Oct. 11, 1932. J. D. NIXON 1,882,230

PACKING ANCHOR

Filed March 21, 1930 2 Sheets-Sheet 1

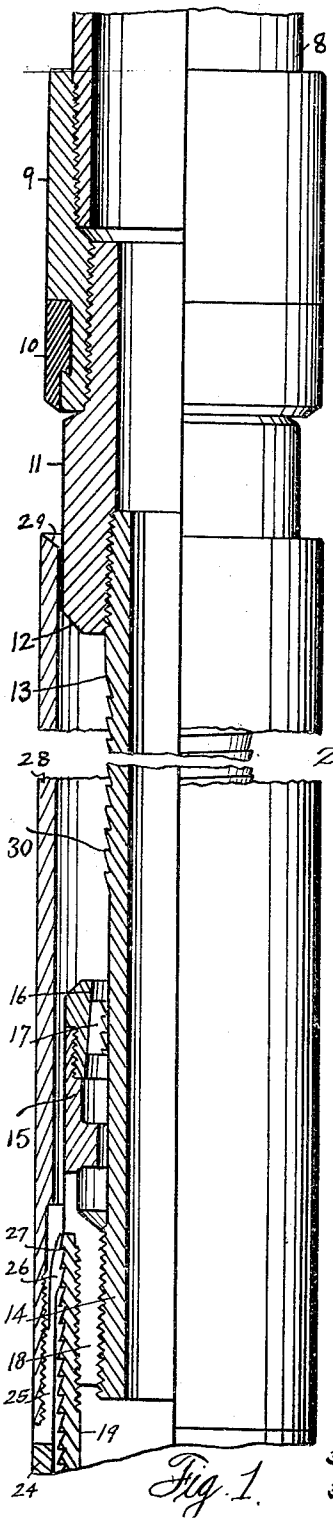


Fig. 1.

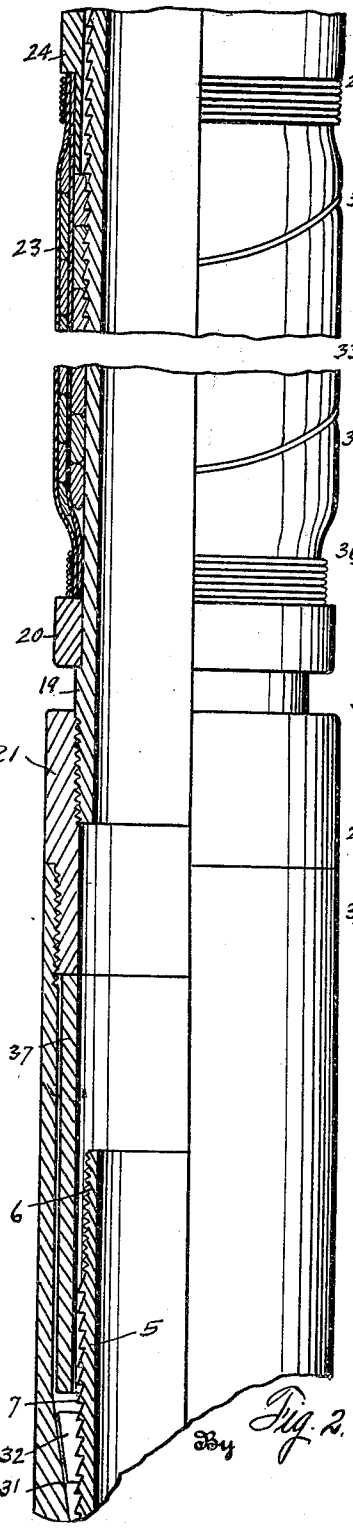


Fig. 2.

