spring cage.

The suspended tubing is lowered slightly and as it moves downwardly, the slips 22, secured to the retarded spring cage, frictionally engage cone 3, lifting it up from shoulder 2, and sliding it on tube 1 until the uppermost spacing ring 11 is encountered by the descending head member 6.

During this movement, and coincident therewith, the cone 3 forces the serrated surfaces 23 of the slips 22 into the surrounding wall of casing 13, locking therewith to resist further displacement by downward pressure of the tubing string. When so engaged, further lowering of the tubing string causes tube 1 to slide through the cone 3 and rings supported thereon and said rings are compressed, the packing rings being deformed and expanded against the wall of casing 13, as shown in Fig. 2, and the complementary surfaces of the spacing rings 11 come into contact, forming a supplemental metal-to-metal seal against leakage of fluid therethrough.

The features so far described are shown and claimed in the patent to Meyer, before mentioned, and form no part of my invention, except insofar as they may be patentable in combination with improvements to be later described. In the Meyer structure, the series of packing rings and spacing rings occupy the entire space between the head 6

and the cone 3 when the device is assembled for "run-in" operation.

The reason why the Meyer packer cannot be lowered in dense fluid or, at a rate demanded by drilling practice, is because said packer is provided with a by-pass (within the packing) which is not operative until after compression of the packing elements (which do not return to their initial size or shape). As the tool is run in rapidly fluid pressure accumulates in said passage, exerting expansive force on said packing members, causing them to offer undue resistance to flow around the outer periphery thereof, which, in the Meyer structure, is the only space for displacement. Two other conditions have resulted, also; First, complete sealing, effecting a fluid lock, preventing further insertion of the device and, second, the protuberance of some portion of the device or its packing elements, causing subsequent engagement with casing joints, or the like, causing them to shear off, or to mechanically obstruct the movement of the packer. In my assembly a space is provided between the head 6 and the topmost ring 11, as indicated by the dotted lines B—C in Fig. 1, said space being of sufficient size to more than accommodate the flow through by-pass openings A in the spacing rings 11.

The provision of this space, however, is not enough to accomplish the desired result, as its purpose would be defeated if means were not provided to prevent the ring assembly from rising and seating against head 6 as it is lowered rapidly into dense fluid.

In order to provide a securing means effective to resist separation of the members of the ring assembly, and to resist separation of the assembled group from cone 3, I provide bolts 31. Said bolts are threaded at 32 to engage tapped holes 33 in the uppermost of rings 11. The remainder of said rings are drilled with a larger drill to form holes 33*a*, Figure 3, thus providing clearance therethrough for the bolts 31.

Cone 3 is provided with spacing lugs 34, coinciding vertically with those of the rings 11 and bolts 31 extend vertically therethrough being inserted from within cone 3, said lugs being also drilled for clearance of said bolts.

It results from this structure that, when the device is run into a casing filled with fluid, the ring assembly is held to the cone 3 by bolts 31, and said cone 3 is held against the shoulder 2 by the interlocking of slips 22 with flange 26 on said cone, and the entire assembly is locked to tube 1 by the engagement of studs 21 by hooks 19.

During the descent of the packer in the casing 13, fluid is displaced through and inside the ring assembly, entering through the open end (bottom) of cone 3 and discharging through the space A—B around the head 6.

When the packer is set (by release of studs 21 from hooks 19) the pressure of the descending head 6 compresses the ring assembly, bolts 31 sliding through all except the uppermost of rings 11 and through lugs 34 in cone 3, each assuming the position indicated in Figure 2 by dotted lines.

When the packer is withdrawn, tube 1 is raised, rotated to reengage studs 21, the head 6 is raised, opening space A—B and fluid in the casing is displaced through the packer in the manner heretofore described, but in the opposite direction.

Experience has proven that when the Meyer device is run into a casing filled with dense fluid it presents such resistance to displacement as to make its use too slow and laborious to warrant its use and in some cases it is impossible to use it.

When provided with my improvement, as herein described, it can be run either in or out of such a casing with facility.

It is obvious that the bolts 31 might be slidably engaged by head 6 instead of cone 3, or that the series of spacing rings and packing rings might be held together and slipped on as a unit, and still function as described, the object being to prevent separation of said elements without impeding their operation.

While the invention is here shown in the form considered to be the best, it is not limited to such form, because it can be embodied in other forms, and it is to be understood that, in this specification and in the appended claims, it is desired to cover the invention in whatever form it may be embodied.

I claim:

1. In a packer wherein a plurality of packing elements, provided with a by-pass therethrough, are adapted to be deformed by compression between two members provided with a limited degree of relative movement, restraining means adapted to hold said packing elements together and to one of said movable members in a manner adapted to keep said by-pass open to passage of fluid therethrough when said packing elements are not under compression, said restraining means being yieldable, however, to compressive force applied by said movable members.

