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J. V. FREDD ET AL

2,908,330

WELL TUBING EXTENSION HANGER AND PLUG

Filed April 27, 1954

2 Sheets-Sheet 1

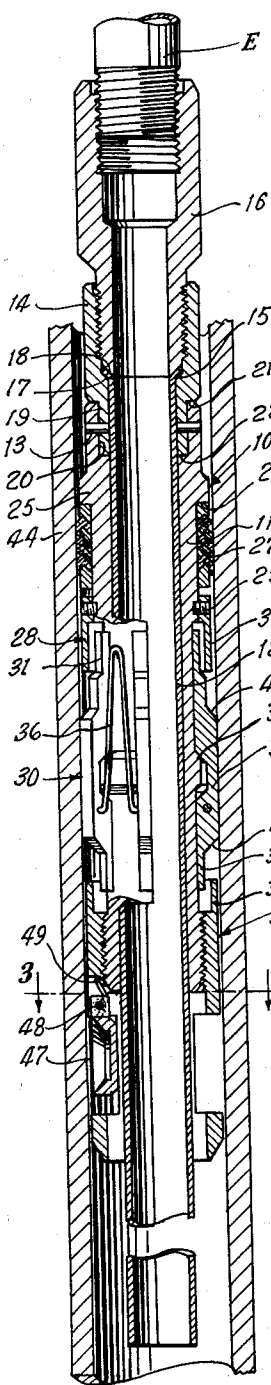


Fig. 1

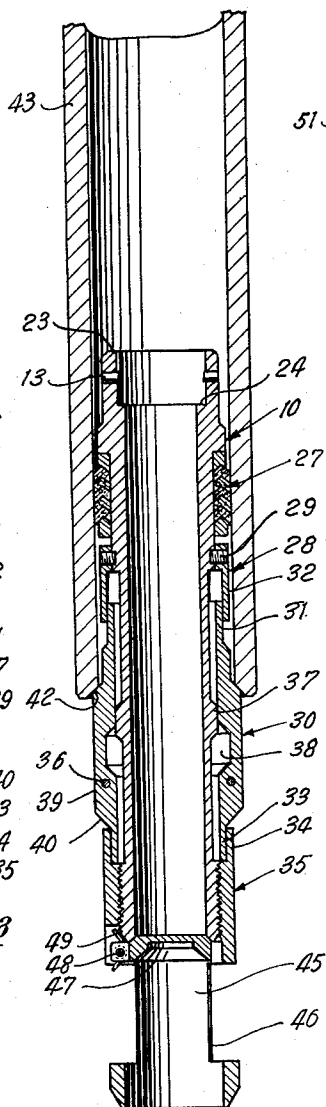


Fig. 2

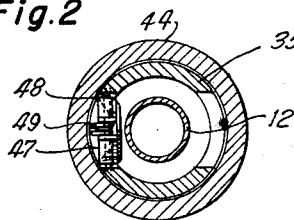


Fig. 3

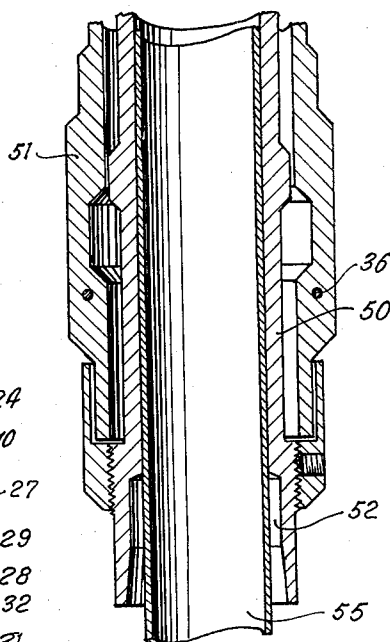


Fig. 4

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2 Sheets-Sheet 2

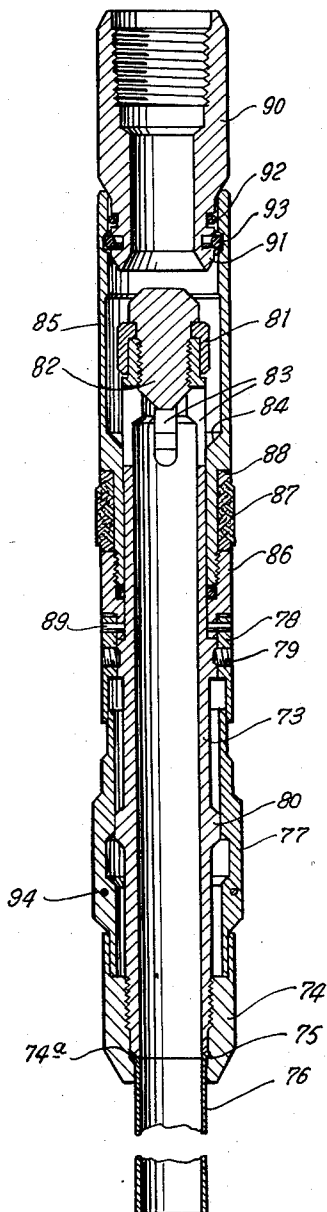


Fig. 6

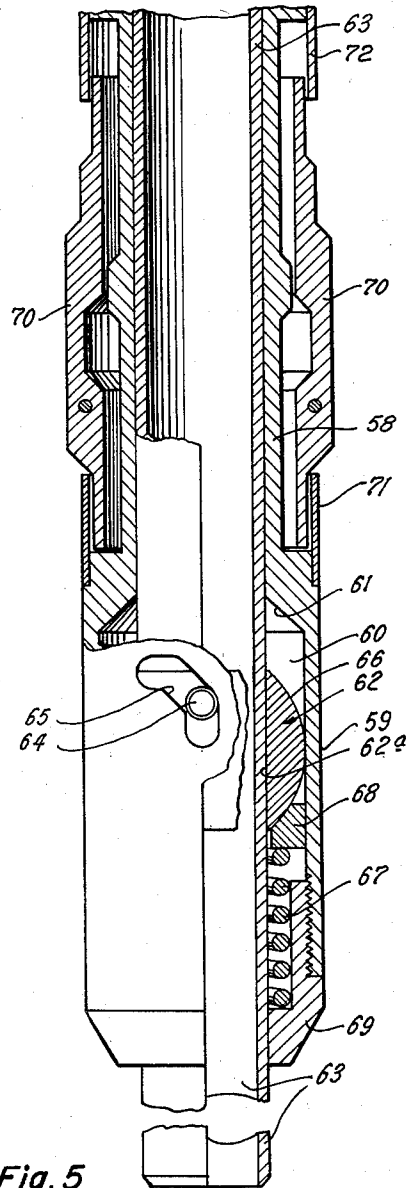


Fig. 5

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2,908,330

WELL TUBING EXTENSION HANGER AND PLUG

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Application April 27, 1954, Serial No. 425,782

20 Claims. (Cl. 166—46)

This invention relates to well tools and more particularly to well tubing extension hangers and plugs, and to a method of treating wells.

An object of the invention is to provide a new and improved method and means for installing an extension tubing at the lower end of the well tubing for effecting the completion operations at the bottom of the well, such as squeeze cementing and sand washing; which allows the installation and removal of the tubing extension under conditions of substantially atmospheric pressure in wells having extremely high pressure gradients.

Another object of the invention is to provide a well tubing extension hanger and plug, of the type described, having a central continuous passageway of maximum diameter and a closure means which opens downwardly.

Still another object of the invention is to provide a well tubing extension hanger and plug for well tubing which may be detachably secured to the lower end of the tubing and having valve means detachably connected to the extension tubing and which is open during operations and while the plug is secured to the tubing extension and which is detached from the tubing extension and closes to plug the lower end of the well tubing when the tubing extension is withdrawn from the well tubing.

A further object of the invention is to provide a well tubing extension hanger and plug for well tubing which is detachably secured to the lower end of the tubing and having a plug detachably connected to the lower end of the extension which is provided with expandable means for engaging the lower end of the well tubing to prevent upward movement of the plug through the well tubing when the extension is detached from the plug and moved upwardly in the tubing.

A still further object is to provide a well tubing extension hanger and plug, of the type described, having a central longitudinal passageway which is closeable by a valve when the plug is secured to the well tubing and the extension is detached from the well plug for removal from the well.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of devices constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

Figure 1 is a vertical sectional view of one form of the well tubing extension hanger and plug showing its various components as they appear during downward movement of the device through well tubing;

Figure 2 is a similar view showing the plug in position closing the lower end of the well tubing;

Figure 3 is a sectional view taken on line 3—3 of Figure 1;

Figure 4 is a fragmentary vertical sectional view of a modified form of the tubing extension hanger and plug;

Figure 5 is a fragmentary vertical sectional view of another modified form of the tubing extension hanger and plug; and

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Figure 6 is a vertical sectional view of still another modified form of the well tubing extension hanger and plug.