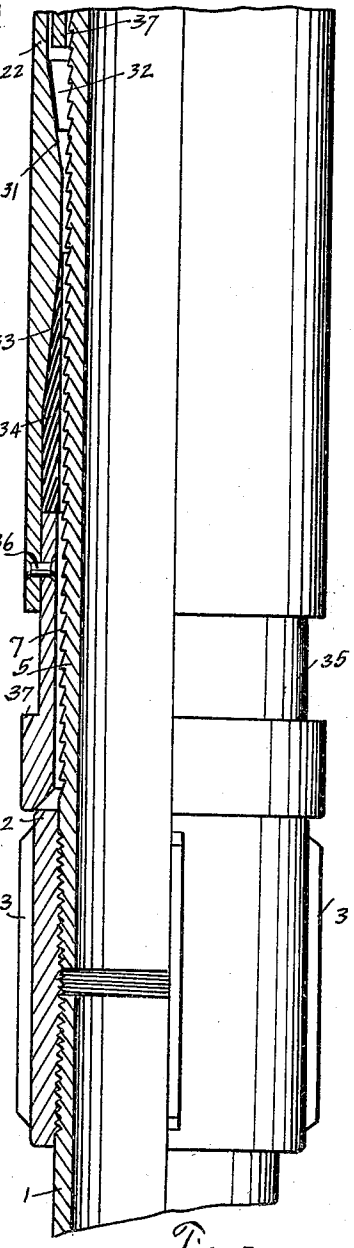


Fig. 3.

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Oct. 11, 1932. J. D. NIXON 1,882,230

PACKING ANCHOR

Filed March 21, 1930 2 Sheets-Sheet 2

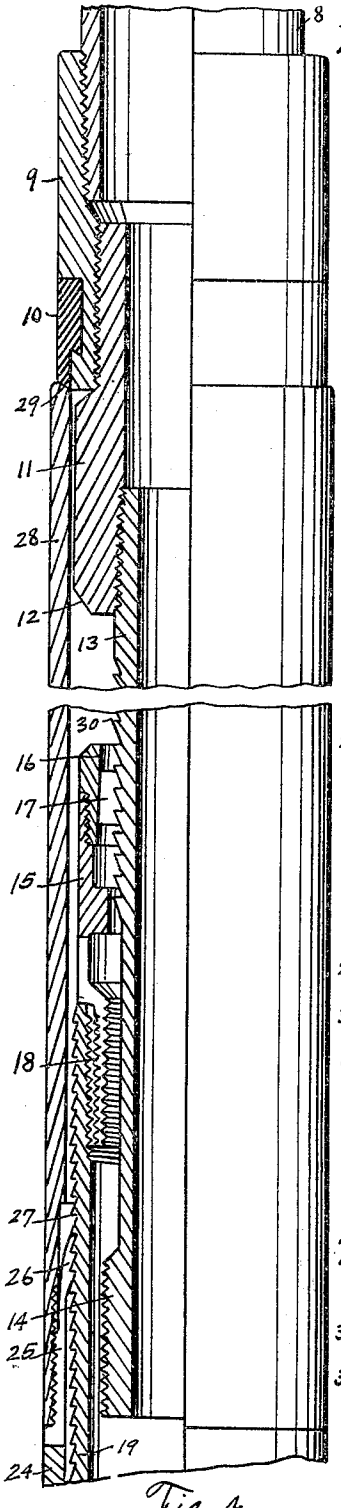


Fig. 4.

