

March 14, 1944.

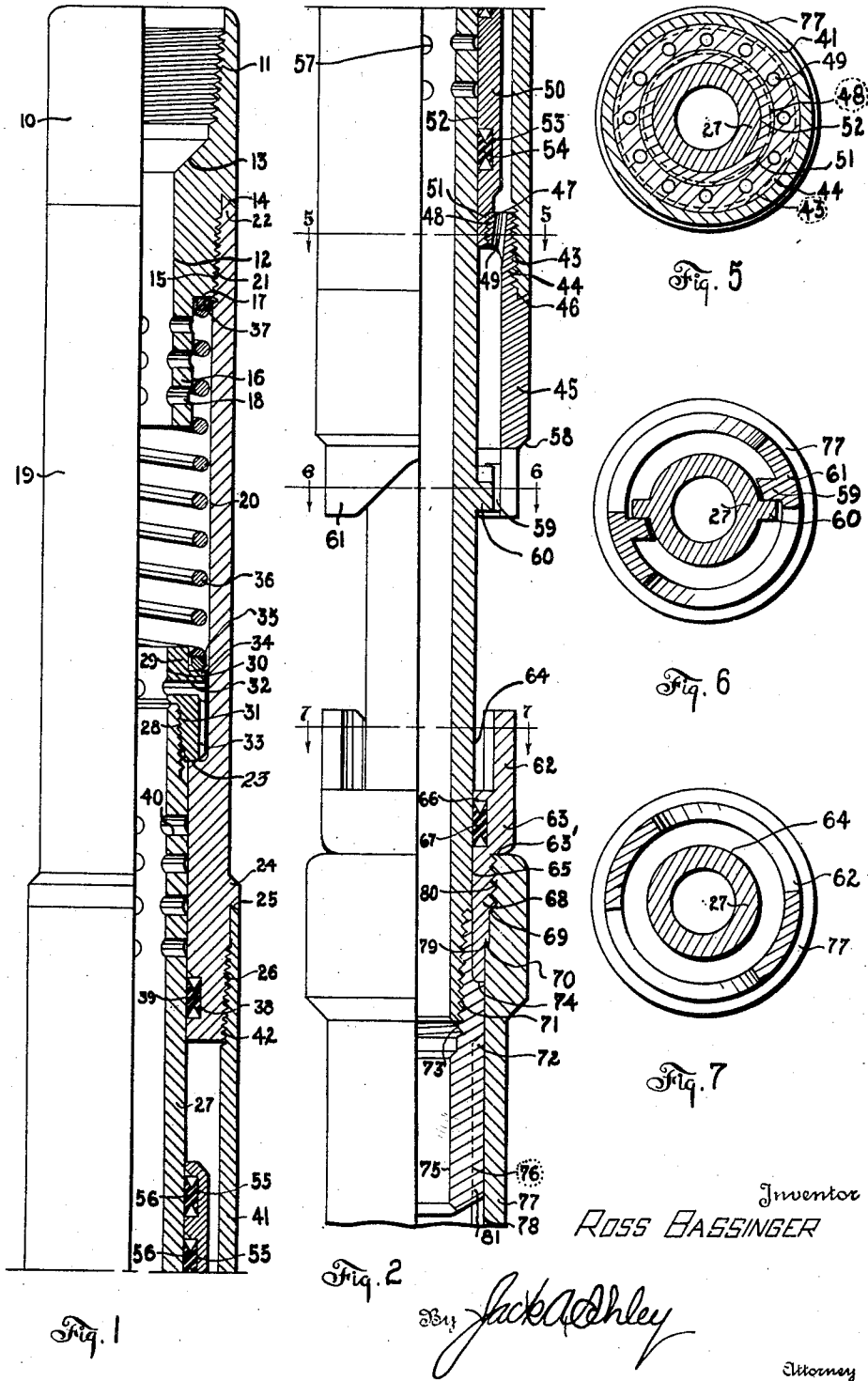
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2,344,121

RELEASABLE SETTING TOOL AND BYPASS

Filed Sept. 23, 1940

4 Sheets-Sheet 1



March 14, 1944.

