Oct. 15, 1935. W. L. CHURCH 2,017,434

PACKER AND SETTING TOOL

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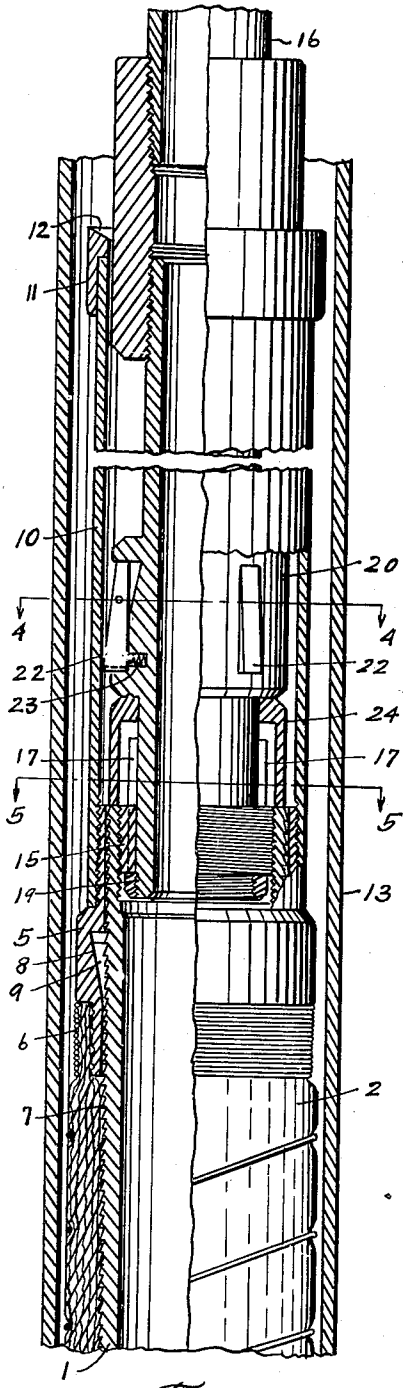


Fig. 1.

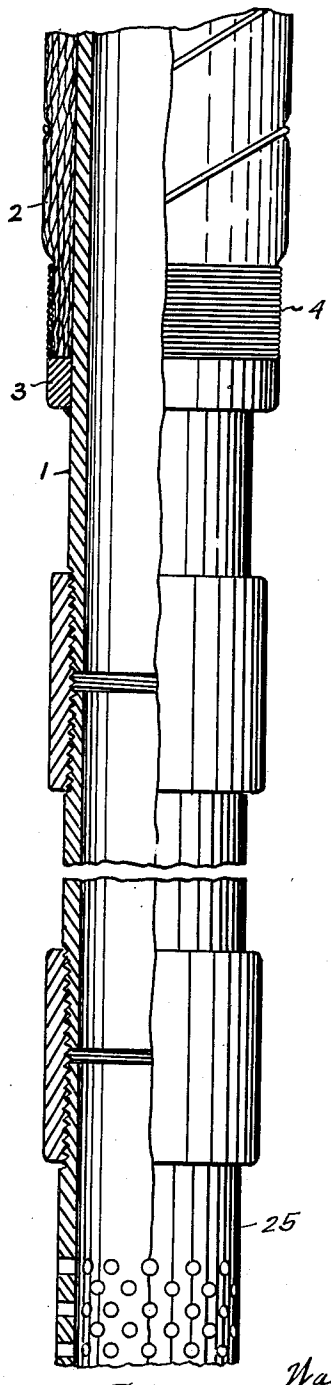


Fig. 2.

