

Aug. 9, 1932.

L. A. LAYNE ET AL

1,870,779

SETTING TOOL

Filed March 2, 1932

3 Sheets-Sheet 1

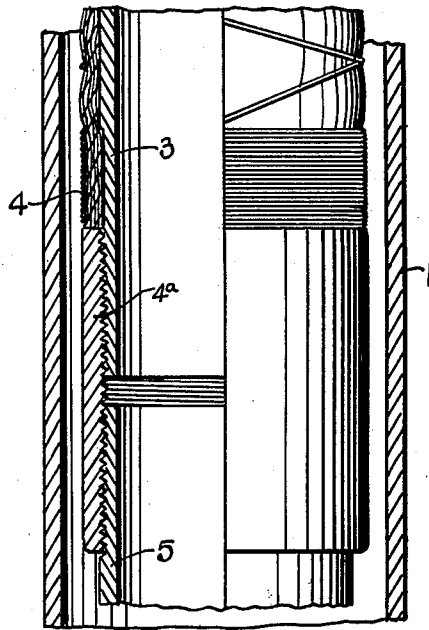
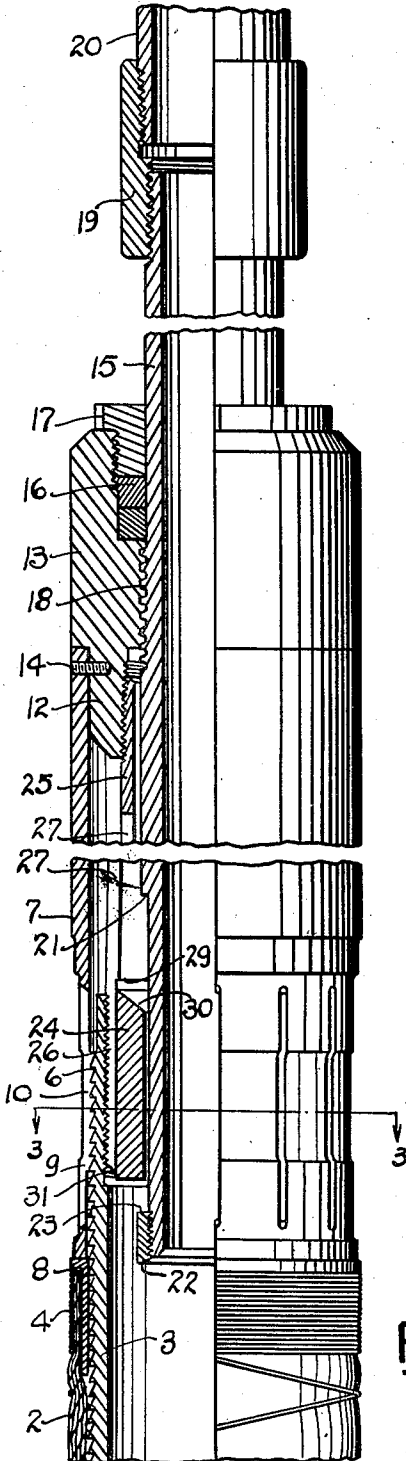


Fig. 2.

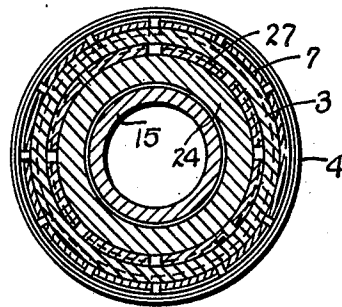


Fig. 3.

Fig. 1.