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2,344,121

RELEASABLE SETTING TOOL AND BYPASS

Filed Sept. 23, 1940

4 Sheets-Sheet 2

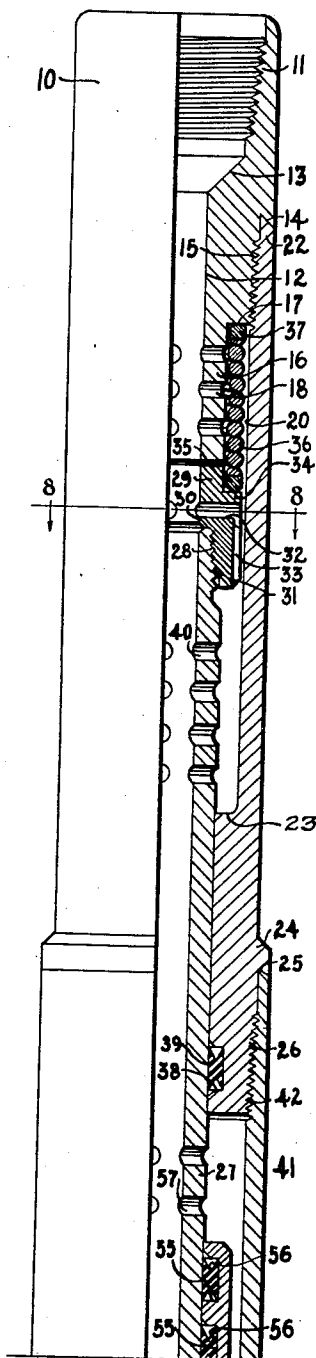


Fig. 3

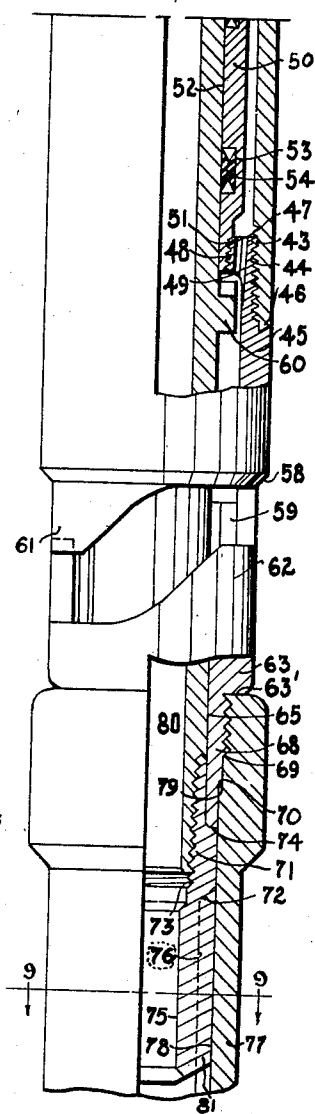


Fig. 4

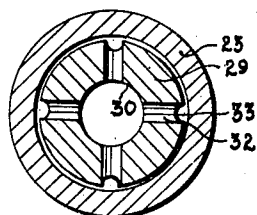


Fig. 8

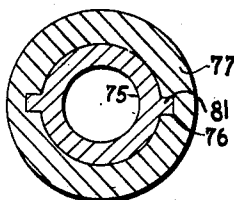


Fig. 9

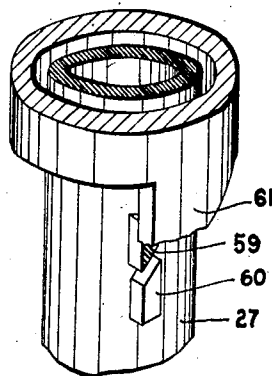


Fig. 10

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RELEASABLE SETTING TOOL AND BYPASS

