

July 11, 1967

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3,330,355

METHOD FOR INSTALLING A WELL

Original Filed Nov. 18, 1957

3 Sheets-Sheet 1

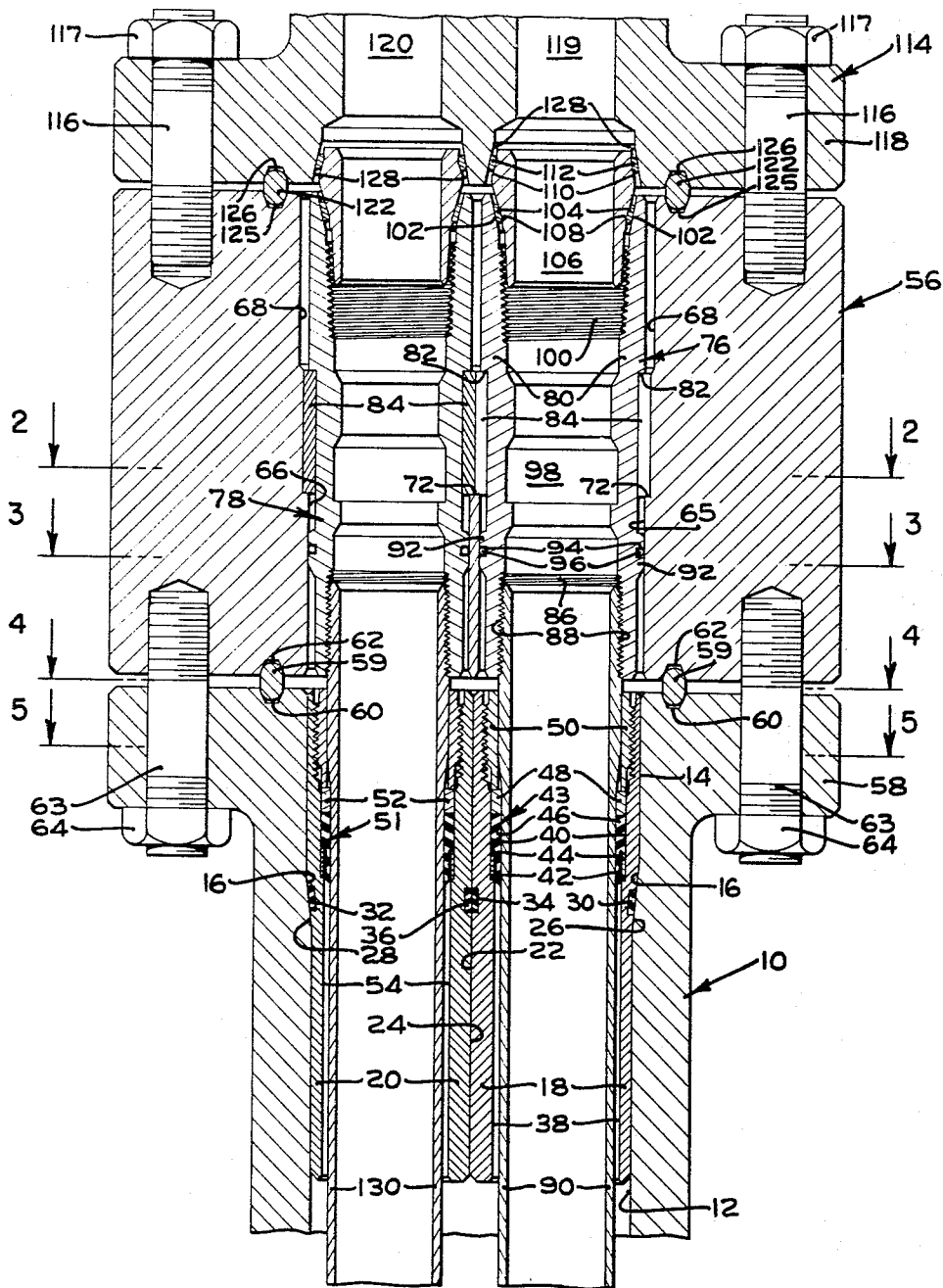


FIG. 1