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3 Sheets-Sheet 2

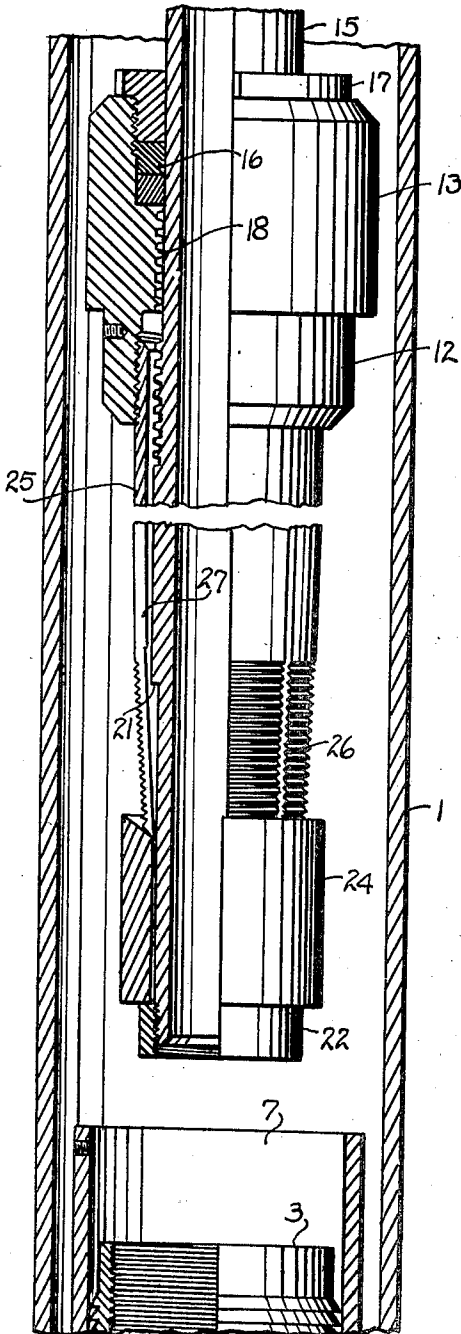


Fig. 4.

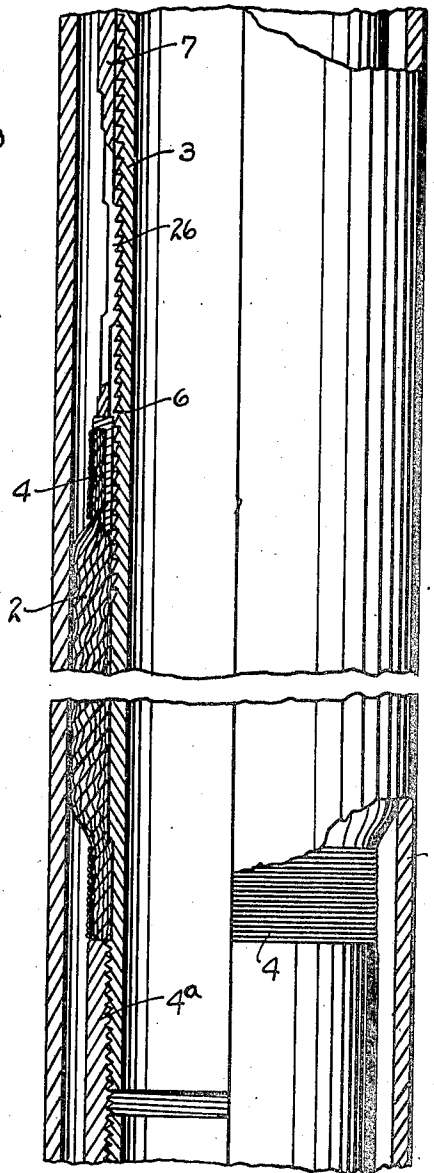


Fig. 5.