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4 Sheets-Sheet 3

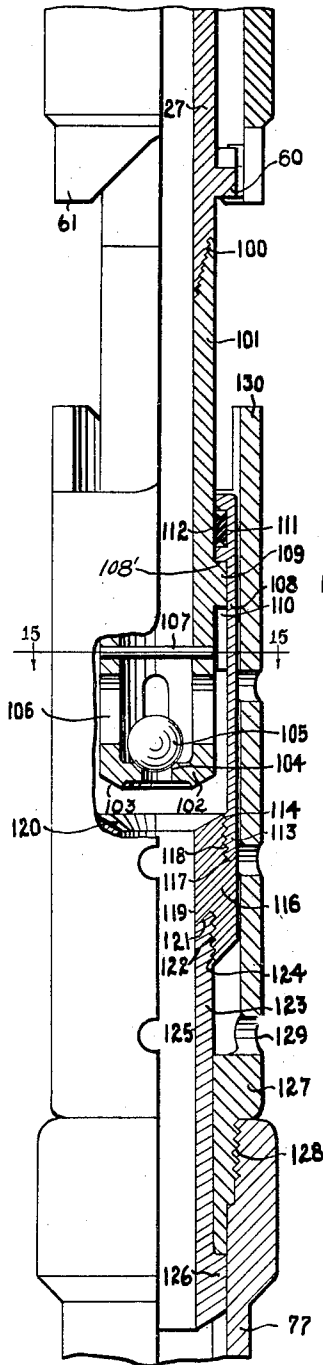


Fig. 11

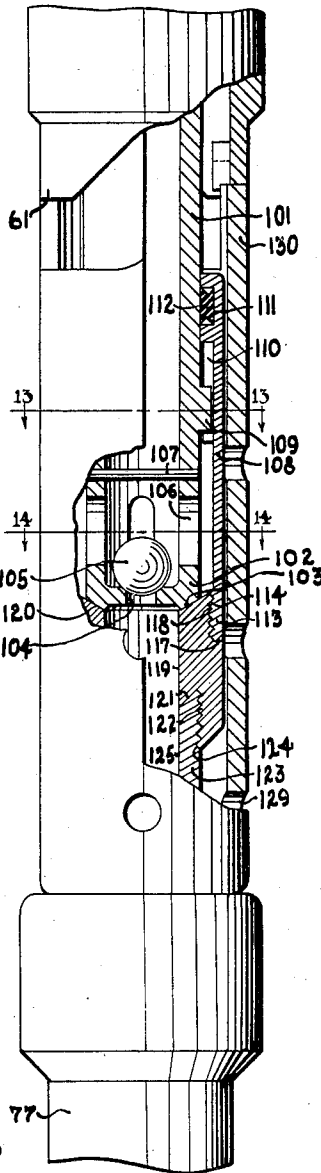


Fig. 12

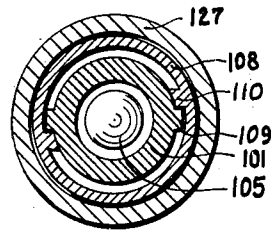


Fig. 13

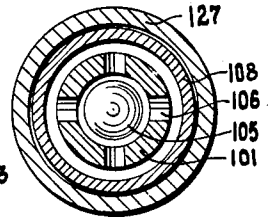


Fig. 14

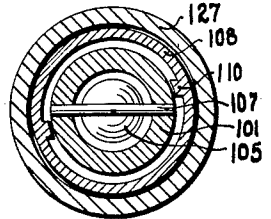


Fig. 15

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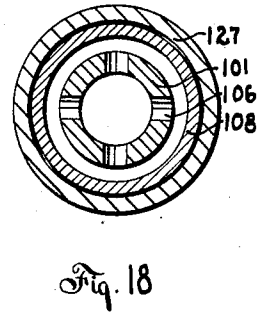
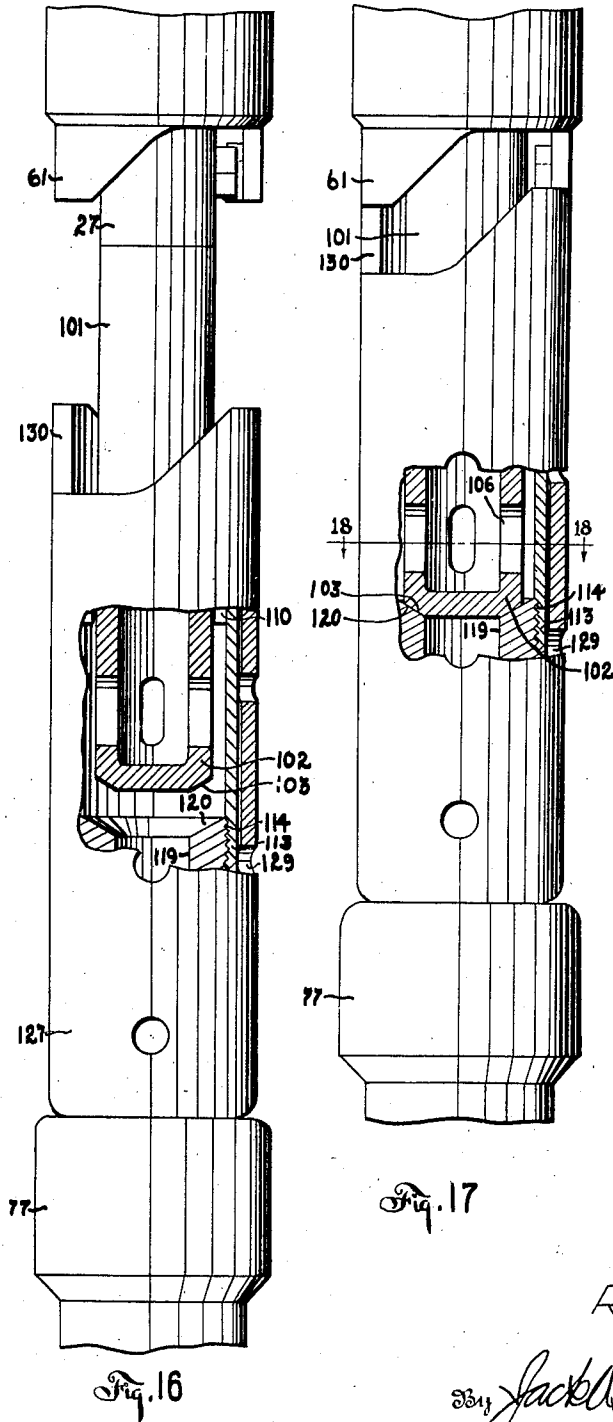
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2,344,121

RELEASABLE SETTING TOOL AND BYPASS

Filed Sept. 23, 1940

4 Sheets-Sheet 4



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2,344,121

RELEASABLE SETTING TOOL AND BY-PASS

Ross Bassinger, Houston, Tex.

Application September 23, 1940, Serial No. 357,905

9 Claims. (Cl. 166—1)

This invention relates to new and useful improvements in a releasable setting tool and by-pass.

In many instances in oil field practice, particularly in fields having a deep producing horizon, it has been found advantageous to cement or seal off certain portions of a well bore. The sealing off operation may be performed in various different ways. The object of the sealing or cementing operation is usually to seal off certain stratum or strata from other stratum or strata, or from the well bore. It is customary to use a well plug, or cement retainer, to hold the sealing cement in place while it hardens or sets. Such a well plug is disclosed in my co-pending applications, Serial No. 292,029, filed August 26, 1939, which became Patent No. 2,230,447, issued February 4, 1941; Serial No. 333,584, filed May 6, 1940; and Serial No. 353,990, filed August 24, 1940.

The setting tool disclosed in the present application is particularly adapted for use with well plugs of these types, but may be utilized in various other modes.

After the sealing cement has been forced downwardly through the tubing string, and delivered below the well plug, as is the usual case, the tubing remains partially filled with cement. Some means is necessary to wash down or clean the tubing of the cement present therein.

In addition, with well plugs of the type disclosed in my co-pending applications, hereinbefore referred to, it is necessary to provide some means for disconnecting the tubing string from the plug so that the former may be withdrawn from the well bore. In my co-pending application, Serial No. 317,232, filed February 5, 1940, which became Patent No. 2,317,021, issued April 20, 1943, there is disclosed such a means.

Now, it has been found that it is desirable to have a setting tool having means for normally holding the clutch jaws apart, and having means for washing down the various elements of said tool.

One object, therefore, of this invention is to provide an improved setting tool for well plugs, and the like, having means for disconnecting the plug from the tubing so that the latter may be withdrawn from the well bore; and wherein means are provided to allow the cement standing in the tubing string to flow or drain therefrom.

Another object of the invention is to provide an improved setting tool for well plugs, and the like, wherein means are provided for normally holding the clutching means disengaged so that

force must be exerted in order to engage said clutch.

An important object of the invention is to provide an improved setting tool wherein means are provided for washing down and cleansing the various elements of the device along with the tubing, so that any cement present is flushed away, thereby preventing any such cement from interfering with the operation of the tool, and leaving the tubing free of cement.