Referring now particularly to Figures 1 to 3 of the drawings, the well tubing extension hanger and plug 10 include an elongate tubular body 11 through which a tubular extension member or wash pipe 12 may extend. The wash pipe is detachably secured to the tubular body 11 of the plug by shear pins 13 extending through registering apertures in the upper end of the tubular body and in a wash pipe clamp fitting 14 in which the flared upper end 15 of the wash pipe is secured by a top sub 16 threaded into the upper end of the fitting, the flared upper end 15 of the wash pipe being firmly held between a bevelled annular shoulder 17 at the lower end of the top sub and a corresponding beveled internal shoulder 18 in the bore of the fitting. The upper end of the top sub is threaded internally so that it may be secured to the lower end of a tubing extension E.

It will be noted that the fitting 14 has a reduced lower end 19 which telescopes in the enlarged upper end 20 of the bore of the tubular body so that the downwardly facing annular shoulders 21 and 22 of the fitting abut the upwardly facing shoulders 23 and 24 of the tubular body. The fitting is thus held against further downward movement in the body.

The tubular body is provided near its upper end with an external annular flange 25 which has a downwardly facing annular stop shoulder 26. A packing or seal assembly 27 is disposed on the tubular body below said stop shoulder, being confined between the stop shoulder and an upper inverted cup-like dog retainer 28 which is secured on the tubular body below the packing assembly by set screws 29.

Elongate locking lugs or keys 30 are slidably disposed on the tubular body 11 for limited longitudinal movement thereon and have reduced upper end portions 31 which are confined between the tubular body and the dependent skirt 32 of the dog retainer 28 spaced outwardly from said tubular body. The similar reduced lower end portions 33 of the keys 30 are disposed between the tubular body and an upwardly extending flange or collar 34 of a cup-like dog retainer 35 threaded on the lower end of the tubular body. The collar 34 is also spaced from the tubular body so that the dogs may move laterally between the retracted positions shown in Figure 1 and the expanded positions shown in Figure 2. The dogs are biased outwardly toward expanded positions by springs 36 engaging in suitable openings in the dogs and having their upper inverted V-shaped ends confined between the skirt 32 and the exterior of the body.

It will be noted that the keys or dogs 30 are also capable of limited longitudinal movement on the tubular body between the upper position on the tubular body shown in Figure 1 and the lower position shown in Figure 2, the retainers 28 and 35 limiting such movement. When in the lower position, the keys are locked against inward retracting movement from such expanded positions by an external annular lock flange 37 on the tubular body which engages the inner surface of the dogs as shown in Figure 2 to lock the dogs in such expanded positions. When the dogs are in the upper position on the body shown in Figure 1, the lock flange 37 is disposed in an internal recess 38 in the inner surface of the dogs and the dogs may retract inwardly toward the body. The upper and lower surfaces of the lock flange and of the recesses are bevelled to facilitate longitudinal movement of the dogs on the tubular body.

The dogs or keys have external bosses 39 provided with downwardly and inwardly extending bevelled shoulders 40, which are adapted to move the dogs inwardly when

they encounter upwardly facing obstructions in the well tubing during downward movement of the plug in the well tubing. The bosses also have upwardly inclined facing stop shoulders 41 at their upper ends which are adapted to engage the downwardly facing annular stop shoulder 42 on the lower end of a landing nipple 43, secured to the lower end of the well tubing 44, to limit upward movement of the well plug in the tubing after the plug has been lowered to a position in which the dogs are below the lower end of the landing nipple, as will be hereinafter more fully explained.

The dog retainer 35 has a dependent shoe portion 45 which extends below the lower end of the tubular body and which has a pair of opposed lateral windows 46 formed therein. A flap valve 47 is pivotally secured, as by the pin 48, to the dog retainer 35 so that it closes the lower end of the tubular body 11 of the plug when in the raised position shown in Figure 2. The flap valve swings to a position in one of the lateral windows 46 when opened, as shown in Figure 1, so that it is protected from any foreign matter which may be encountered by the plug in moving through the well tubing. A spring 49 biases the flap valve toward its closed position.

