

June 20, 1961

J. W. KENNEDAY

2,989,122

APPARATUS FOR USE IN OIL AND GAS WELLS

Filed Aug. 11, 1958

2 Sheets-Sheet 1

FIG. 5.

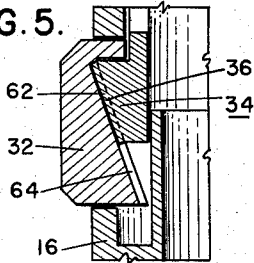


FIG. 2.

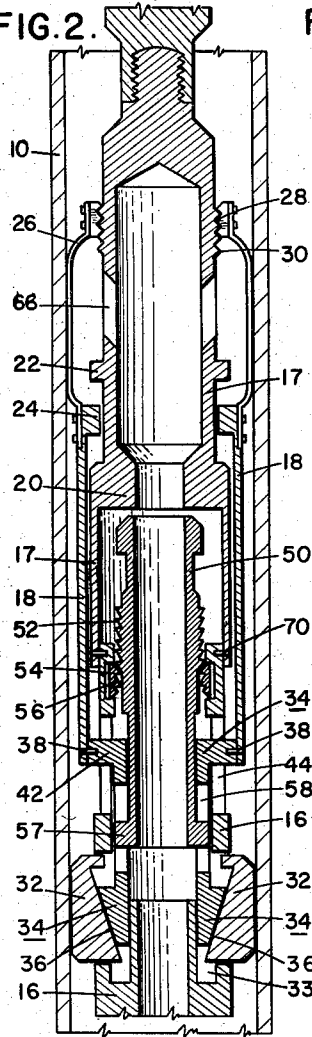


FIG. 1.

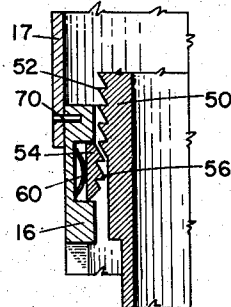
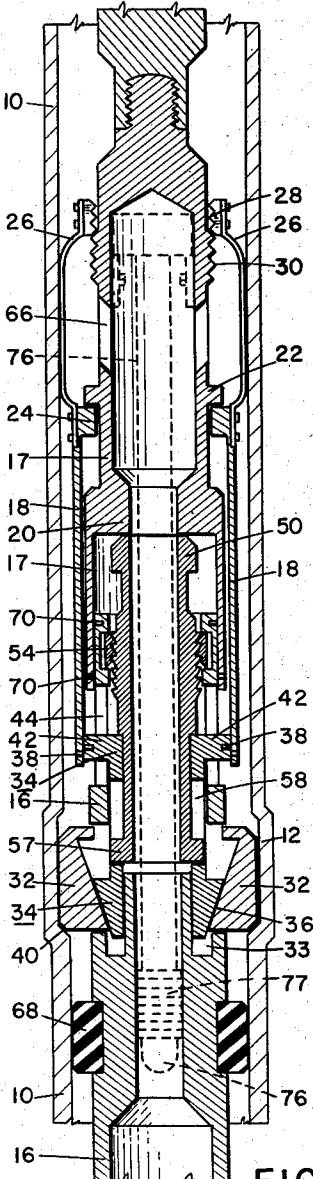
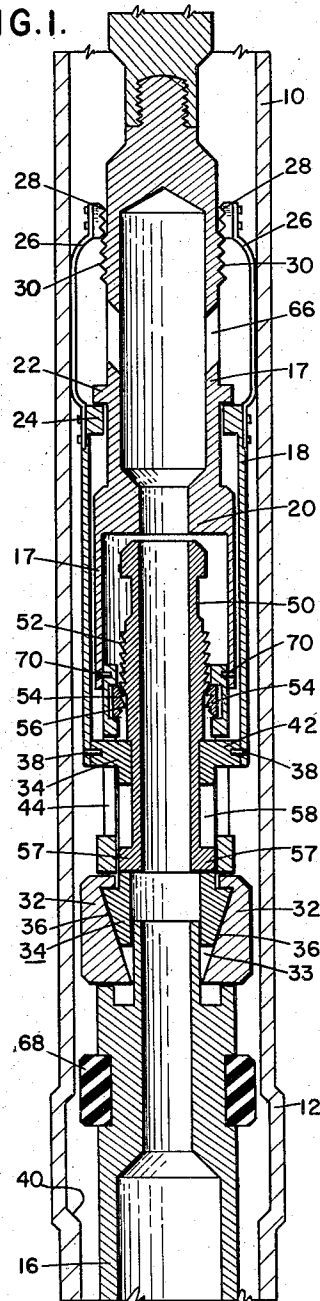