A further object of the invention is to provide an improved setting tool which may be utilized to disconnect the tubing from the well plug in such a manner that only the plug itself is left in the well bore, the tubing and setting tool being withdrawn in their entirety.

A still further object of the invention is to provide an improved setting tool which, when in a washing-down and releasing position, positively prevents any fluid from being pumped into the formation from the conductor connected to said tool, whereby the possibility of contaminating the cementing zone during the washing-down operation is obviated.

An additional object of the invention is to provide an improved setting tool which, when used in conjunction with a well plug having no back pressure valve, may be utilized to form a production packer to produce the well or as a cement retainer, whereby the tool, along with a well plug, may be lowered into a well bore and the well started flowing, the well being shut off if it produces undesirable fluids, such as salt water or gas, and the tool utilized as a cement retainer to plug the well bore.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a longitudinal view, partly in elevation and partly in section, of the upper portion of a setting tool constructed in accordance with the invention, and showing the tool in a setting position,

Figure 2 is a view, similar to Figure 1, and a continuation thereof, showing the lower portion of the setting tool in a setting position,

Figure 3 is a view, partly in elevation and partly in section, showing the upper portion of the setting tool in a washing-down and releasing position,

Figure 4 is a continuation of Figure 3, showing the lower portion of the tool in a washing-down and releasing position,

Figure 5 is a horizontal, cross-sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a horizontal, cross-sectional view taken on the line 6—6 of Figure 2,

Figure 7 is a horizontal, cross-sectional view taken on the line 7—7 of Figure 2,

Figure 8 is a horizontal, cross-sectional view taken on the line 8—8 of Figure 3,

Figure 9 is a horizontal, cross-sectional view taken on the line 9—9 of Figure 4,

Figure 10 is an isometric view of a portion of the tool showing the upper set of clutch jaws and one pair of splines,

Figure 11 is a longitudinal view, partly in elevation and partly in section, of the lower portion of a setting tool constructed in accordance with a modification of the invention, and showing the tool in a setting position,

Figure 12 is a longitudinal view, partly in elevation and partly in section, of the lower portion of the setting tool as shown in Figure 11, showing the tool in a washing-down and releasing position,

Figure 13 is a horizontal, cross-sectional view taken on the line 13—13 of Figure 12,

Figure 14 is a horizontal, cross-sectional view taken on the line 14—14 of Figure 12,

Figure 15 is a horizontal, cross-sectional view taken on the line 15—15 of Figure 11,

Figure 16 is a longitudinal view, partly in elevation and partly in section, of the lower portion of a setting tool constructed in accordance with a further or second modification of the invention, and showing the tool in a setting position,

Figure 17 is a longitudinal view, partly in elevation and partly in section, of the lower portion of the setting tool as shown in Figure 16, showing the tool in a washing-down and releasing position, and

Figure 18 is a horizontal, cross-sectional view taken on the line 18—18 of Figure 17.

In the drawings, the numeral 10 designates a circular head having an internally screw-threaded box 11 formed at the upper end thereof. The head 10 is provided with a restricted axial bore 12 which extends downwardly from an internal, beveled, annular shoulder 13 formed below the box 11. The outer portion of the head 10 is reduced in diameter at a point spaced from the upper end thereof, so as to form an external annular shoulder 14. The shoulder 14 is recessed so as to extend downwardly and outwardly at an angle and thereby overhang the reduced portion of the head, external screw-threads 15 being provided upon said reduced portion. The outside diameter of the head is further reduced below the threads 15 to form a shank 16 and a second shoulder 17. For establishing communication between the bore 12 and exterior of the shank 16, a plurality of radial ports 18 are provided in the wall of said shank.

A tubular sleeve 19, having substantially the same outside diameter as the upper portion of the head 10, is provided with an axial bore 20. Internal screw-threads 21 are formed on the upper portion of the bore 20 and engage the threads 15 formed on the head 10 so as to suspend the sleeve therefrom. The upper end 22 of the sleeve is beveled so as to fit into the recessed shoulder 14. The lower portion of the bore 20 is reduced in diameter so as to form an internal annular shoulder 23, while an external annular

boss 24 is provided on the outer side of the sleeve 19 below the horizontal plane of said shoulder. The lower side 25 of the boss 24 is recessed in the same manner as the shoulder 14. External screw-threads 26 are formed upon the lower end of the sleeve below the boss 24.

A tubular mandrel 27 has a sliding fit within the restricted lower portion of the bore 20, and has its upper end reduced and formed with external screw-threads 28. A collar 29 is disposed above the mandrel 27 within the bore 20, and is provided with an axial bore 30 substantially equal in diameter to the bore of said mandrel. The lower portion of the bore 30 is enlarged and carries internal screw-threads 31 so as to engage the screw-threads 28 formed upon the mandrel. As clearly shown in Figures 1 and 3, the collar 29 is of larger outside diameter than the mandrel and rests upon the shoulder 23, thereby supporting the mandrel within the restricted lower portion of the bore 20.

The collar 29 is provided with a plurality of radial ports 32 which extend from the wall of the bore 30 to the outer surface of the collar. A vertical groove 33 extends downwardly in the outer surface of the collar from each of the ports 32. The upper portion of the collar 29 is reduced in diameter so as to form an external annular shoulder 34. A bearing ring 35 encircles the reduced portion of the collar and rests upon said shoulder. A helical coil spring 36 is disposed within the bore 20 of the sleeve 19 so as to rest upon the bearing ring 35. The upper end of the spring 36 engages a bearing ring 37 similar to the ring 35, which ring 37, in turn, engages the shoulder 17 formed upon the head 10. Thus, the spring 36 is placed so as to constantly urge the mandrel 27 downwardly with respect to the sleeve 19, so that the collar 29 engages the shoulder 23.