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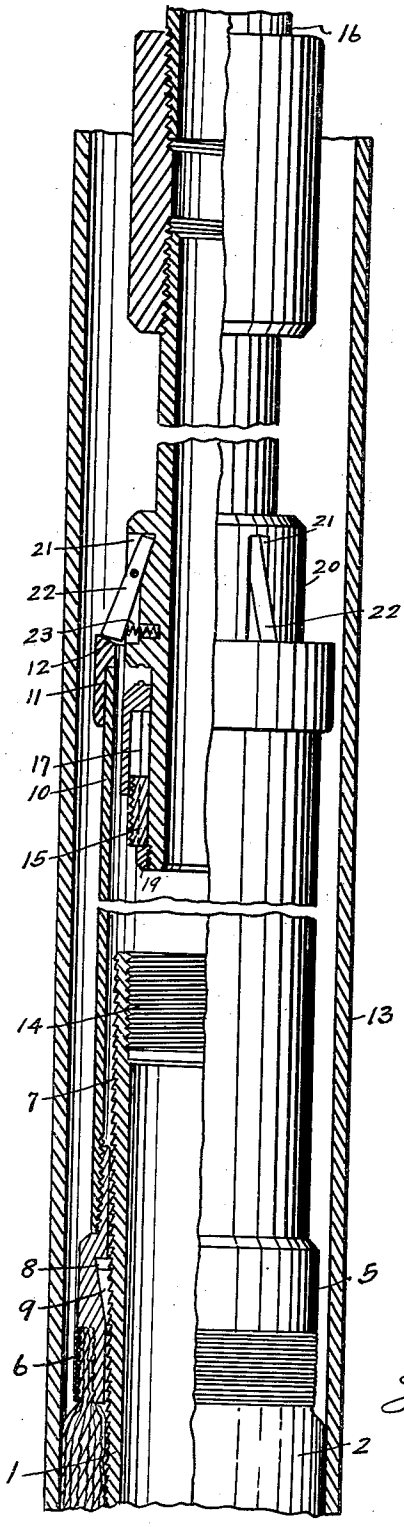


Fig. 3.

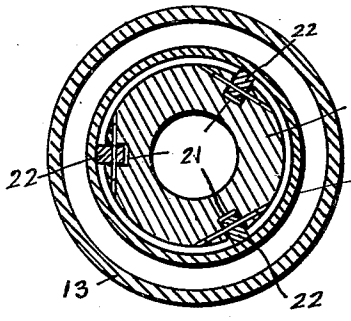


Fig. 4.

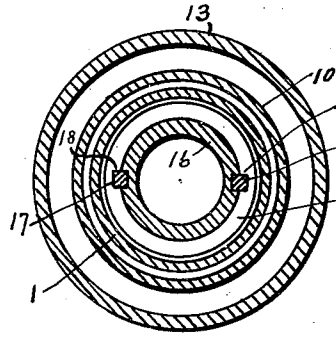


Fig. 5.

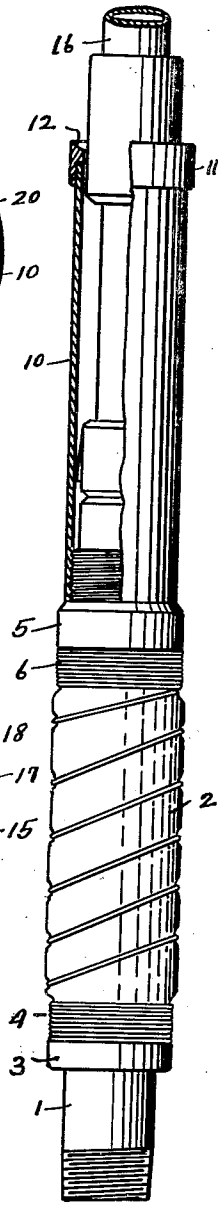


Fig. 6.

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UNITED STATES PATENT OFFICE

2,017,434

PACKER AND SETTING TOOL

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Application January 2, 1934, Serial No. 704,891

11 Claims. (Cl. 166—10)

This invention relates to a packer and setting tool.

An object of the invention is to provide means for setting a liner or screen in a well beneath the well casing, for forming a seal between the upper end of the screen or liner and the surrounding well casing and being of such construction that the string used for performing the setting operation may be readily detached and removed from the well.

Another object of the invention is to provide in a packer and setting tool novel means for connecting the setting string to the packer support whereby said string and support will be rigidly connected together to prevent the premature expansion or setting of the packer while going into the hole, said means being readily releasable from the packer support by rotation of the string whereby the string may be detached from the support and the packer set or expanded and the string withdrawn.

A further object is to provide in a device of this character, means for relieving the threads which connect the setting string to the packer support from the weight of the setting string to the end that said threads will not become stripped.

With the above and other objects in view the 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:

Figure 1 shows a side elevation partly in section of the upper end of the packer showing the setting tool connected thereto..

Figure 2 shows a side view partly in section of the lower end of the packer showing the liner and screen beneath.