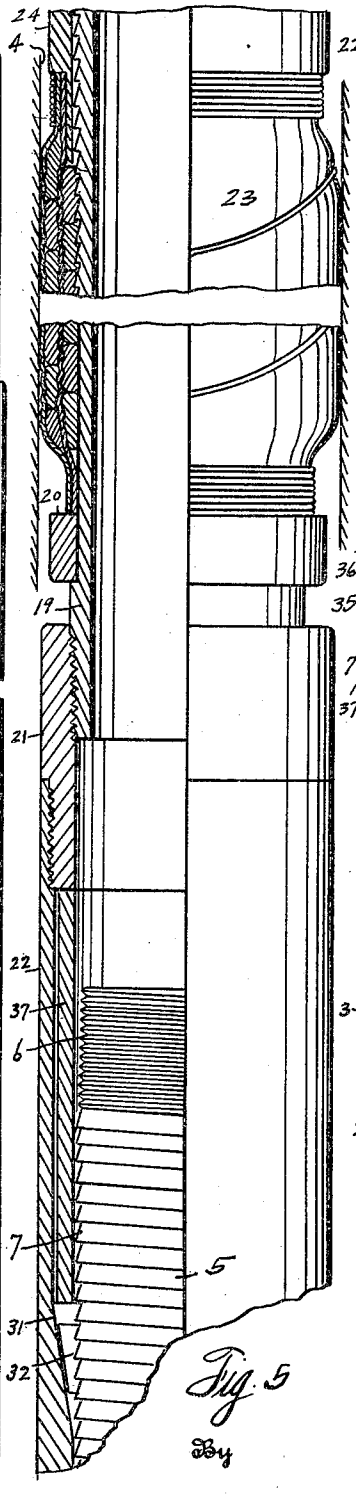


Fig. 5

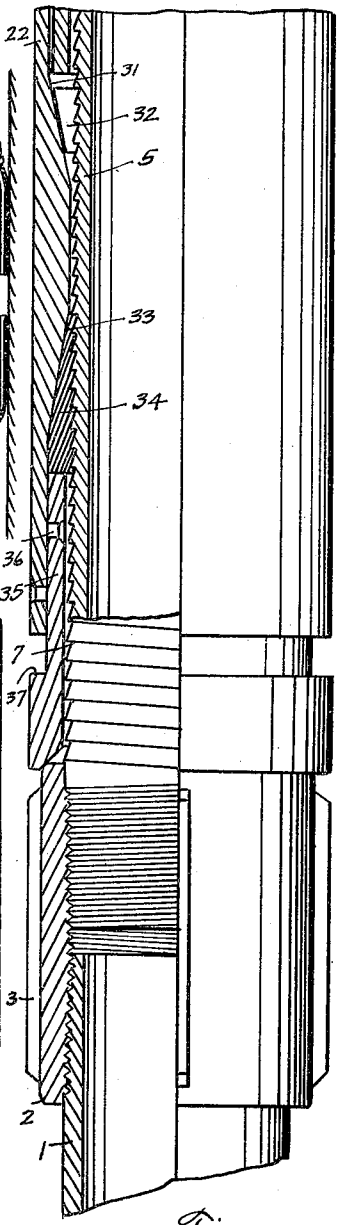


Fig. 6

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UNITED STATES PATENT OFFICE

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PACKING ANCHOR

Application filed March 21, 1930. Serial No. 437,703.

This invention relates to new and useful improvements in a packer anchor.

One object of the invention is to provide novel means whereby a packer may be anchored to the upper end of a pipe or screen, set in a well bore, or to the liner to which said screen is attached, for the purpose of forming a seal, or fluid tight joint, between said screen, or liner, and the casing in the well.

In oil well drilling operations when a producing stratum has been reached it is customary to set a well screen in the well opposite said stratum, either alone or attached to the lower end of the liner and then to set a packer between the upper end of the screen, or liner and the well casing for well known purposes. After the screen is set in the bore but before the packer is set it is usually necessary to wash the well, that is, to force clean water down through the setting string, used to lower the screen, and through said screen and up around the screen to carry out the mud, shale and clogging materials that obstruct the flow of oil into the screen. After the well is washed the packer is then set and the well thus completed. It is customary to attach the packer and packer setting tool to the upper end of the screen, or liner, and lower the same, with the packer collapsed, into the well and then wash the well, as above stated, before expanding, or setting, the packer. When done in this manner, however, the material washed from the well is forced, under strong pressure, up past the packer and in many cases cuts and wears the same away to such an extent that the packer, when set, will not form a tight joint with the casing, and at other times the offending material being washed out will collect underneath and about the packer to such an extent that the packer cannot be effectively set, or expanded, when the well has been washed. It is the prime object of this invention to provide novel means whereby a packer may be anchored to the screen, or liner, after the screen has been set and washed, and then expanded into set, or sealing, position.

The invention however is also capable of use generally for the purpose of connecting pipe or tubing in a well.

With the above and other objects in view this invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:—

Figures 1, 2 and 3 show side views, partly in section, of upper, intermediate and lower sections, respectively, of a packer setting tool, packer and the anchoring nipple as attached to the upper end of a screen, or liner in a well, with the packer collapsed, and

Figures 4, 5 and 6 show views similar to those shown in Figures 1, 2 and 3 but showing the packer expanded.

Referring now more particularly to the drawings, wherein, like numerals of reference designate similar parts in each of the figures the numeral 1 designates a screen, or a liner, to the lower end of which a screen is attached, as set in a well. Attached to the upper end of this screen, or liner, there is an outside collar 2, preferably having external, vertical wings, or ribs 3, to hold it centered in the well casing 4. There is a nipple 5, forming a packer anchor, whose lower end is threaded into said collar 2 and whose upper end has the external, left hand, threads 6. This nipple has the external ratchet teeth 7, preferably spiralled therearound.