An annular recess 38 is formed near the lower end of the wall of the restricted lower portion of the bore 20, and a pressure-seal packing ring 39 is positioned therein. The ring 39 is adapted to seal off the space between the mandrel 27 and the sleeve 19 against pressures acting both upwardly and downwardly. A plurality of radial ports 40 are provided in the wall of the mandrel near the upper end thereof. While the ports 40 are shown as circular in the drawing, they may be of any suitable or desirable shape. This statement applies with regard to all the ports provided in the device. The ports 40 are located so as to be above the packing ring 39 when the device is in a setting position, as is shown in Figure 1.

A tubular sleeve 41, having internal screw-threads 42 formed in its upper end, is secured to the lower end of the sleeve 19 by means of the threads 26. The upper end of the sleeve 41 is beveled so as to fit into snug engagement with the beveled shoulder 25. The sleeve 41 has an outside diameter substantially equal to the outside diameter of the boss 24 so that a substantially continuous exterior surface is provided. Internal screw-threads 43 are provided on the lower end of the sleeve 41 so as to engage external screw-threads 44 formed upon the upper end of a collar 45, whereby said collar is supported by the sleeve. The collar 45 is enlarged below the threads 44 so as to form an exterior annular shoulder 46, which shoulder abuts the lower end of the sleeve 41. The lower end of the sleeve is beveled and the shoulder 46 is beveled

in a complementary fashion so as to form a snug joint between the collar and the sleeve.

An internal annular flange 47 is provided at the upper end of the collar 45 and carries internal screw-threads 48 upon its inner surface. A plurality of longitudinal ports 49 are provided in the flange 47 so as to communicate between the spaces above and below said flange. A tubular member 50 carries external screwthreads 51 upon its lower end and is mounted above the flange 47 by means of the engagement of said screw-threads with the screw-threads 48. The tubular member 50 is formed with an axial bore 52 of such diameter as to allow the member to have a sliding fit around the mandrel 27, and extends upwardly from the flange 47 to a point spaced below the lower end of the sleeve 19. An internal, annular recess 53 is formed in the wall of the bore 52 at a point near the lower end of the member 50, and a pressure-seal packing ring 54, similar to the packing ring 39, is disposed in said recess. A pair of internal, annular recesses 55 are also formed, one above the other, near the upper end of the member 50; said recesses being similar to the recess 53 and being provided with pressure-seal packing rings 56, similar to the packing ring 54 and the packing ring 39.

A plurality of radial ports 57 are provided in the mandrel 27 so as to lie between the packing ring 54 and the packing rings 56 when the device is in a setting position, as is shown in Figure 1.

The lower end of the collar 45 is reduced in diameter so as to form a beveled shoulder 58, and a plurality of internal splines 59 are spaced about the inner wall of the collar at the lower end thereof. The splines 59 are adapted to engage a plurality of complementary splines 60 formed upon the outer surface of the mandrel 27. In this manner a rotative motion may be imparted to the head 10 and transmitted through the sleeve 19, the sleeve 41, the collar 45, and the splines 59 and 60, to the mandrel 27. The advantages of this construction will be pointed out hereinafter. The lower ends of the splines 59, and the upper ends of the splines 60 are inclined, so that said splines will readily mesh when moved toward one another.

The lower reduced end of the collar 45 is cut away in portions so as to form depending clutch jaws 61. The device is shown in the drawings as being provided with two such jaws adapted to transmit right-hand rotation. However, it is to be noted that any desirable number of jaws might be utilized. A similar pair of clutch jaws 62 are disposed on the upper end of a clutch member 63 which encircles the mandrel 27 at a point spaced below the collar 45. The clutch jaws 62 are adapted to mesh with the jaws 61, whereby a right-hand rotative movement may be communicated from the collar 45 to the clutch member 63.

As will be noted in the drawings (Figures 2 and 4), the jaws 62 are spaced from the mandrel 27, whereby an annular space 64 is provided between said jaws and the mandrel. The clutch member 63 is provided with an axial bore 65 of such diameter as to give the member a snug sliding fit upon the mandrel. The bore 65 extends from the lower end of the jaws 62 to the lower end of the clutch member, and is provided with an internal, annular recess 66, carrying a pressure-seal packing ring 67, similar to the packing rings 54 and 56. The outer surface of the clutch member is reduced in diameter intermediate the ends

of said member so as to form an external annular shoulder 63' and a tubular shank 68. External left-hand screw-threads 69 are formed upon said shank near the upper end thereof. The shank 68 is further reduced at a point spaced below the screw-threads 69 to form an exterior annular shoulder 70.

The mandrel 27 has its lower end disposed near the lower end of the member 63. The lower end of the mandrel is reduced in diameter and provided with external screw-threads 71. A tubular spline member 72, having an internally screw-threaded bore 73 formed in its upper end, is secured to the lower end of the mandrel 27 by means of the threads 71. The spline member 72 has its upper end reduced in diameter to substantially the diameter of the mandrel so as to accommodate the shank 68 of the clutch member 63. The shoulder 74, formed by reducing the upper end of the spline member, abuts the lower extremity of the clutch member. An axial bore 75 extends from the bore 73 to the lower end of the spline member and a plurality of external splines 76 are formed upon the lower portion of the member 72.