Figure 3 shows a side view partly in section of the upper end of the packer showing the setting tool detached and in position to expand the packer.

Figure 4 shows a cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 shows a cross sectional view taken on the line 5—5 of Figure 1, and

Figure 6 shows a side view partly in section of the complete tool.

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 tubular packer support mounted on which there is a surrounding expansible packer 2. The lower end of this packer may be supported by an annular collar 3, which is secured around said support, and may be secured in place by wire wrapping 4. The upper end of the packer is secured to a coupling 5 which is slidable on the packer support. The packer may be secured to said coupling in any preferred manner as by the wire wrapping 6. The packer 2 may be of conventional construction well known to those familiar with this art. The upper end of the packer support has external annular teeth 7 which may be in the form of buttress threads if desired. The coupling 5 has an internal downwardly converging seat 8 on which may be mounted wedge shaped slips 9 whose inner sides are toothed to engage the external teeth 7 to hold the packer expanded. Attached to the upper end of the coupling 5 is an upstanding tubular setting nipple 10 which may have attached to its upper end a collar 11 provided with an outwardly flared seat 12. Upon downward movement of setting nipple 10 the packer 2 will be expanded to form a fluid tight joint with the surrounding casing 13 in the well.

The upper end of the packer support 1 has internal left hand threads 14 provided to receive a ring nut 15 which has corresponding external left hand threads.

There is a tubular setting string 16 which extends to the ground surface and whose lower end is slidably fitted through the ring nut 15 and is secured against turning relative thereto by means of the keys 17, 17. These keys are slidable through the inside keyways 18 in said ring nut. The ring nut is retained against detachment from the lower end of the setting string by means of a retainer ring 19 which is screwed onto the lower end of the setting string beneath the ring nut 15.

Spaced above its lower end the setting string is provided with an enlarged head 20 having side grooves 21 whose upper ends are widened radially. Pivotally mounted in these grooves are the dogs 22 with coil springs 23 seated in suitable sockets in said head and pressing outwardly against the lower ends of said dogs.

There is a hood shaped housing 24 rotatably mounted on the setting string beneath said head and whose lower end is adapted to rest on the upper end of the packer support 1 when the string is connected to the packer support 1.

When it is desired to set a screen or liner in a well and pack the upper end thereof, the packer and setting tool are assembled as shown in Figure 1 with nut 15 screwed into the upper end of the packer support and with housing 24 resting on said packer support and in turn supporting head 20 and the string above. The string

is thus locked against longitudinal movement relative to the packer support by ring 19 on one side and housing 24 on the other. When so assembled dogs 22 will be held retracted by the setting nipple 10 and the assembled apparatus may be lowered with the screen into the well until the screen 25 is set on the bottom of the hole. It is obvious that the threads connecting ring nut 15 to packer support 1 will thus not sustain the weight of the string above but said weight will be sustained by the housing 24.

When it is desired to expand the packer the string 16 will be turned to the right. The head 20 will ride on the upper end of the housing 24 during this turning operation. As setting string 16 is turned ring nut 15 will be unscrewed out of the packer support, moving upwardly into housing 24, and when it is entirely unscrewed the setting string may be elevated until the dogs 22 are above the upper end of the setting nipple as shown in Figure 3 when the lower ends of the dogs 22 will be forced outwardly by the springs 23. The string 16 may then be lowered whereupon the dogs 22 will engage the seat 12 and force the setting nipple 10 downwardly to expand the packer. The slips 9 will engage the packer support 1 and thus hold the packer expanded. The setting string and tool carried by the lower end thereof may then be withdrawn from the well.

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. A packer and setting tool comprising a tubular packer support, an expansible packer thereon, a setting nipple connected to the packer, a ring nut arranged to be threaded to the packer support and to be detached therefrom, a setting string, having a slidable and non-rotatable connection with the ring nut and a housing adapted to be supported on the packer support and to support the string and having a swiveling connection with the string.

2. A packer and setting tool comprising a tubular packer support, an expansible packer thereon, compression means connected to the packer, a setting string, means having a slidable and non-rotatable connection with the string and adapted to be screwed to and unscrewed from the packer support, and means adapted to be supported on the packer support and to support the string thereon said string supporting means having a non-threaded, swiveling connection with the string.