FIG. 4.

FIG. 3.

INVENTOR.
JOHN W. KENNEDAY,
BY *Frank S. Trivitt*
ATTORNEY.

June 20, 1961

J. W. KENNEDAY

2,989,122

APPARATUS FOR USE IN OIL AND GAS WELLS

Filed Aug. 11, 1958

2 Sheets-Sheet 2

FIG. 6.

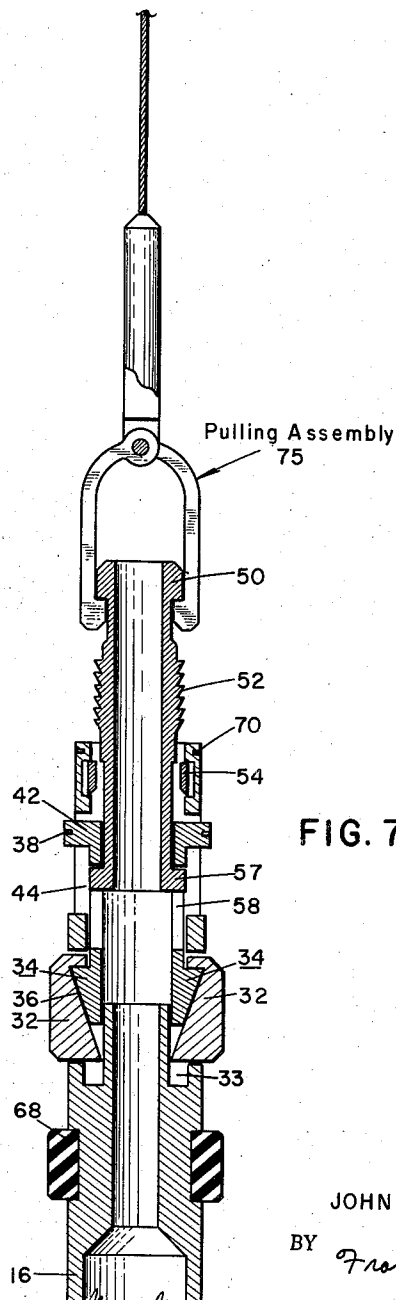
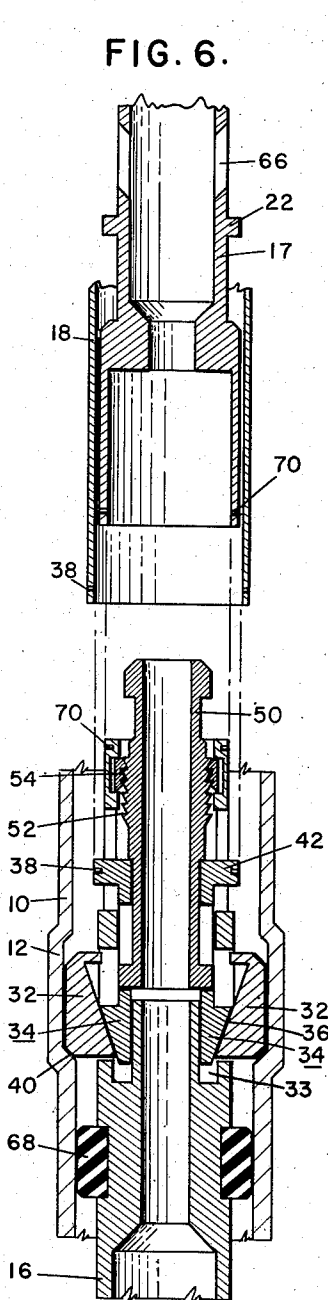


FIG. 7.