A well plug 77, having an axial bore 78, is disposed beneath the clutch member 63. The plug 77 may be of any suitable type. The device herein described is particularly applicable to well plugs such as are disclosed in my co-pending applications, mentioned hereinbefore. The upper end of the bore 78 is enlarged so as to form an internal annular shoulder 79 which engages the shoulder 70 formed upon the clutch member 63. Internal left-hand screw-threads 80 are provided in the enlarged portion of the bore 78 and engage the left-hand screw-threads 69 formed upon said clutch member, whereby the plug is suspended from said member. The clutch member, in turn, is supported by the shoulder 74 of the spline member 72 which is secured to the lower end of the mandrel 27. A plurality of internal splines 81 are formed upon the wall of the bore 78. The splines 81 are engaged by the splines 76, whereby rotational movement is transmitted from the spline member 72 to said plug.

The operation of the auxiliary device is positive and efficient. As the plug 77 is lowered into the well bore (not shown), it is suspended from the lower end of the device as has been hereinbefore described. The lower end of the tubing string (not shown) connects into the box 11 of the head 10 so as to support the device and the plug. After the plug has been lowered to the desired location within the well bore, the compressive force exerted by the spring 36 will force the device to assume an extended or setting position, as is shown in Figures 1 and 2 of the drawings. The weight of the plug will coact with the spring 36 in its function to cause the device to assume an extended position. The spring 36 coacts with the plug to force the mandrel 27 downwardly within the sleeves 19 and 41 so as to place the device in such a position. It will be noted in the drawings that the ports 40 abut the restricted lower portion of the bore 20, and are sealed by means of the packing ring 39. Thus, the ring 39 prevents any fluid from passing through the ports 40 and downwardly into the space between the mandrel 27 and the sleeve 41. The ports 57 are similarly packed off by means of the packing rings 54 and 56 which are positioned respectively below and above said ports.

With the plug and auxiliary device in this po-

sition, the tubing, which is not shown in the drawings, may be rotated to set the plug. The rotative movement will be transmitted from the tubing to the head 10, and thence through the sleeve 19 to the sleeve 41. The movement is then transmitted from the sleeve 41, through the collar 45, the splines 59 and 60, to the mandrel 27; and from the mandrel, through the splines 76 and 81, to the well plug proper 77, whereby the plug is set within the well bore. Cement may now be pumped down through the tubing, the bore 12 of the head 10, the bore 26 of the sleeve 19, and the bore of the mandrel 27, into the interior of the plug 77, from where it is delivered to the desired location within the well bore.

For the next step in the operation, the tubing string is lowered so that the weight of said tubing rests upon the head 10 of the auxiliary device. This action compresses the spring 36 and causes the sleeves 19 and 41 and the collar 45 to telescope the mandrel 27, so that the splines 59 and 60 are disengaged and the clutch jaws 61 and 62 engaged with one another. This position of the device is shown in Figures 3 and 4 of the drawings. It is to be noted that the extremities of the clutch jaws 61 and 62 are formed blunt so that the possibility of mismatching the jaws, or jamming the jaws, is eliminated. A suitable washing fluid may now be conducted downwardly through the tubing string so as to enter the bore 12 of the head 10. The washing fluid will pass outwardly through the ports 18 in the shank 16 of the head 10 so as to thoroughly wash and flush the space occupied by the compressed spring 36. The fluid will also pass through the ports 32 and the recess 33 so as to wash out the space beneath the collar 29 and above the shoulder 23.

As may be noted in the drawings, with the device in its washing position, the ports 40 are adjacent said space so that the washing fluid may circulate therefrom. Continuing downwardly, the washing fluid will flow outwardly through the ports 57 and downwardly around the outside of the tubular member 50, so as to pass through the ports 49 and wash the splines 59 and 60. At the same time, downwardly-traveling washing fluid will wash and flush the clutch jaws 61 and 62. Any fluid trapped in the annular space 64 between the mandrel and the jaws 62 may flow outwardly between the jaws. Thus, the tubing and the auxiliary device are flushed clean of cement and the various elements of the auxiliary device are individually washed and flushed so that further operations are not impeded in any way by the presence of cement. Manifestly, if the operator so desires, the washing-down operation may be conducted in a manner opposite to that described hereinabove. The washing fluid may be conducted downwardly through the well casing (not shown) and upwardly through the well tubing. The two methods are substantially equivalent.

After the washing operation is completed, the next step is the releasing of the auxiliary device from the well plug. Since the plug is now in a set position, and the mandrel 27 is secured thereto, the mandrel may not be rotated. However, the disengagement of the splines 59 and 60 allows the sleeves 19 and 41 to be rotated while the mandrel remains stationary. For this reason the bearing rings 35 and 37 are provided at the lower and upper ends, respectively, of the helical spring 36. The bearing rings allow the head 10 to be rotated, while the collar 29 remains stationary, without causing the spring 36 to become snarled

or entangled in any fashion with other elements of the device. As has been hereinbefore set forth, the splines 59 and 60 are disengaged when the device is in a washing position, and the rotative motion of the sleeve 41 will not be communicated to the mandrel 27 through the collar 45. Instead, the clutch jaws 61 and 62 being engaged, the clutch member 63 will be given a right-hand rotation by the collar 45. This rotation unscrews the left-hand joint formed by the left-hand threads 69 and 79, whereby the auxiliary device is disconnected from the well plug. After the left-hand joint has been broken, the tubing and the auxiliary device may be raised and removed from the well bore. It is to be noted that the spline member 72 will engage the clutch member 63 by means of the shoulder 74 and prevent said member from being left in the well bore. Thus, the entire structure with the exception of the well plug itself is retrieved from the well bore.