3. In combination a packer support, a setting string, a ring nut on the string and adapted to be threaded to the support and unscrewed therefrom and having a slidable but non-rotatable connection with the string, spaced abutments on the string one of which is engageable with the ring nut, means adapted to rest on the packer support and on which the other abutment is adapted to swivel to sustain the string whereby the string and support may be maintained against relative longitudinal movement when the ring nut is connected to said support.

4. In combination a packer support, a setting string, a ring nut on the string adapted to be screwed to and unscrewed from the support and having a slidable but non-rotatable connection with the string, spaced abutments on the string one of which is engageable with the ring nut, means on the packer support and with which the other abutment has a swivelling, non-threaded connection to support the string whereby the string and support are maintained against relative longitudinal movement when the ring nut is connected to said support, said ring nut being releasable from the support, upon rotation of the string, whereby the string may be detached from the support.

5. In combination a packer support, a setting string, a housing supporting the string and adapted to rest on the support, an annular connecting member shaped to be received by the housing and having a slidable and non-rotatable connection with the string and adapted to be screwed to and unscrewed from the support.

6. In combination a packer support, a setting string, means adapted to support the string and to rest on the support, an annular connecting member having a slidable and non-rotatable connection with the string and adapted to be screwed to and unscrewed from the support, a stop on the string, said stop and string supporting means being arranged to prevent relative longitudinal movement of the string, and packer support when the connecting member is connected to the packer support, said connecting member being releasable from the packer support upon rotation of the string to permit the separation of the string from the packer support said string supporting means being arranged to prevent longitudinal movement of the string relative to the packer support during such rotation of the string.

7. A packer and setting tool comprising a tubular packer support, an expansible packer thereon, a tubular setting nipple above the packer, a setting string releasably connected to the support, nipple engaging means on the string normally maintained retracted by the nipple but expansible upon the detachment and elevation of the string, into position to engage the upper end of the nipple whereby upon subsequent descent of the string the nipple will be moved downwardly and the packer expanded, a ring nut slidable and non-rotatable on the string and adapted to be threaded to the support and forming the means for releasably connecting the string to the support and a pillar adapted to rest on the packer support upon which the string is adapted to swivel.

8. In combination a tubular packer support, a setting string, a housing between the support and string adapted to sustain the weight of the string on the support, means for connecting the string to the support, said connecting means being movable into released position within the housing by the rotation of the string relative to the support, an expansible packer on the support, compression means above the packer, means on the string engageable with the compression means, upon the release and elevation of the string, whereby the compression means may be moved downwardly to expand the packer upon the descent of the string.

9. In a packer and setting tool, a tubular packer support, a setting string, a housing adapted, when in one position, to rest on the support, said string having an enlarged head arranged to seat and swivel on the housing when the housing is supported on the packer support, whereby the string is sustained on and permitted to swivel relative to the packer support, a ring nut adapted to be screwed into and unscrewed from the packer support, said ring nut having a splined connection with the string, and being movable into released

position on the housing upon rotation of the string relative to the packer support, whereby the string may be disconnected from the packer support.

10. In a packer and setting tool, a tubular packer support, a setting string having an enlarged head, a housing arranged, when in one position, to rest on the packer support, and on which the head is adapted to rest to support the setting string, a ring nut having a threaded connection with the packer support, and through which the string extends, an abutment on the string beneath said ring nut, said ring nut having a slidable, but non-rotatable connection, with the setting string, whereby upon rotation of the string, while supported on the housing, the ring nut may be unscrewed from the packer support, and the string thus detached from the packer support.

11. In a packer and setting tool, a tubular packer support, a setting string having an enlarged head, a housing arranged, when in one position, to rest on the packer support, and on which the head is adapted to rest to support the setting string, a ring nut having a threaded connection with the packer support, and through which the string extends, an abutment on the string beneath said ring nut, said ring nut having a slidable, but non-rotatable connection, with the setting string whereby upon rotation of the string, while supported on the housing, the ring nut may be unscrewed from the packer support, and the string thus detached from the packer support, an expansible packer on the support, compression means above the packer, means on the string engageable with the compression means, upon the release and elevation of the string whereby the compression means may be moved downwardly to expand the packer upon the subsequent descent of the string.

WALTER L. CHURCH.