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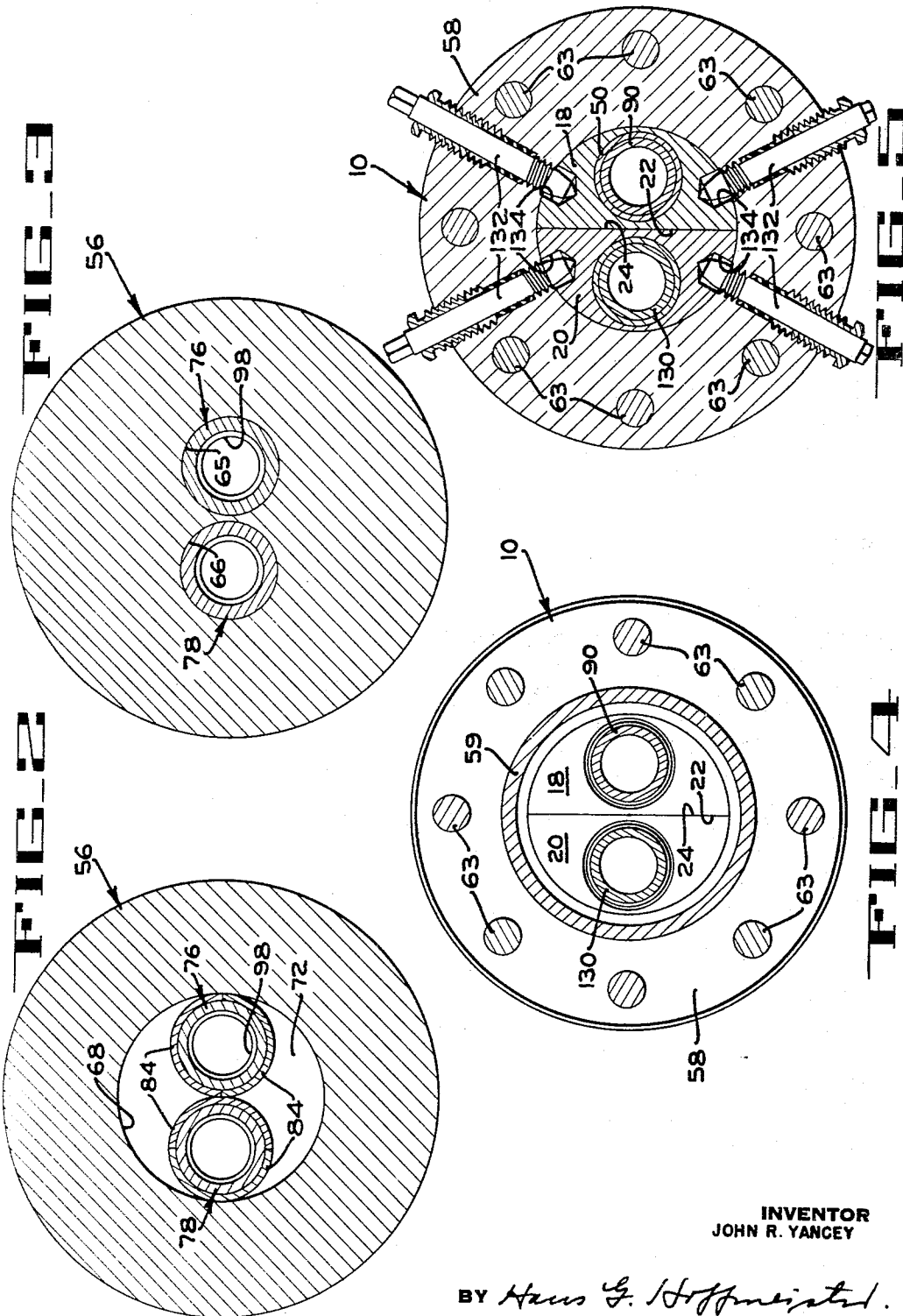
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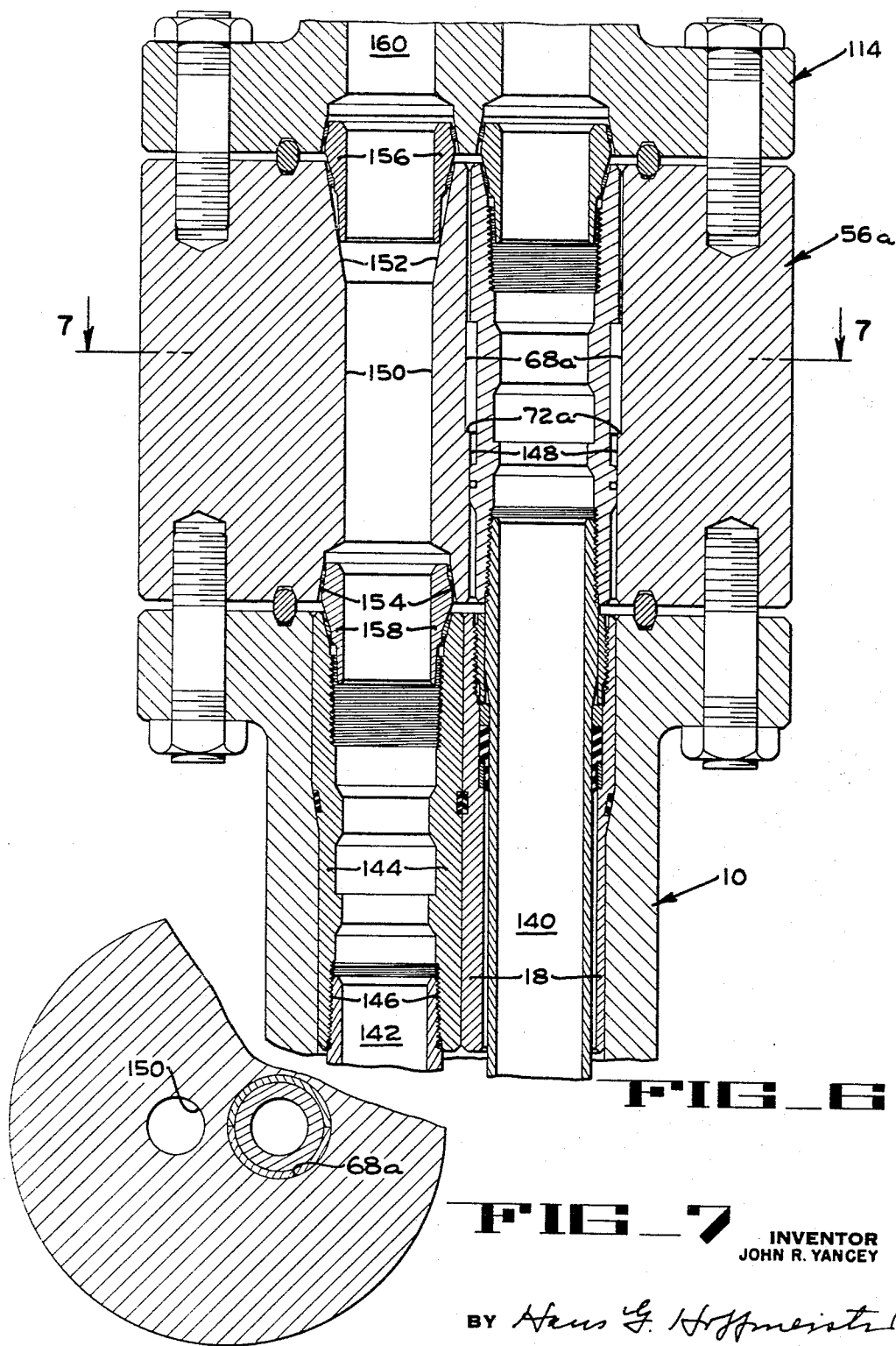
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METHOD FOR INSTALLING A WELL