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3 Sheets-Sheet 3

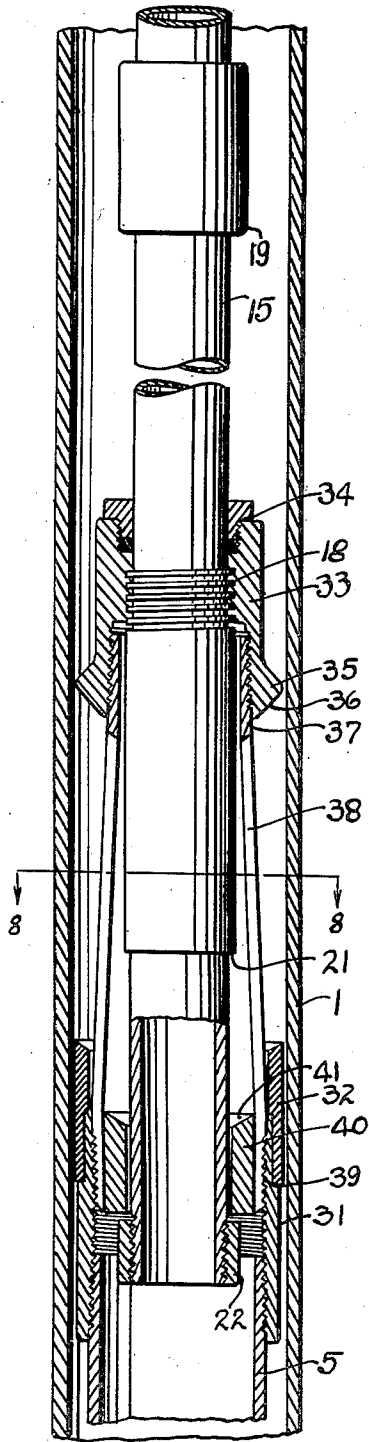


Fig. 6.

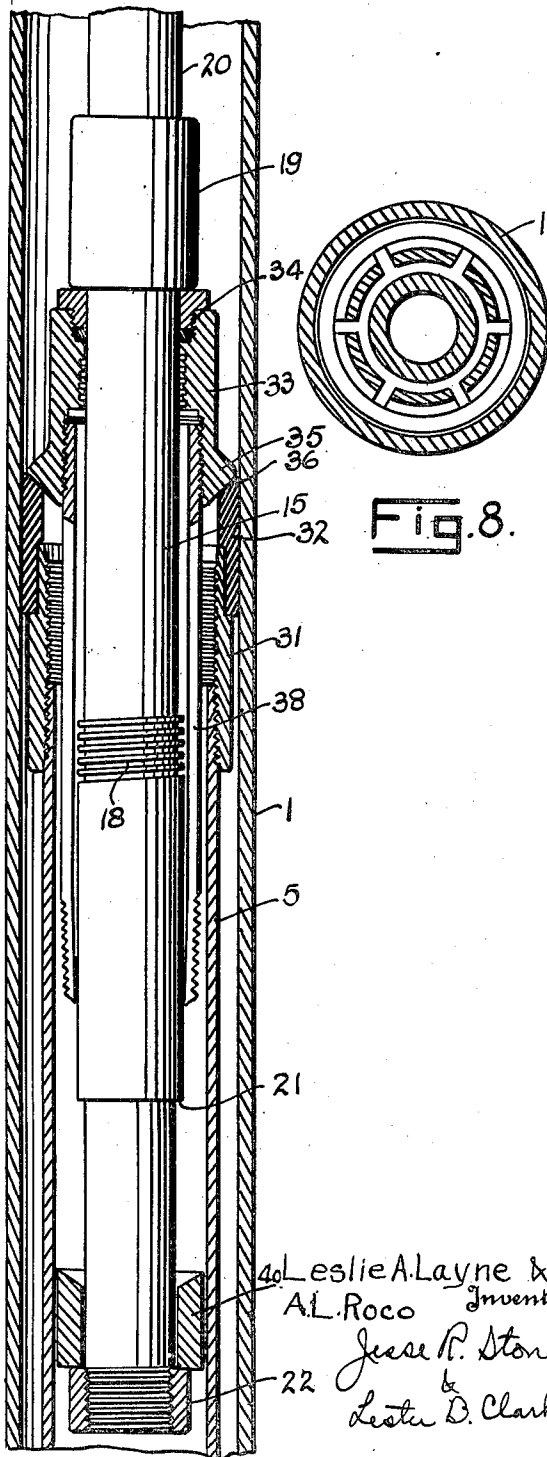


Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE

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SETTING TOOL

Application filed March 2, 1932. Serial No. 596,238.