A setting string of pipe may be connected to the upper end of said nipple 5 and the screen lowered and set in a completed well and washing water then forced down through the screen and back up around the screen and string to the ground surface and the screen and well thus washed and freed of clogging material that would otherwise interfere with the flow of oil from the oil bearing strata and into said screen. The setting string may be then turned to the right and thus unscrewed from the upper end of the nipple 5 and withdrawn leaving the screen and anchoring nipple in the bore.

The packer and packer setting tool may then be lowered and connected as will be hereinafter explained.

The numeral 8 designates a stem, or string of pipe, through which the packer apparatus is lowered and which extends up to the ground surface. A coupling 9 is screwed onto the lower end of this string and whose lower end carries an external sealing ring 10, preferably of soft metal. Screwed into the lower end of the coupling 9 there is a reducing nipple 11, the lower end of said nipple being beveled off, as at 12.

The numeral 13 designates a tubular mandrel whose upper end is attached to the lower end of the nipple 11 and whose lower end is flared as at 14 and externally threaded. On the mandrel 13 there is a slidable sleeve 15 having the inside downwardly flared seat 16 in which there is located an annular expansible dog 17 which surrounds the mandrel 13. The lower end of the sleeve 15 is reduced forming bushing 18. The inside contour of the bushing 18 is similar to the contour of the flared lower end of the mandrel 13.

A tubular packer support 19 is provided whose upper end is internally threaded to receive bushing 18. The lower end of this packer support 19 has an annular seat 20 thereon and beneath this seat said packer support is threaded into a coupling 21 by means of which the tubular housing 22 beneath is connected to said packer support.

There is a sleeve like packing element 23 around the support 19 and resting on the seat 20. This packing element may be formed of rubber, or of fabric, as burlap or the like, or any other suitable expansible material.

Fitted over the upper end of the packer support 19 and seated on the upper end of the packer 23 there is a collar 24 whose upper end has vertical slots as 25 forming the yieldable dogs 26 integral therewith. The upper end of the packer support has external left hand buttress threads 27 and the dogs 26, are correspondingly internally threaded so as to mesh with said threads 27.

Threaded onto the collar 24 by right hand threads and upstanding therefrom there is an elongated tubular setting nipple 28 whose upper end is outwardly flared forming seat 29 for the purpose to be hereinafter explained.

An intermediate portion of the mandrel 13 is provided with upwardly pitched buttress threads 30 engageable with the dog 17 as hereinafter explained. The housing 22 has an internal upwardly flared seat 31 on which there is mounted an annular expansible dog 32 which surrounds the nipple 5 and which has internal ratchet teeth engageable with the teeth 7 and beneath the seat 31, said housing has an internal downwardly flared seat 33 in which is located an upwardly tapering annular packing sleeve 34 preferably formed of lead or other soft metal.

There is a tubular expander nipple 35 whose upper end is fitted within the lower end of the housing 22 in abutting relation with the packer sleeve 34 and is temporarily secured to said housing by means of a frangible pin as 36.

When the well has been washed as hereinabove explained the packing apparatus is assembled and connected together as shown in Figures 1, 2 and 3 with the bushing 18 screwed into the upper end of the packer support 19 and also threaded onto the flared portion 14 of the mandrel 13 and as thus assembled is let down into the well. The anchoring nipple 5 being held centered in the casing by the wings 3, the assembled packing apparatus as above described will telescope over the upper end of said nipple 5 and the expander nipple 35 will finally land on the upper end of the collar 2. The downward movement of said nipple 35 being now stopped, the weight of the apparatus above will shear the pin 36 and as the housing 22 moves on downward the sealing ring 34 will be expanded into the position shown in Figure 6 and into engagement with teeth 7 thus forming a fluid tight seal. The range of downward movement of the housing 22 will be limited by the external annular shoulder 37 on said expander nipple 35.