In use, the assembled wash pipe 12 and plug 10 are secured to the lower end of a tubing extension E by means of the top sub 16 which is threaded on the lower end of the tubing extension. The tubing extension, carrying the plug 10, is then lowered into the well tubing of a well which is to be treated; for example, to be squeeze cemented or washed of sand. The open lower end of such well tubing is closed by an expendable plug, such as that shown in the co-pending application of John V. Fredd, Serial No. 420,945, filed April 5, 1954, which expendable plug had previously been installed in the landing nipple 43 of the well tubing. As the plug 10 on the tubing extension nears the expendable plug, fluid is pumped into the tubing to create a downwardly acting pressure differential on the expendable plug which displaces the expendable plug downwardly out of the nipple. The tubing extension and the well plug 10 carried thereby are then free to move downwardly out of the now open lower end of the landing nipple 43.

It will be noted that during the downward movement of the plug 10 through the well tubing, the keys 30 are biased outwardly by the springs 36 to engage and ride along the walls of the well tubing, and the flap valve 47 is held in open position by the wash pipe 12. (See Figure 1.)

When the tubing extension is locked in suspended position in the well tubing by a suitable hanger, such as that shown in the co-pending application of John V. Fredd, Serial No. 346,974, filed April 6, 1953, now Patent No. 2,798,559, cementing or sand washing operations are commenced. When such operations are completed, the tubing extension, and the plug 10 carried thereby, are raised until the stop shoulders 41 of the dogs or keys 30, which are then in their expanded positions, engage the stop shoulder 42 at the lower end of the landing nipple.

As the upward movement of the tubing extension is continued, after the engagement of these stop shoulders of the dogs with the landing nipple, the tubular body 11 moves upwardly relative to the dogs, whose upward movement is stopped by such engagement. As a result, the lock flange 37 of the tubular body moves upwardly out of alignment with the recesses 38 of the dogs to the position shown in Figure 2 wherein it abuts the inner surfaces of the dogs above the recesses and thus locks them against inward lateral movement toward retracted positions. The dogs now prevent further upward movement of the plug. Upward force imparted to the tubing extension will shear the pins 13 which secure the fitting 14 to the tubular body. The sealing assembly 27 then engages the inner wall of the landing nipple 43 and seals between the nipple and the tubular body. The friction between the sealing or packing assembly and

the nipple is generally sufficient to hold the plug in place in the nipple until the flap valve is closed.

It is desirable to maintain reverse circulation through the tubing extension during the time the pins are being sheared to assure that the plug remains in place in the nipple 42 until after the flap valve is closed. The tubing extension and wash pipe 12 can then be moved upwardly relative to the plug 10, and when the lower end of the wash pipe moves upwardly past the flap valve 47 the spring 49 moves the flap valve to position closing the lower end of the tubular body. The lower end of the well tubing is thus closed against excessive well pressures or pressure gradients so that the tubing extension may be easily removed from the well tubing, since it is not then under extreme pressures. If, subsequently, further operations must be performed on the well, the plug 10 may be displaced downwardly from the nipple by pumping fluid into the well tubing or else it may be displaced mechanically by a suitable tool lowered into the well tubing on a flexible line.

It will be seen that a new and improved well plug 10 has been disclosed which has a tubular body 11 adapted to be detachably secured to the lower end of a tubing extension by shear pins 13. It will also be seen that dogs 30 are disposed on the tubular body which permit downward movement of the plug in the well tubing but which, when expanded below the lower open end of the tubing and locked in expanded position by the lock flange 37 of the tubular body, prevent upward movement of the plug and thus lock the plug in position closing the lower end of the well tubing. It will also be apparent that the tubular body is provided with a flap valve 47 which is normally open and which closes to close the bore of the tubular body when the wash pipe 12 attached to the tubing extension is moved upwardly out of the tubular body.

One of the principal advantages of the plug is the continuous linear passageway provided by the wash pipe which precludes blocking of the passageway with sand or foreign matter, such as might occur if the passageway were tortuous, and another is the open lower end of the wash pipe which permits the open end of the passageway to directly contact the sand in the well during sand washing operations.

It will also be apparent that the well plug seals off the bottom of the well tubing and provides for removal of the tubing extension without excessive well pressure being present in the tubing.

In Figure 4 is illustrated a modified form of the well plug wherein the tubular body 50, which corresponds to the tubular body 11 of the plug 10, is provided with similar locking dogs or keys 51. The lower end of the bore of the body is enlarged to provide a counterbore 52 which is adapted to receive the reduced upper end 53 of a closure cap 54 secured to the lower end of a tubular extension member or wash pipe 55 corresponding to the wash pipe 12 of the plug already described. The cap 53 is detachably secured to the wash pipe by a shear pin 56, and the wash pipe is provided with lateral windows 57 above the cap but below the tubular body 55.