In Figures 11 to 15, inclusive, a modification of the invention is disclosed. This form of the invention is very similar to the first form with the exception of the structure below the upper clutch jaws 61. The structure of this modification is identical to the structure of the first form, hereinbefore described, down to the splines 60 which are formed upon the mandrel 27. In the second form, the mandrel is terminated at a point spaced slightly below the splines 60 and is provided with tapered, external screw-threads 100. A shorter mandrel 101 is provided with tapered internal screw-threads at its upper end so as to engage the screw-threads 100 of the mandrel 27 and be supported thereby. As will be noted, the mandrel 101 is formed with substantially the same inside and outside diameter as the mandrel 27. The lower end 102 of the mandrel 101 has its edges 103 beveled so as to comprise a valve drop. An axial opening 104 is provided in the lower end 102, and a valve ball 105, disposed within the bore of the mandrel 101, seats thereupon. A plurality of radial, elongate openings 106 are provided in the mandrel 101, adjacent the ball 105. A pin 107 extends diametrically across the bore of the mandrel above said openings to limit upward movement of the ball. A tubular spline member 108 surrounds the lower portion of the mandrel 101 and is provided with inwardly projecting splines 110 upon its inner wall. The splines 110 engage external splines 109 formed upon the mandrel 101 above the pin 107. The upper portion of the bore of the member 108 is reduced so as to have a snug sliding fit about the mandrel 101 and to form an internal annular shoulder 108'. An annular recess 111 is formed in the reduced portion of the bore of the member 108 and a pressure-seal packing ring 112, similar to the rings 54 and 56, is disposed therein. The ring 112 prevents cement from flowing upwardly past the mandrel during the cementing operation. The splines 109 engage beneath the shoulder 108' so as to support the member 108 and the elements suspended therefrom.

The lower end 113 of the spline member 108 is beveled and internal screw-threads 114 are provided thereupon. A collar 116 has its upper portion reduced with respect to outside diameter and so as to form a shoulder 117. External screw-threads 118 are provided upon the upper reduced portion of the collar and engage the screw-threads 114 formed on the lower end of the member 108, whereby the collar is supported therefrom. The shoulder 117 is tapered so as to form a snug joint with the beveled lower end

113 of the spline member. The collar is provided with an axial bore 119 and has a beveled valve seat 120 formed on its upper end adapted to receive the lower beveled end 103 of the mandrel 101.

The lower end of the collar 116 is reduced with respect to inside diameter so as to form a tapered shoulder 121, and is provided with internal screw-threads 122. A sleeve 123 has external screw-threads 124 formed on its upper end, which threads engage the threads 122 of the collar 116 so as to support the sleeve 123 therefrom. The upper end of the sleeve is tapered so as to form a tight joint with the tapered seat 121. The sleeve is provided with an axial bore 125 which forms a continuation of the bore 119. The lower end of the sleeve is provided with an external annular flange 126 which has its lower face beveled so as to rest upon the upper end of the splines 81.

An elongate clutch member 127 is disposed in the upper end of the well plug 77 in substantially the same manner as is set forth in the description of the first form of the invention, and is secured thereto by means of left-hand threads 128 similar to the left-hand threads 79. The lower end of the member 127 abuts the upper surface of the flange 126. The upper portion of the member 127 is in the form of a sleeve and carries a plurality of radial ports 129. Clutch jaws 130, similar to the jaws 62 of the first form, are formed upon the extreme upper end of the member 127.

In its broad aspects, the operation of this second form of the invention is substantially identical to the operation of the first form. As the device is lowered into the well bore, the well fluid usually present therein will pass upwardly through the opening 104, displacing the ball 105. The pin 107 prevents the ball from traveling too great a distance upwardly through the bore of the mandrel 101.

In many instances the pressure required to wash down the well bore along with the tubing and auxiliary device, after the cementing operation has been completed, is greater than the pressure required to pump cement into the desired location, due to the fact that it is necessary to overcome the hydrostatic head of the fluid standing in the well bore above the well plug. In such a situation the use of ordinary cementing means, or the use of the first form of this invention, would allow the washing-down fluid to enter the area being cemented with the accompanying undesirable results. With the structure disclosed in this modification of the invention, such an occurrence is prevented. When the tubing is lowered so as to place the device in a washing-down and releasing position, the lower end 103 of the mandrel 101 will come to rest upon the seat 120. At the same time, the ball 105 will seat upon the opening 104, thereby closing the same. Washing-down fluid may now be conducted down into the device under any desirable, practical pressure and will be positively prevented from entering into the plug 77 and thence into the cementing zone. This is only one instance of the applicability of this form of the invention. There are other advantageous uses of the same. It is to be noted that there is a slight space between the upper sleeve-like portion of the clutch member 127 and the outside of the spline member 108. This allows washing fluid to pass downwardly through said space and

out through the ports 129 so as to flush out any cement which may enter into said space.

In Figures 16, 17, and 18 of the drawings, there is shown a further modification of the invention. This third form of the invention is substantially identical to the second form hereinbefore described with the exception that the opening 104, the ball 105, and the pin 107, are omitted.

In some instances in oil field practice, it is desirable to run a tool into the well bore through which the well may be produced, or which may be used to cement the well. This third form of the invention fulfills such a need. The device is lowered into the well bore along with a well plug having no back pressure valve. After the plug 77 is set, the well may be flowed through the tubing string. If the well produces undesirable fluids, cement may be conducted downwardly through the tubing so as to cement off the zone producing undesirable fluids. After the cement has been conducted to the desired location, the tubing is lowered, thereby bringing the lower end of the mandrel 101 into engagement with the valve seat 120. This operation closes off the bore 125 and the bore of the plug 77, so that the equivalent of a back pressure valve is provided. The closing of the bore 125 holds the cement in place within the well bore and formation until it has reached its initial set. After an initial set has been obtained, the auxiliary device is released from the well plug in the same manner as the first and second forms of the invention, and withdrawn from the well bore. It is to be noted that the cementing operation may be commenced without withdrawing the tubing from the well so as to make alterations or additions to the auxiliary device or the well plug.