There is a blank tubular nipple 37 within the upper end of the housing 22 and interposed between the lower end of the coupling 21 and the annular dog 32 beneath, and as the apparatus moves downwardly as above explained, this nipple 37 will force the dog 32 downwardly and this dog by engaging with the teeth 7 will hold the housing securely in position to maintain a close fit against the sealing ring 34 and will maintain a tight joint therebetween. The stem 8 may now be rotated to the right and the expander 14 thus unscrewed from the bushing 18 and when so unscrewed will pass below said bushing as shown in Figure 4 and said mandrel 13 will move downwardly through the sleeve 15 and through the dogs 17 therein and the annular sealing ring 10 on the coupling 9 will seat, against and form a close fitting joint with the seat 29. The weight now upon the setting nipple 28 will force the collar 24 downwardly and expand the packing element 23 out against the casing 4 or other wall of the bore and form a watertight joint therewith and thereupon the dogs 26 will engage with the teeth 27 to hold the packer expanded.

When the packer is set the string may be pulled upwardly carrying the mandrel 13 with it and as said mandrel moves upwardly the teeth 30 will engage with the dog 17 and carry the sleeve 15 along upwardly with the mandrel. The bushing 18 is slitted, so that it may contract and disengage itself from the threads of the tubular packer support 19 and the setting tool may then be

withdrawn leaving the packer securely held in expanded position by the collar 24 and the dogs 26 thereof.

The invention comprehends not only the apparatus hereinabove described but also the process disclosed.

The drawings and description disclose what is now considered to be a preferred form of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:—

1. The combination with a pipe adapted to be set in a well bore and having a screening surface, of a tubular anchor at the upper end thereof, a packing device including an expansible packer, said anchor and the lower end of said packing device being shaped to be telescoped upon their relative longitudinal movement in the bore, an annular seal between said telescoping parts, abutments confining said seal and effective to expand the same, to form a substantially fluid tight joint between said telescoped parts, when said parts are fully telescoped together.

2. The combination with a pipe adapted to be set in a well bore and having a screening surface, of a tubular anchor at the upper end thereof, a packing device including an expansible packer, said anchor and the lower end of said packing device being shaped to telescope, an annular seal between said telescoping parts, abutments confining said seal and effective to expand the same, to form a substantially fluid tight joint between said telescoped parts, when said parts are fully telescoped together, and means for interlocking said telescoped parts against separation.

3. The combination with a pipe adapted to be set in a well bore and having a screening surface, of a tubular anchor at the upper end thereof, a packing device including an expansible packer, said anchor and the lower end of said packing device being shaped to telescope, an annular seal between said telescoping parts, abutments confining said seal and effective to expand the same, to form a substantially fluid tight joint between said telescoped parts, when said parts are fully telescoped together, means for interlocking said telescoped parts against separation and other means for expanding said expansible packer to form a seal between said pipe and the walls of the well bore.

4. The combination with a pipe adapted to be set in a well bore, of a tubular anchor at the upper end thereof, a packing device including an expansible packer, said anchor and the lower end of said packing device being shaped to telescope, an annular seal between said telescoping parts, abutments confining said seal and effective to expand the same, to form a substantially fluid tight joint between said telescoped parts, when said parts are fully telescoped together, and means for interlocking said telescoped parts against separation.

5. The combination with a pipe adapted to be set in a well bore, of a tubular anchor at the upper end thereof, a packing device including an expansible packer, said anchor and the lower end of said packing device being shaped to telescope, an annular seal between said telescoping parts, abutments confining said seal and effective to expand the same, to form a substantially fluid tight joint between said telescoped parts, when said parts are fully telescoped together, means for interlocking said telescoped parts against separation and other means for expanding said expansible packer to form a seal between said pipe and the walls of the bore.

6. A joint for connecting sections of tubing in a well including tubular parts shaped to be telescoped upon their relative longitudinal movement an annular seal between said telescoping parts, abutments confining said seal and adapted to expand the same to form a substantially fluid tight joint between said telescoped parts upon the relative longitudinal movement of said parts in one direction, said abutments limiting said movement in said direction and means for interlocking said telescoped parts against separation and against relative movement in the other direction and in position to maintain said fluid tight joint.

7. A joint for connecting sections of tubing in a well comprising tubular parts shaped to be telescoped upon their relative longitudinal movement, an annular seal carried by one of said telescoping parts, abutments on said telescoping parts, arranged to confine said seal to form a fluid tight joint between said parts upon the relative longitudinal movement of said parts in one direction, said abutments limiting said movement in said direction and means for interlocking said telescoping parts against separation and in position to maintain said joint fluid tight, said interlocking means preventing relative movement of said telescoping parts in the other direction.

In testimony whereof I have signed my name to this specification.

JEDDY D. NIXON.