The invention relates to the setting of strainers, liners, packers, or seals, and the like, in wells, and has particular application to the setting tool with which the placing of the devices in the well may be accomplished.

It is an object of the invention to provide a setting device whereby a strainer, liner, packer, or the like may be set in the well easily and positively.

It is a further object of the invention to provide a setting tool which may be readily released from the device which is placed in the well.

It is also an object to provide a setting tool which is adapted to expand the packer or seal by a continuous downward movement, after releasing the setting tool therefrom and to use the pipe or tubing connected with the setting tool as a flow line without the necessity of having to remove the said pipe or tubing from the well and to then have to insert a separate pipe to be employed as a flow line.

The invention consists generally in the construction of a setting tool which may be operated simply and easily and by a right-hand rotation thereof to set the strainer, liner, packer, or seal by a series of simple movements in a downward direction, so that the device can not fail in use.

In the drawing herewith, Fig. 1 is a side view, partly in elevation and partly in central longitudinal section, showing the construction of a preferred form of our invention.

Fig. 2 is a broken side view similar to Fig. 1 and illustrating a continuation of the structure shown in Fig. 1.

Fig. 3 is a transverse section on the plane 3-3 of Fig. 1.

Fig. 4 is a view similar to that shown in Fig. 1, but illustrating the setting device as withdrawn from the upper end of the packer.

Fig. 5 is a side view partly in elevation and partly in longitudinal section showing a continuation of the structure below that shown in Fig. 4, Fig. 5 being a downward continuation of Fig. 4.

Figs. 6 and 7 are side views largely in central vertical section showing a modified form of the invention disclosed in Figs. 1 to 5,

inclusive, Fig. 6 showing the setting tool attached to the packer or liner and Fig. 7 showing the setting tool released therefrom.

Fig. 8 is a transverse section on the plane 8-8 of Fig. 6.

We have illustrated our invention as employed in setting a packer which may be at the upper end of a strainer or liner in a well. The casing of the well is shown at 1. The packer is shown in Figs. 1 to 3, inclusive, as in normal extended position as it is introduced into the well.

The packer is shown as a canvas packer comprising layers 2 of canvas or similar compressible material secured on the outer surface of the packer tube 3 by means of windings of wire 4 in the usual manner. The lower end of the packer tube 3 is connected by means of a coupling 4^a to the liner 5. At the upper end of the packer tube the exterior of the said tube is formed with ratchet threads 6, the shoulders of which are presented downwardly to resist upward movement thereon of the packer barrel 7. The upper end of the layers of canvas 2 are secured by the wire 4 to the sliding nipple 8, which is fitted closely over the threaded portion 6 of the packer tube.

The packer barrel 7 fits over the outer side of the packer tube 3 and has a ratchet connection with the upper end thereof. The lower end of the barrel rests upon the sliding nipple 8 and, spaced from the lower end, the said barrel is slotted at 9 and is depressed inwardly at 10 to bring the threaded interior into resilient engagement with the threaded portion 6 of the tube. Thus the barrel may be moved downwardly relative to the tube by force applied on said barrel, but the ratchet threads will resist an upward sliding movement of the barrel relative to the other. The upper end of the packer barrel is fitted over the lower reduced end 12 of the threaded bushing 13. The only connection between the packer barrel and said bushing is by way of a shear pin 14 which holds the two parts together during the setting operation.