INVENTOR.
JOHN W. KENNEDAY,
BY *Frank S. Trivett*
ATTORNEY.

1

2,989,122

APPARATUS FOR USE IN OIL AND GAS WELLS

John W. Kenneday, Houston, Tex., assignor, by mesne assignments, to Jersey Production Research Company, Tulsa, Okla., a corporation of Delaware
Filed Aug. 11, 1958, Ser. No. 754,363
5 Claims. (Cl. 166—216)

This invention relates to oil and gas wells. More particularly, this invention relates to a new and useful apparatus for lowering an extension member into a production tubing and securely locking the extension member within any desired recess within the production tubing.

In the production of oil and gas, it is sometimes desirable to lower an extension member into a production tubing having its lower extremity spaced above the bottom of a well. The extension member may be utilized, for example, for carrying out workover operations such as the removal of sand and debris from the well.

Briefly described, this invention includes a running tool with an extension member releasably attached to the running tool. Means are provided for expanding a locking means located within the extension member against the tubing. The locking means may then be seated in the next lower recess as the running tool and extension member are thereafter lowered. The extension member is then securely locked in position.

A better understanding of this invention, as well as its many advantages, may be had by reference to the following detailed description and drawings, in which:

FIG. 1 is an elevational view in section showing the device being lowered down the production tubing;

FIG. 2 is a sectional view showing the manner in which the locking means are expanded against the inside of the production tubing prior to the device being lowered to the next lower recess;

FIG. 3 is a sectional view showing the new device with the extension member securely locked in position within the recess;

FIG. 4 is an enlarged sectional view of a portion of the device;

FIG. 5 is an enlarged sectional view of the locking means;

FIG. 6 is a sectional view showing the running tool portion of the device removed from the extension member; and

FIG. 7 illustrates the position of the device when it is being removed from the tubing.

Referring to the drawings, a production tubing 10 is shown. Production tubing 10 is provided with a recess, such as provided in landing nipple 12. Though only one landing nipple 12 is shown, it is to be understood that, if desired, a plurality of vertically spaced apart recesses can be provided. The lower end of production tubing 10 is located above the bottom of the well to permit permanent well completion operations.

The new device includes a running tool to which is releasably connected an extension member 16. The running tool includes an inner cylindrical member 17 and an outer cylindrical member 18. Inner cylindrical member 17 includes an inwardly facing shoulder 20 and an outwardly extending shoulder 22. The outer cylindrical member 18 includes a circular shoulder 24. Outer cylindrical member 18 is mounted for slidable movement with respect to the inner member 17, the upward movement being limited by the contact of shoulder 24 of outer cylindrical member 18 against shoulder 22 of inner cylindrical member 17.

A plurality of bow springs 26 are connected to the upper portion of the outer cylindrical member 18. Bow springs 26 are in frictional contact with the inside of the tubing 10.

The upper portion of each bow spring 26 is provided with serrations such as grabbing teeth 28. As the tool

2

is lowered into tubing 10, grabbing teeth 28 are out of engagement with the grabbing teeth 30 provided on the outside perimeter of the inner member 17.

The extension member 16 is provided with locking means such as the locking keys 32. Locking keys 32 are mounted in recesses 33 provided in extension member 16. The locking keys 32 are expanded by means of a slidable expander 34 having lower tapered portions 36 which mate with the tapered inside portion of locking keys 32. The tapered portion 36 of slidable expander 34 is provided with splines 62 which fit within grooves 64 provided within the locking keys 32, as shown clearly in FIG. 5. The upper portion of slidable expander 34 is provided with lugs 42 releasably connected to the lower portion of outer cylindrical member 18 by means of shear pins 38. The lugs 42 extend through ports 44 provided within the upper portion of extension member 16.