Thus, a device is provided which serves a two-fold purpose within the well bore, and which performs either function without requiring removal from and re-insertion into the well opening, with the accompanying expense and lost time of such an operation. This form operates in all other respects in substantially the same manner as the second form. Well fluid passing upwardly through the device, as the same is lowered into the well bore, flows around the lower end of the mandrel 101 and through the openings 106, rather than through the opening 104. Aside from the disclosure given hereinbefore, the structure and operation of the third form of the invention is substantially the same as that set forth in connection with the description of the second form.

Various changes, alterations and modifications may be made in the size, shape and arrangement of the herein described elements within the scope of the appended claims.

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

1. A well device for connecting a conductor with a well tool which is set in the well including, an elongate body having means at its upper for securing it to a well conductor, an elongate tubular member movably mounted in the body, means for rendering said member incapable of rotative movement relative to the body, said member being adapted to undergo a limited longitudinal movement within said body with relation to the body so as to disengage said second-named means, valve means disposed within the device and adapted to be engaged by said elongate member so as to prevent the flow of fluid into the well tool when said member is

in a predetermined longitudinal position with respect to the body, and means connecting said member with the well tool, whereby a rotation of the conductor will rotate the tool through the body and member to permit setting of said tool in the well bore.

2. A well device for connecting a conductor with a well tool which is set in the well including, an elongate body having means at its upper end for securing it to a well conductor, an elongate tubular member movably mounted in the body, means for rendering said member incapable of rotative movement relative to the body, said member being adapted to undergo a limited longitudinal movement within said body with relation to the body so as to disengage said second-named means, valve means disposed within the device and adapted to be engaged by said elongate member so as to prevent the flow of fluid into the well tool when said member is in a predetermined longitudinal position with respect to the body, and clutching means disposed between the body and the well tool and arranged to be actuated by the longitudinal movement of the body, whereby when the clutching means is engaged a rotation may be imparted to the tool from the conductor and through the body, the body and member having ports therein which are adapted to communicate with each other when the member is in a predetermined longitudinal position with relation to the body, whereby the fluid within the conductor may be drained therefrom through the communicating ports.

3. A well device for connecting a conductor with a well tool which is set in the well including, an elongate body having means at its upper end for securing it to a well conductor, an elongate tubular member movably mounted in the body, means for rendering said member incapable of rotative movement relative to the body, said member being adapted to undergo a limited longitudinal movement within said body with relation to the body so as to disengage said second-named means, a back pressure valve seat disposed within the device and adapted to be engaged by said elongate member so as to prevent the flow of fluid into the well tool when said member is in a predetermined longitudinal position with respect to the body, and means connecting said member with the well tool, whereby a rotation of the conductor will rotate the tool through the body and member to permit setting of said tool in the well bore.

4. A well device for connecting a conductor with a well tool which is to be set in a well bore including, an elongate body having means at its upper end for securing it to a well conductor, an elongate tubular member movably mounted in the body, means for preventing rotative movement of the member relative to said body, means at the lower end of said member for securing the member in connection with the well tool, whereby rotation of the conductor will rotate said tool by means of the body and member to permit setting of the tool in the well bore, said body being movable longitudinally with relation to said member so as to disengage the preventing means and permit rotation of the body relative to the member, and means carried by said body for engaging the securing means upon relative longitudinal movement between the body and

member to release said member for disconnection from said tool by rotation of said body.

5. A well device as set forth in claim 4 wherein the body and member each have spaced ports formed therein which are normally closed and which communicate with each other when said body is moved longitudinally relative to said member, whereby fluid within the conductor may be drained therefrom through the communicating ports.

6. A well device for connecting a conductor with a well tool which is to be set in a well bore including, an elongate body having means at its upper end for securing it to a well conductor, an elongate tubular member movably mounted in the body, and having the well tool connected to its lower end, means for preventing rotation of the member relative to said body, the body being movable longitudinally relative to said member so as to disengage the preventing means, and co-acting clutch means associated with said body and well tool normally spaced from each other and being engaged by longitudinal movement of the body relative to the member and tool, whereby rotation may be imparted to said tool from the conductor through said body and member to set the tool when the clutch means is disengaged and the preventing means engaged, the body being rotatable relative to said tool and member to release the device for disconnection from the tool when said clutch means is engaged and said preventing means disengaged.

7. A well device as set forth in claim 6 wherein the body and member each have spaced ports formed therein which are normally closed and which communicate with each other when said body is moved longitudinally relative to said member, whereby fluid within the conductor may be drained therefrom through the communicating ports.

8. A well device for connecting a conductor with a well tool which is to be set in a well bore including, an elongate body having means at its upper end for securing it to a well conductor, an elongate tubular member movably mounted in the body, and having the well tool connected to its lower end, means for preventing rotation of the member relative to said body, the body being movable longitudinally relative to said member so as to disengage the preventing means, and co-acting clutch means associated with said body and well tool normally spaced from each other and being engaged by longitudinal movement of the body relative to the member and tool, the clutch means being disengaged in one position of said body to permit rotative movement to be imparted to said tool from the conductor through the body and member and engaged in another position of said body in which the preventing means is disengaged to permit the device and conductor to be released from the tool through rotation of the body and clutch means by the conductor.

9. A well device as set forth in claim 1 wherein the body and member each have spaced ports formed therein which are normally closed and which communicate with each other when said body is moved longitudinally relative to said member, whereby fluid within the conductor may be drained therefrom through the communicating ports.

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