The bushing 13 is fitted about the setting toolstem 15 and a seal is obtained between said

bushing and stem by means of a stuffing box including packing rings 16 and gland 17. Below the stuffing box the bushing is threaded at 18 with a coarse thread, which as shown

5 may be a flat crested threaded.
The setting stem 15 is connected by a coupling 19 with the tube or drill stem 20. It is provided with a coarse exterior thread to engage with the bushing 13, as previously noted, and is extended below said bushing to the interior of the upper portion of the packer tube.

10 At a point spaced from the lower end the exterior diameter is reduced to provide a shoulder 21 and at the lower extremity we secure an extracting collar 22. Said collar is threaded to the lower end of the setting tool stem and its upper end forms a shoulder 23 to engage the retaining bushing 24, as will be presently noted.

15 Secured to the lower end of the bushing 13 is a setting tool barrel 25. Said barrel is a tubular member threaded at its upper end to engage the bushing 13 and is threaded at its lower end at 26 to engage within the packer tube 3. Said setting tool barrel is of resilient metal and is slotted from the lower end upwardly, as shown at 27, so that the said lower end may be expanded outwardly from its normal diameter to bring the threaded end 26 into engagement with the interior threaded end of the packer tube. When in this position the said lower end is held expanded by means of the retaining bushing 24 previously noted and a shoulder 29 is provided on the interior of the setting tool barrel to limit the upward movement of the retaining bushing therein. The upper end of the said retaining bushing is belled outwardly at 30 to engage the lower tapered end 31 of the setting tool barrel, as will be later described.

20 In the operation of our device the tubing or drill stem 20 is connected to the setting tool stem 15 and the remaining parts of the setting device are secured to the upper end of the packer tube, as shown in Fig. 1. The device is then lowered to the desired position in the well, with the lower end of the liner or strainer below the packer resting upon a support. The packer is then expanded. This is done by rotating the tube 20 and the setting tool stem 15 in a right-hand direction and screwing the said stem downwardly in the bushing 13 until it is released from said bushing. The further downward movement of the stem will bring the shoulder 21 thereon into contact with the retaining bushing 24 and will force it downwardly out of its position within the lower end of the setting tool barrel. This will allow the said lower end of the barrel to contract, bringing the said barrel away from the packer tube and freeing the same therefrom. A still further downward movement of the setting stem will bring the lower end

of the collar 19 on the stem against the upper end of the bushing 13 and force the packer barrel 7 downwardly along the packer tube 3, and compress the packer 2 longitudinally of the tube and expand it laterally into the position shown in Fig. 5, sealing the space between the packer tube and the casing. When the packer has thus been set in position the engagement between the packer barrel 7 and the packer tube 3 will prevent the upward release of the packer and will hold it locked in position. The setting tool may, however, be moved upwardly out of the packer 2 and, if desired, may be withdrawn from the well. When the stem 15 is moved upwardly the shoulder 23 upon the lower end thereof will engage the retaining bushing 24 and will move it upwardly therewith, the upper beveled portion 30 on the bushing engaging the lower end of the setting tool barrel 25 and thus holding the device assembled as shown in Fig. 4, allowing it to be withdrawn from the well.

In case it is desired to place a flow line within the upper end of the packer tube to conduct the liquid therefrom from the well, the setting tool may be extended downwardly into the packer tube and held in position therein and will serve the purpose of a flow line for the liquid coming upwardly through the line.

In Figs. 6, 7 and 8 our inventive idea has been shown as employed in setting a different type of packer. The upper end of the liner 5 is formed with a special collar 31 thereon, upon the upper end of which is mounted a sleeve 32 of lead, which we employ as forming a seal between the liner and the casing 1.

The setting tool in this instance embodies the same principle as that already disclosed. The packer stem 15 is constructed as in the other embodiment. The threaded portion of the stem is engaged with a bushing 33, which is sealed about the stem 15 by means of the stuffing box 34. The lower end of the bushing 33 is enlarged at 35, the extremity being tapered downwardly to provide an expanding shoulder 36. The interior of the bushing at the lower end is threaded into engagement with the setting tool barrel 37.