A slidable member, such as slidable fishing neck 50, is also mounted within the extension member 16. Slidable fishing neck 50 has provided about its outside perimeter along a longitudinal portion thereof a plurality of serrations or teeth 52. Locking slips 54, having shearable teeth 56, are provided within a recess in the upper portion of extension member 16. Teeth 52 and shearable teeth 56 are normally disengaged. Lugs 57 provided at the lower extremity of fishing neck 50 move within ports 58 provided in the slidable expander 34.

As shown in detail in FIG. 4, the locking slips 54 are spring biased by springs 60. The slidable fishing neck 50 can thus be moved downwardly with respect to the locking slips 54, but when the serrations 52 have engaged the shearable teeth 56, the slidable fishing neck 50 is locked firmly against upward movement.

The inner member 17 of the running tool is provided with circulation ports 66. A packer 68 is mounted on extension member 16 and below the locking keys 32 so that after the extension member 16 has been securely locked in position, fluid can be circulated upwardly through extension member 16, inner cylindrical member 17, and through ports 66 to the surface of the well.

In operation, the running tool and extension member are first lowered down the production tubing 10. The relative positions of the parts are then as shown in FIG. 1. The friction means or bow springs 26 hold the outer cylindrical member 18 in its upward position with respect to the inner cylindrical member 17. This retains the locking key expander assembly 34 in the upper position so the locking keys 32 remain retracted within the extension member 16.

When the running tool and extension member have been located just above the particular recess to which it is desired to securely lock the extension member, the inner member 17 is moved upwardly by pulling the running tool upwardly at the earth's surface. The bow springs 26 hold the outer cylindrical member 18 relatively fixed as the inner cylindrical member 17, which is connected to the extension member 16 by shear pins 70, moves the extension member upwardly. This causes locking keys 32 to be expanded against the inside of the tubing 10. This movement also causes the grabbing teeth 28 on bow springs 26 to matingly engage the serrations 30 on inner member 17. The device is then in the position shown in FIG. 2.

With the locking keys 32 in their expanded position against the inside of tubing 10, the running tool is then lowered to the landing nipple 12. Landing nipple 12 has a slightly restricted bore below the locking recess. With the extension locking keys 32 in this partially expanded lowering position, the keys will stop against the top of the restricting shoulder 40. It is then desirable to positively and securely lock the locking keys 32 within the landing nipple 12. This is accomplished by jarring downwardly

against the inner member 17. The jarring overcomes the frictional resistance between teeth 28 and 30 so that they become disengaged, as shown in FIG. 3. The jarring breaks the shear pins 70 connecting the inner member 17 to extension member 16, and then breaks the shear pins 38 connecting the expander 34 to the outer cylindrical member 18. The upper end of slidable fishing neck 50 is thereafter hammered by inwardly facing shoulder 20 so that the lugs 57 on fishing neck 50 force the tapered portions 36 of expander 34 downwardly as far as possible to securely lock the locking keys 32 within the landing nipple 12, as shown in FIG. 3. The running tool which, as formerly stated, consists of inner cylindrical member 17 and outer cylindrical member 18, may then be removed to the surface of the well, as illustrated in FIG. 6. The extension member 16 is then securely locked in position for the carrying out of workover operations. The undesired upward movement of slidable fishing neck 50 is prevented by means of the engagement of the shearable teeth 56 on locking slips 54 with the serrations 52 on slidable fishing neck 50.

After the extension member 16 has been landed and locked in landing nipple 12, it may be desirable to pressure test the seal 68. For this purpose a testing prong 76, as shown in dotted lines in FIG. 3, may be provided. The prong 76 would be fixed at its upper end within the sleeve 17 with its lower end, which is provided with sealing means 77, extending into the bore of the extension 16. The prong may also be attached to the member 16 by shear pins if desired to prevent movement of the prong during the test.