This form of the plug is installed in the well in the same manner as the plug previously described, and all parts of this plug not herein expressly shown and described and given a new number are the same in structure and function as the corresponding parts of the plug of Figures 1 and 2. When the well operations requiring the use of the tubing extension are completed, the tubing extension is moved upwardly until the keys 51 prevent further upward movement of the tubular body 50. Upward force applied to the tubing extension then shears the pins which secure the tubular body to the wash pipe, and the wash pipe is then moved upwardly through the tubular body until the reduced upper end 53 of the cap 54 enters and is seated in the counterbore 52 of the tubular body, in which position the cap closes the bore of the body.

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Further upward jars now shear the pin 55 which secures the cap 54 to wash pipe, whereupon the wash pipe and tubing extension may be removed from the tubing while the cap 54 remains in place sealing the lower end of the bore of the tubular body. It will thus be seen that this modified form of the plug also permits the easy removal of the tubing extension from the well by sealing off the lower end of the tubing against excessive well fluid pressure.

Figure 5 illustrates still another modified form of the well plug wherein a tubular body 58 has an enlarged lower end portion 59 provided with an elongate counterbore 60 having a downwardly facing valve seat 61 therein. A ball valve 62 is mounted in the counterbore 60 of the tubular body, and a wash pipe 63 extends through a central aperture 62a in the ball valve. The ball valve has a pair of oppositely outwardly projecting guide pins 64 which extend into a pair of three directional slots 65 in the tubular body so that when the ball valve is moved upwardly in the counterbore 60, the engagement of the pins 64 in the slots 65 will cause the valve to rotate in a counterclockwise direction and bring its outer arcuate surface 66 into contact with the seat 61 to close the central passage or bore of the tubular body. Such upward rotary movement of the valve, of course, can take place only when the wash pipe is removed from its position extending through the bore 62a of the valve and from within the counterbore 60 of the tubular body.

The ball valve 62 is biased upwardly toward the valve seat 61 by a spring 67 bearing at its upper end against a ball washer 68 interposed between the ball valve and the spring in the counterbore 60 of the body, and bearing at its lower end against an annular retainer bushing 69 threaded in the lower end of the counterbore of the tubular body. The tubular body is provided with locking dogs or keys 70 which correspond to the dogs 30 of the plug 10 previously described, and which are held on the tubular body by dog retainers 71 and 72 in the same manner as the dogs 30. All parts of this form of the plug not here expressly shown and described and numbered are the same in structure and function as the corresponding parts of the plug of Figures 1 and 2.

In use, the wash pipe 63 is secured to the lower end of the tubing extension in the same manner as the wash pipe 12 of the plug 10 and the tubular body 58 is secured to the tubing extension by shear pins in the same manner as the tubular body 11 of the plug 10. The tubing extension is lowered into and suspended from the lower end of the well tubing in the manner already described to allow cementing or sand washing operations to be performed in the well. When such operations are completed, the tubing extension is pulled up until the dogs 70 engage the landing nipple at the lower end of the tubing and prevent further upward movement of the tubular body 58. Upward force imparted to the tubing extension shears the pins which secure the tubular body to the tubing extension, and the tubing extension and the wash pipe 63 are then removed upwardly. As the lower end of the wash pipe 63 passes upwardly through the aperture 62a in the ball valve, the valve is freed to move upwardly and also to rotate. The spring 67 then moves the ball valve upwardly, and during such upward movement the engagement of the guide pins 64 with the slots 65 causes the ball valve to rotate to a position in which the arcuate surface 66 of the ball valve seats or abuts against the valve seat 61 in the counterbore of the tubular body and thus closes the central bore of the tubular body to seal the interior of the well tubing from the well fluid pressure. The tubing extension may then be easily removed from the well tubing without being exposed to high fluid pressure.

In Figure 6 is illustrated still another modified plug having a tubular body 73 which has a dog retainer 74 threaded on its lower end. The flared upper end 75 of a wash pipe 76 is clamped between the lower end of the tubular body and an internal annular shoulder 74a in the dog retainer. A plurality of locking dogs or keys 77

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are held on the body by the lower retainer 74 and an upper retainer 78 secured to the tubular body by set screws 79, and the tubular body is provided with the usual lock flange 80 for locking the keys in expanded positions. A valve or packing seal 81 is secured to the upper end of the tubular body by a valve head 82 threaded into the upper end of the tubular body, and a plurality of lateral ports 83 are provided in the tubular body immediately below the valve seal 81. The valve seal 81 is adapted to contact a beveled valve seat 84 in the bore of an elongate tubular packing mandrel 85 which telescopes over the upper end of the tubular body. A packing retainer ring 86 is threaded on the lower end of the packing mandrel to hold an external packing assembly 87 on the mandrel, the packing assembly being confined between the retainer ring and a downwardly facing annular shoulder 88 on the packing mandrel. The packing mandrel is secured to the tubular body by shear pins 89 which extend through registering apertures in the upper retainer 78 and the packing retainer ring 86.