The setting tool barrel is slotted at 38, as in the other embodiment, and the lower threaded end thereof is engaged at 39 with the collar 31 previously referred to. It is held in engagement therewith when expanded by the retaining bushing 40, which is constructed in all respects similarly to the bushing 24 previously noted and has its upper end beveled at 41, as in the other embodiment.

When the device is introduced in the well the parts are assembled as shown in Fig. 6 and the device is placed in position as before and the lead seal 32 is expanded by first screwing downwardly on the stem 15 to release the

same from the bushing 33. This will allow the stem to be moved downwardly bringing the shoulder 21 against the bushing 40 and driving it from within the lower end of the setting tool barrel 38 and allowing the arms to spring inwardly away from the collar 31. As the setting tool is further lowered the shoulder 36 on the bushing 33 will engage within the upper end of the lead sleeve 32 and expand it outwardly into close engagement with the casing, as shown in Fig. 7.

The tool may then be allowed to remain in the well as a flow line or it may be drawn upwardly and removed from the well in the same manner as previously noted relative to the first embodiment.

It will be noted that our device is simple in its construction and easily and positively operated. There are no parts which may easily get out of order or fail to function properly in actual use. The only rotative movement necessary is a simple righthand rotation which will readily screw the coarse loose thread 18 out of engagement and allow the stem to be moved downwardly. When the stem is drawn upwardly for withdrawing the same from the well the shear pin 14 is easily broken, allowing the assembled tool to be withdrawn. If, however, it is desired to leave the setting tool in the well as a flow line, the connection need not be broken and the setting stem may be used as a flow line.

This use of the setting stem as a flow line will avoid the necessity of an extra trip into the well and may in many instances be of great value, not only in the saving of time consumed in removing the setting tool and substituting an ordinary tube therefor, but will avoid danger of blow out which may occur by the upward movement of the gas and other fluid following the withdrawal of the setting stem. Our device is therefore easily operated and economical to use and is conducive to safety in the operation of a well.

While we have shown the setting tool as employed upon a liner and packer, we wish it understood that it is capable of general use in wells for setting any similar devices, the invention not being limited to the practical use herein described.

What we claim as new is:

1. A setting tool of the character described including a setting stem, a bushing threaded thereon and releasable therefrom by a downward screwing of said stem, a setting tool barrel secured to said bushing outside said stem, a packer barrel releasably secured to said bushing outside said setting tool barrel, expansible means on said setting tool barrel to engage a packer support, releasable means on said stem to support said expansible means in engaged position, means on said stem to release said supporting means, and means to engage said bushing and move it

with said barrels downwardly along said packer support.

2. A setting tool of the character described including a setting stem, a bushing threaded thereon and releasable therefrom by a downward screwing of said stem, a setting tool barrel secured to said bushing outside said stem, expansible means on said setting tool barrel to engage a packer support, releasable means on said stem to support said expansible means in engaged position, means on said stem to release said supporting means, and means to engage said bushing and move it with said barrels downwardly along said packer support.

3. A setting tool of the character described including a setting stem, a bushing engaged thereon and adapted to be disengaged therefrom by a downward screwing of said stem, a packer tube, a packer barrel secured to said bushing and adapted to telescope over said packer tube, a setting tool barrel associated with said bushing and releasably connected with said packer tube, said setting tool barrel being releasable responsive to the relative downward movement of said setting stem.

4. A setting tool of the character described including a setting stem, a bushing engaged thereon and adapted to be disengaged therefrom by a downward screwing of said stem, a packer tube, a packer barrel secured to said bushing and adapted to telescope over said packer tube, means connecting said bushing and said packer tube, means on said setting stem to release said connecting means from engagement with said packer tube when said setting stem is moved relatively downward, and means on said stem to engage and drive said bushing downwardly when said bushing is released therefrom.