After the workover operations are completed, the extension member 16 can be removed from the tubing 10 by jarring upwardly on fishing neck 50 by means such as a wireline pulling tool designated 75 in FIG. 7. The upward jarring will shear shearable teeth 56, permitting the upward movement of fishing neck 50 and the retraction of the locking keys 32 so that the extension member 16 can be removed to the surface.

I claim:

1. For use in wells including tubing having a recess: a running tool provided with grabbing means; an extension member having recesses formed therein and openings above the recesses releasably attached to the running tool; an outwardly movable locking member having an inner cam surface mounted in each of said recesses in the extension member; an expander mounted within the extension member and including a cam surface for operative association with the inner cam surfaces of the locking members and a lug extending outwardly through the openings in the extension member; a friction member connected to the lug and having grabbing means, said friction member being in contact with the inside of the tubing for holding the expander relatively stationary as the running tool is pulled upwardly to move the locking members outwardly against the tubing and to interengage the grabbing means on the running tool and the grabbing means on the friction member thus causing the locking members to engage the tubing recess as the running tool and the releasably attached extension member are thereafter lowered until the locking members are adjacent the tubing recess; a longitudinally movable fishing neck having a portion thereof adapted to engage the expander upon downward jarring of the running tool to cam the locking members into engagement with the tubing recess; and interengaging members on the fishing neck and extension member adapted to lockingly engage upon downward movement of the fishing neck.

2. For use in wells including tubing having at least one recess: a running tool including an inner member provided with grabbing means, and an outer member slidably disposed about the inner member; friction means associated

with the outer member and having grabbing means, said friction means tending to hold the outer member in an upward position or in a downward position with respect to the inner member as the running tool is lowered or raised in the well, respectively; an extension member having lateral openings and releasably attached to the running tool; outwardly movable locking means mounted on the extension member; an expander mounted within the extension member and having a portion extending through said lateral openings which portion is releasably connected to said outer member, and operated to expand the locking means against the tubing upon upward pulling of said inner member and cause the engagement of the grabbing means on the running tool and the grabbing means on the friction means so that the locking means seats in the next lower recess as the running tool and extension member are thereafter lowered; and a longitudinally movable member mounted in the extension member, said movable member having a portion thereof adapted to engage the expander to operate the expander to expand the locking means into locking engagement with said recess upon downward movement of said inner member against said longitudinally movable member to release the expander from said outer member; and interengaging members on the movable member and extension member adapted to lockingly engage upon downward movement of the longitudinally movable member.

3. An apparatus in accordance with claim 2 wherein the friction means associated with the outer member are bow springs connected to the outer member and in frictional contact with the inside of the tubing.

4. For use in wells including tubing having at least one recess: a running tool including an inner member provided with grabbing teeth, and an outer member slidably disposed about the inner member; a plurality of bow springs, each provided with grabbing teeth, connected to the outer member and in frictional contact with the inside of the tubing, the grabbing teeth on the inner member and bow springs being out of engagement as the running tool is lowered within the well; an extension member releasably attached to the inner member; locking keys mounted in the extension member; and an expander also mounted for slidable movement within the extension member and connected to the outer member by frangible members so that upon upward movement of the inner member, the grabbing teeth on the bow springs and inner member engage, and the expander moves the locking keys against the tubing; a slidable fishing neck in the extension member actuated by downward movement of the inner member of the running tool to release the expander from said outer member and move said expander to position the locking keys in tight engagement with said recess; and locking slips mounted in the extension member for locking the slidable fishing neck against movement to thereby lock the extension member in position.

5. An apparatus in accordance with claim 4 wherein the slidable fishing neck is provided with serrations and the locking slips are provided with shearable teeth which matingly engage the serrations to lock the extension member in position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,401,119	Taylor	May 28, 1946
2,798,559	Fredd	July 9, 1957
2,816,613	Minter et al.	Dec. 17, 1957
2,856,003	Fredd	Oct. 14, 1958
2,856,007	Fredd	Oct. 14, 1958
2,862,560	Bostock et al.	Dec. 2, 1958
2,862,564	Bostock	Dec. 2, 1958
2,871,947	Fredd	Feb. 3, 1959