A top sub 90 has a lower reduced end 91 which telescopes in the upper end of the packer mandrel and is detachably secured thereto by a snap ring 93. An O-ring or seal 92 in an external annular groove on the lower reduced end of the sub seals between the sub and the packing mandrel. The top sub 90, of course, is internally threaded at its upper end for connection to the lower end of a tubing extension.

In use, the tubing extension with the plug connected thereto are lowered through the well tubing with the dogs 77 biased outwardly by the springs 94. When the sand washing or cementing operations are completed, the tubing extension is moved upwardly until the dogs engage the lower end of the tubing or landing nipple. Further upward movement of the tubing extension now moves the locking flange 80 to the locking position and locks the keys in their expanded positions.

Upward force imparted to the tubing extensions shears the pins 89, and after the pins are sheared the packer mandrel moves upwardly relative to the tubular body until the valve 81 engages the valve seat 84 and this stops further upward movement of such packer mandrel. The valve 81 now seals the central passageway or bore of the tubular body while the packer assembly 87 seals between the packer mandrel and the well tubing or landing nipple. The interior of the well tubing above the plug is now relieved of the well fluid pressure.

Further upward force applied to the tubing extension contracts the snap ring 93 and thus frees the tubing extension from the plug for upward removal from the well tubing.

By substituting a suitable running tool for the top sub 90, it is possible to install the plug with conventional wire line tools and techniques, thus sealing off the tubing from well pressure to permit installation of a tubing extension. The lower end of such an extension would be equipped with the top sub 90. When the top sub enters the mandrel 85, the snap ring 93 couples the extension and plug mechanically while the O-ring 92 provides a seal for the joint. The weight of the extension or fluid pumped into the tubing at the well head can be used to move the plug downwardly out of the landing nipple. When the extension hanger is landed in its landing nipple, conventional sand washing operations can be performed. Removal of the extension from the well can be accomplished in the manner already described. Use of this plug in a cement squeezing operation would necessitate the installation of a check valve (not shown) directly above the top sub to permit pumping the cement slurry out of the extension into the casing since the valve 81 would be closed.

It is also possible to run one of the plugging tools, such as in the form illustrated in Figure 4, by means of a wire line running and pulling mechanism connected by a shear pin to the top sub 16. In such instance, it

would be lowered to substantially the position shown in Figure 2, and would be suspended by the wire line in that position. When it is desired to close the tubing 44, the wire line would be pulled up, shearing the pin 13 and pulling the cup 54 into the lower end of the tubular body, whereupon the shear pins connecting the top sub to the running and pulling mechanism could be sheared and the running and pulling mechanism then removed from the well tubing.

It will be seen that several different modified forms of well tubing plugs have been illustrated and described, each of which may be detachably secured to the lower end of an extension tubing and each of which is provided with a valve means which remains open during lowering of the tubing extension through the tubing and during the performance of cementing and washing and other well operations. It will also be seen that the valve means of each plug closes to seal the well tubing against well fluid pressure after the plug enters the open lower end of the well tubing and is locked therein by dogs or keys cooperating with a lock flange on a central tubular body of the plug.

The foregoing description of the invention is explanatory only, and changes in the details of the constructions illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What we claim and desire to secure by Letters Patent is:

1. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; expansible and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body through the well tubing, said expansible and retractable means being initially retractable so as to be lowerable through the well tubing and expansible below the lower end of said well tubing so as to be engageable with the lower end of said tubing; valve means connected to said tubular body for closing said bore; means biasing said valve means toward closed position, said tubular member holding said valve means in open position while connected to said tubular body by said holding means; and sealing means for sealing between said tubular body and the well tubing.

2. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; expansible and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body through the well tubing, said expansible and retractable means being initially retractable so as to be lowerable through the well tubing and expansible below the lower end of said well tubing so as to be engageable with the lower end of said tubing; a flap valve mounted on the lower end of said tubular body for pivotal movement thereon for closing the lower end of the tubular body; means biasing said flap valve toward closed position, said tubular member holding said flap valve in open position while connected to said tubular body by said holding means; and sealing means for sealing between said tubular body and the well tubing.

3. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; expansible and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body through the well tubing, said expansible and retractable means being initially retractable so as to be lowerable through the well tubing and expansible below the lower end of said well tubing so as to be engageable with the lower end of said tubing; a dependent valve mandrel connected to the lower end of said tubular body having a longitudinal bore communicating with the longitudinal bore of said tubular body and having a valve seat; a ball valve mounted in said bore of said mandrel and having a central aperture; means biasing said ball valve toward said valve seat, said ball valve and said valve mandrel having cooperating means for rotating said ball valve upon movement of the ball valve toward said valve seat, said central aperture of the ball valve being in communication with said longitudinal bores when said ball valve is remote from said valve seat and being out of communication with said longitudinal bores when said ball valve is seated on said valve seat, said tubular member extending through said central aperture and holding said ball valve open when said tubular member is connected to said tubular body; said tubular member being removable from said central aperture of the ball valve when the means connecting said tubular member to said tubular body is disconnected, permitting said ball valve to be moved to closed position on said valve seat; and sealing means on said tubular body for sealing between the body and well tubing.

4. The device of claim 3 wherein: said expansible and retractable means engageable with the lower end of the well tubing comprises a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; and lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position.

5. The well plug of claim 3 wherein said cooperating means include a three directional slot provided in said mandrel, and a guide pin on said ball valve extending outwardly into said slot.

6. The device of claim 5 wherein: said expansible and retractable means engageable with the lower end of the well tubing comprises a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; and lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position.

7. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubu-

lar member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said body; expandable and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body through the well tubing, said expandable and retractable means being initially retractable so as to be lowerable through the well tubing and expandable below the lower end of said well tubing so as to be engageable with the lower end of said tubing; means on the lower end of said tubular body having a counterbore; a cap detachably connected to the lower end of said tubular member and receivable in said counterbore for closing said longitudinal bore of said tubular body when said tubular member is removed upwardly through the tubular body, said tubular member having lateral apertures disposed below said tubular body when said tubular member is connected to said tubular body; and sealing means on said tubular body for sealing between the tubular body and well tubing.

8. The device of claim 7 wherein: said expandable and retractable means engageable with the lower end of the well tubing comprises a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded position, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of well tubing; and lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position.

9. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a packer mandrel telescoping over the upper portion of said tubular body, said packer mandrel having an internal valve seat; a valve on the upper end of said tubular body engageable with said valve seat to close said longitudinal bore when said packer mandrel is moved upwardly to an upper position on said tubular body; shearable means holding said packer mandrel in a lower position on said tubular body; means on the upper end of said packer mandrel for detachably connecting said packer mandrel to the lower end of a tubing extension movable through the well tubing; sealing means on said packer mandrel for sealing between the packer mandrel and the well tubing; and expandable and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body in the well tubing, said expandable and retractable means being initially retractable so as to be lowerable through the well tubing and expandable below the lower end of said well tubing so as to be engageable with the lower end of said tubing.

10. The well plug of claim 9 wherein: said expandable and retractable means engageable with the lower end of the well tubing comprises a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; and lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position.

11. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and

having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower position, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position; valve means for closing said longitudinal bore upon upward movement of said tubular member relative to said tubular body; and sealing means for sealing between said plug and said well tubing.

12. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position; valve means connected to said tubular body for closing said bore; means biasing said valve means toward closed position, said tubular member holding said valve means in open position while connected to said tubular body by said holding means; and sealing means for sealing between said tubular body and the well tubing.

13. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular member to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of well tubing; lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position; a flap valve mounted on the lower end of said tubular body for pivotal movement thereon for closing the lower end of the tubular body; means biasing said flap valve toward closed position, said tubular body holding said flap valve in open position while connected to said tubular body by said holding means; and sealing means for sealing between said tubular body and the well tubing.

14. A well plug for well tubing comprising: a pair of tubular members, one of said tubular members telescop-

ing in the other of said tubular members; shearable means holding said members against longitudinal movement relative to one another; one of said tubular members being connectible at its upper end to the lower end of a tubing extension; one of said tubular members having expansible and retractable stop means thereon initially retractable so as to be lowerable through the well tubing and expansible below the lower end of said tubing so as to be engageable with the lower end of said tubing for preventing upward movement of said tubular member having said stop means thereon through said well tubing; one of said tubular members having means thereon for sealing between said tubular member and the well tubing; and valve means for closing the bore of the tubular member having the sealing means thereon, said valve means being held in open position while said shearable means holds said members against longitudinal movement relative to one another, longitudinal movement of said tubular members relative to one another after said shearable means has been sheared permitting the valve means to be moved to closed position.