5. A setting tool of the character described including a setting stem, a bushing engaged thereon and adapted to be disengaged therefrom by a downward screwing of said stem, a packer tube, a packer barrel secured to said bushing and adapted to telescope over said packer tube, a setting tool barrel on said bushing, means holding said setting tube barrel releasably connected with said packer tube adapted to be rendered ineffective by a downward blow from said setting stem and means on said stem to force said bushing and packer barrel downwardly on said packer tube.

6. A setting tool of the character described including a setting stem, a bushing engaged thereon and adapted to be disengaged therefrom by a downward screwing of said stem, a packer tube, a packer barrel secured to said bushing and adapted to telescope over said packer tube, a setting tool barrel on said bushing, means to expand the lower end of said setting tool barrel into engagement with said packer tube and adapted to be forced from expanding position in said setting tool

barrel by said stem, and means on said stem to strike a blow on said bushing.

7. A setting tool of the character described including a setting stem, a bushing engaged thereon and adapted to be disengaged therefrom by a downward screwing of said stem, a packer tube, a packer barrel secured to said bushing and adapted to telescope over said packer tube, a setting tool barrel on said bushing, the lower end of the same being split and threaded, a retaining bushing to expand said lower end into engagement with said packer tube, and a shoulder on said stem positioned to engage said retaining bushing and force it from within said setting tool barrel.

8. A setting tool of the character described including a setting stem, a connecting collar thereon having a lower shoulder thereon, a bushing releasably secured on said stem below said collar, a packer tube into which said stem may extend, a packer barrel on said bushing fitting over said packer tube, a setting tool barrel on said bushing, means normally holding the lower end of said setting tool barrel engaged with said packer tube, means on said tube to remove said holding means and to release said engagement with said packer tube, said connecting collar being adapted to strike a blow upon said bushing when said stem is released from connection with said bushing.

9. A setting tool of the character described including a setting stem, a connecting collar thereon having a lower shoulder thereon, a bushing releasably secured on said stem below said collar, a packer tube into which said stem may extend, a packer barrel on said bushing fitting over said packer tube, means normally spacing said bushing from said packer tube, but releasable by a downward blow thereon from said stem, said shoulder on said connecting collar being adapted to deliver a blow upon said bushing when said stem is disconnected from said bushing.

10. A setting tool of the character described including a setting stem, a connecting collar thereon having a lower shoulder thereon, a bushing releasably secured on said stem below said collar, a packer tube into which said stem may extend, a packer barrel on said bushing fitting over said packer tube, a setting tool barrel having its lower end engaged with said packer tube, means responsive to a downward blow from said stem to release said setting tool barrel from engagement with said packer tube, said shoulder being then adapted to strike a blow upon said bushing and force said packer barrel downwardly upon said packer tube.

11. In a setting tool, a setting stem, a packer tube into which said setting tool may extend, a bushing on said stem, said bushing being releasable to allow a downward movement of said stem therein, a packing member on said packer tube, means to hold said bush-

ing spaced from said packer tube adapted to be released by the downward movement of said stem when said bushing is released, and means on said bushing to then expand said packing member.

12. In a setting tool, a setting stem, a packer tube into which said setting tool may extend, a bushing on said stem, and secured to said stem by a coarse thread and released therefrom by the downward screwing of said stem, a packing member on said packer tube, means to hold said bushing spaced from said packer tube adapted to be released by the downward movement of said stem when said bushing is released, and means on said bushing to then expand said packing member.

13. In a setting tool, a setting stem, a packer tube into which said setting tool may extend, a bushing on said stem, said bushing being releasable to allow a downward movement of said stem therein, a packing member on said packer tube, a setting tool barrel on said bushing, the lower end being expansible radially to engage said packer tube, a retaining bushing to hold said setting tool barrel expanded releasable by a downward blow from said stem, and means to expand said packer member when said setting tool barrel is released.