2. In a packer wherein two members are provided with a limited degree of relative movement, one of said members supporting a series of packing elements, separated by spacing members, provided with a by-pass through said supporting member and within said packing and spacing members, restraining means adapted to engage said packing and spacing members with said supporting element, in a manner adapted to resist their separation therefrom but to be yieldable to compression between said movable members, and providing an outlet for said by-pass when said elements are not under compression.

3. In a multiple-ring packer wherein a plurality of packing rings and interposed spacing elements are provided with a by-pass therethrough, and in which are members provided with a predetermined degree of relative movement to compress and deform said packing elements, the combination therewith of means for securing said rings and said spacing elements together, as a unit, in a manner adapted to keep said by-pass open at all times except when said packing rings are under compression between said members.

4. In a multiple-ring packer wherein a plurality of packing rings and interposed spacing elements are provided with a by-pass therethrough, and in which are members provided with a predetermined degree of relative movement to compress and deform said packing elements, the combination therewith of means for securing said rings and said spacing elements together, as a unit, in a manner adapted to keep said by-pass open at all times except when said packing rings are under compression between said members, and means rendering said securing means yieldable to compressive force applied to said rings by said relatively movable members.

5. A packer comprising a head member, a tubular member secured thereto, a spreader member movably mounted on said tube and provided with a by-pass therethrough, means for limiting the movement of said spreader with respect to said head, a spring cage slidable on said tubular member, means for releasably engaging said cage

with said tube, slips carried by said cage, complementary means on said slips and said spreader adapted to interlock when said cage is in engagement with said tube, a plurality of packing rings surrounding said tube, spacing rings adapted when compressed to deform said packing rings and thereby effect a seal between said spacing rings and a surrounding surface, said spacing rings provided with a by-pass therethrough, and means, yieldable to compressive force, for restraining said spacing rings and said packing rings from separation.

6. A packer comprising a head member, a tubular member secured thereto, a spreader member movably mounted on said tube and provided with a by-pass therethrough, means for limiting the movement of said spreader with respect to said head, a spring cage slidable on said tubular member, means for releasably engaging said cage with said tube, slips carried by said cage, complementary means on said slips and said spreader adapted to interlock when said cage is in engagement with said tube, a plurality of packing rings surrounding said tube, spacing rings adapted when compressed to deform said packing rings and thereby effect a seal between said spacing rings and a surrounding surface, said spacing rings provided with a by-pass therethrough, and means, yieldable to compressive force, for restraining said spacing rings and said packing rings from separation, securing said spacing rings, said packing rings, and said spreader together, and means rendering said securing means yieldable to compression of said rings between said head and said spreader.

7. In a packer of the class described, the combination of; a tubular support member, a plurality of packing members on said support member, compressing members, one of which is movable with respect to the other and to said support member, adapted to deform said packing members to a sealing position, spacing members positioned between adjacent packing members and forming a passage outside of said tubular support and within said packing members, and means, associated with one of said compressing members, for confining said spacing members and said packing members, in a manner providing an outlet passage communicating with said first named passage.

8. In a packer of the class described, the combination of: a tubular support member, a plurality of packing members on said support member, compressing members, one of which is movable with respect to the other and to said support member, adapted to deform said packing members to a sealing position, spacing members positioned between adjacent packing members and forming a passage around said tubular support and within said packing members, and means, associated with one of said compressing members, for confining said spacing members and said packing members, in a manner providing an outlet passage communicating with said first named passage, and means rendering said confining means yieldable to contraction of said compression means.

9. In a packer of the class described, the combination of: a tubular support member, a plurality of packing members on said support member, compressing members, one of which is movable with respect to the other and to said support member, adapted to deform said packing members to a sealing position, spacing members positioned between adjacent packing members and forming a passage around said tubular support and within said packing members, and means, associated with one of said compressing members, for confining said spacing members and said packing members, in a manner providing an outlet passage communicating with said first named passage, said confining means comprising bolts, slidable in one of said compression members and through all of said spacing members except that one which is remote from said compression member, said bolts provided with means for rigid connection with said remote spacing member.

10. In a packer for sealing the space between a tubular member and a surrounding casing, the combination of: a head member on said tubular member, a tapered member movable on said tubular member relatively to said member, a plurality of packing members compressible between said head and said tapered members, spacing members interposed between adjacent packing members, said spacing members providing a passage outside of said tubular member and within said packing members when said packing members are not compressed by said head member and said tapered member, and means restraining said spacing members and said packing members from movement toward the head member to prevent the closing of the passage by the head during packer lowering operation.

11. In a packer for sealing the space between a tubular member and a surrounding casing, the combination of: a head member on said tubular member, a tapered member movable on said tubular member relatively to said head member, a plurality of flexible packing members, compressible between said head and said tapered member, providing a passage outside of said tubular member and within said packing members when said packing members are not compressed by said head and said tapered member, and means restraining said packing members and said spacing members from movement toward the head member to prevent the closing of the passage by the head member during the packer lowering operation.

WALTER T. WELLS.