15. A well tool for treating a well having a tubing string therein terminating short of the bottom of the bore of the well, said tool including: an elongate tubular section having a flow passage longitudinally thereof and insertable into and downwardly through said tubing string to extend below the lower end of said tubing string for treating said well; and a closure means detachably connected to the lower end of said elongate tubular section and having expansible and retractable stop means thereon engageable with the lower end of the tubing string to position said closure means at the lower end of said tubing string to close the bore of said tubing string against upward flow therethrough when said elongate tubular section is moved upwardly out of said tubing string and detached from said closure means, said closure means being detachable from said tubular member by longitudinal force applied to said tubular section and without rotation of said tubular section with respect to said closure means.

16. A well plug for well tubing comprising: a tubular body having a longitudinal bore; means for detachably connecting the upper end of said tubular body to the lower end of a tubing extension movable through well tubing; expansible and retractable locking means on said tubular body initially retractable so as to be lowerable through the well tubing and expansible below the lower end of the well tubing to a position to engage the lower end of said well tubing for preventing upward movement of the tubular body in the well tubing; sealing means on said body for preventing the flow of fluids between said body and the well tubing; closure means connected to said tubular body and co-acting therewith for opening and closing the said bore; and means extending through said body and initially holding said closure means in open position and movable from such position to permit said closure means to be moved to bore closing position when said means for detachably connecting said tubular body to a tubing extension is disconnected.

17. The device of claim 16 wherein: said locking means engageable with the lower end of the well tubing comprises a plurality of dogs mounted on said tubular body for lateral movement between retracted and expanded positions; means biasing said dogs toward expanded positions, said dogs also being mounted on said tubular body for limited longitudinal movement between upper and lower positions, said tubular body being movable upwardly relative to said dogs to move said dogs to said lower position on said body when said dogs engage the lower end of said well tubing; and lock means on said tubular body engageable with said dogs to lock said dogs in expanded position when said dogs are in said lower position.

18. A well plug for well tubing comprising: a tubular body having a longitudinal bore; a central tubular member extending slidably through said tubular body and having means on its upper end for connecting said tubular body to the lower end of a tubing extension lowerable through the well tubing; means detachably connecting said tubular member to said tubular body and holding said tubular member against longitudinal movement in said tubular body; expansible and retractable means on said tubular body engageable with the lower end of the well tubing for preventing upward movement of the tubular body through the well tubing, said expansible and retractable means being initially retractable so as to be lowerable through the well tubing and expansible below the lower end of said well tubing so as to be engageable with the lower end of said tubing; valve means co-acting with said tubular body for opening and closing the bore thereof, said valve means engaging said body for closing said longitudinal bore; said tubular member being engageable with said valve means for holding said valve means open and being disengageable from said valve means, permitting said valve means to be moved to closed position when said means connecting said tubular member to said tubular body is disconnected; and sealing means for sealing between said plug and said well tubing.

19. The method of running an extension tubing in a well having casing and tubing permanently secured therein for the purpose of performing operations through the tubing in the well bore below the lower end of the tubing which includes: temporarily closing the lower end of the tubing string in place in the well to shut off fluid pressure from the producing formation from admission into said tubing, releasing pressure from within the tubing at the surface; inserting an extension tube in the tubing while the lower end of the tubing is closed; lowering the extension tube to the lower end of the tubing string; closing the upper end of the tubing string above the extension tube; opening the lower end of the tubing string and lowering the extension tube downwardly out of the lower end of the tubing string to establish an extended flow path from the lower end of the tubing string to a point spaced therebelow; seating the upper end of the extension tube in the tubing string in sealing engagement therewith to provide such extended flow path; performing the desired operations in the well bore through such extended flow path; eliminating said extended flow path by moving the extension tube upwardly in the tubing; again temporarily closing the lower end of the tubing string to shut off admission of fluid pressure from the formation into said tubing string; releasing pressure within the tubing string at the surface; removing the extension tube from within the tubing string; then closing the upper end of the tubing string and opening the lower end of said tubing string to admit fluid flow into said tubing string.

20. The method of running an extension tube in a well as set forth in claim 19 and including: the additional step of opening the lower end of the tubing string after the extension tube has been removed therefrom by pumping fluid downwardly through said tubing string from the surface.

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