14. A setting tool stem, a packer tube, a packer thereon, a bushing detachably secured to said stem, spacing means on said bushing engaging said packer tube to hold said bushing normally spaced above said tube, means on said stem adapted when said stem is released from said bushing to detach said spacing means from said packer tube, and means on said bushing to then expand said packer.

15. A setting tool stem, a packer tube, a packer thereon, a bushing detachably secured to said stem, spacing means on said bushing engaging said packer tube to hold said bushing normally spaced above said tube, means on said stem adapted when said stem is released from said bushing to detach said spacing means from said packer tube, and a tapered wedge member on said bushing to engage and expand said packer.

16. In a setting tool, a setting tool stem, a collar thereon having a lower shoulder, a setting bushing having a coarse threaded engagement with said stem below said collar, a packer tube, a packer thereon, a setting tool barrel, the lower end of which is slit to allow expansion thereof, a retaining bushing to expand said barrel into engagement with said packer to space said bushing above said tube, a shoulder on said stem to engage said retaining bushing and drive it from said barrel and release said barrel from said tube, and means on said setting bushing to engage and expand said packer when a blow is delivered thereon by said shoulder.

17. In a setting tool, a setting tool stem, a collar thereon having a lower shoulder, a set-

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ting bushing having a coarse threaded engagement with said stem below said collar, a packer tube, a packer thereon, a setting tool barrel, the lower end of which is slit to allow expansion thereof, a retaining bushing to expand said barrel into engagement with said packer tube to space said bushing above said tube, a shoulder on said stem to engage said retaining bushing and drive it from said barrel and release said barrel from said tube, means on said setting bushing to engage and expand said packer when a blow is delivered thereon by said shoulder, and means on said stem to engage said retaining bushing on the upward movement of said stem, said bushing being then adapted to engage and withdraw said barrel.

18. A setting tool comprising a setting stem, a packer tube, a packer thereon, a bushing releasably connected with said stem, means on said bushing adapted to engage and expand said packer, means to normally hold said bushing spaced above said tube but connecting it therewith, means on said stem to release said spacing means, to allow said bushing to move to bring said expanding means into engagement with said packer, and means on said stem to strike a blow on said bushing and expand the said packer.

19. A setting tool comprising a setting stem, a packer tube, a packer thereon, a bushing releasably connected with said stem, means on said bushing adapted to engage and expand said packer, means to normally hold said bushing spaced above said tube but connecting it therewith, means on said stem to release said spacing means, to allow said bushing to move to bring said expanding means into engagement with said packer, means on said stem to strike a blow on said bushing and expand the said packer, said bushing fitting within said packer, and a fluid seal between said bushing and said stem whereby said stem may form a flow line when left in position in said packer tube.

20. A setting tool including a setting stem, a retaining bushing slidable thereon, means to limit the sliding movement of said bushing on said stem, a setting bushing releasably engaged to said stem above said retaining bushing, a setting tool barrel on said bushing adapted to be expanded outwardly at its lower end by said retaining bushing to engage a tube, and means on said setting bushing to engage a packer.

21. A setting tool including a setting stem, a retaining bushing slidable thereon, means to limit the sliding movement of said bushing on said stem, a setting bushing releasably engaged to said stem above said retaining bushing, a setting tool barrel on said bushing adapted to be expanded outwardly at its lower end by said retaining bushing to engage a tube, means on said setting bushing to engage a packer, a seal between said

setting bushing and said stem, and means on said stem to strike a blow upon said setting bushing.

22. A setting tool including a setting stem, a retaining bushing slidable thereon, means to limit the sliding movement of said bushing on said stem, a setting bushing releasably engaged to said stem above said retaining bushing, and a setting tool barrel on said bushing adapted to be expanded outwardly at its lower end by said retaining bushing to engage a threaded member, said retaining bushing being removable to detach said setting tool barrel from said member.

In testimony whereof we hereunto affix our signatures this the 19th day of February, A. D. 1932.

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