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Application Jan. 24, 1961, Ser. No. 85,954, now Patent No. 3,269,755, dated Aug. 30, 1966, which is a continuation of abandoned application Ser. No. 697,195, Nov. 18, 1957. Divided and this application Oct. 3, 1963, Ser. No. 313,695

13 Claims. (Cl. 166—46)

This application is a division of United States patent application, Ser. No. 85,954, filed Jan. 24, 1961, now patent No. 3,269,755, issued Aug. 30, 1966, for Well Installation which, in turn, is a continuation of United States patent application, Ser. No. 697,195, filed Nov. 18, 1957, now abandoned for Multiple Tubing Hanger Assembly.

This invention pertains to a method for installing a well and more particularly to a method for completing a well with one or more tubing strings.

An object of this invention is to provide a method of completing a well wherein tubing strings and other elements going to make up the completed well can be installed and manipulated while maintaining the well under continuous pressure control during all steps.

Another object is to provide a method for completing a well installation whereby one or more parallel tubing strings can be run into a well through a blowout preventer and sealed in a tubing head mounted below the blowout preventer.

A further object of the invention is to make it possible to avoid losing pressure control of a well while removing the blowout preventer employed during completion of the well before installation of the Christmas tree.

Another object is to provide for supporting the tubing hangers directly from the tubing head while removing the blowout preventer and substituting a combined hanger and Christmas tree support member therefor.

Another object of this invention is to provide a method for installing multiple tubing strings wherein the tubing strings can be connected to a Christmas tree in a manner permitting one or more of the tubing strings to be raised or lowered as desired without disconnecting the Christmas tree or disturbing the seal between the well casing and the tubing strings, which seal controls the pressure of the well.

Another object is to provide a method of the character described wherein one or more of the tubing strings can be raised without disconnecting the Christmas tree therefrom to unseat packers or release one or more of the tubing strings from packers situated in the well so that the well can be killed or fluids flushed through the tubing and casing, while concurrently maintaining the seal between the tubing strings and the tubing head.

Other objects and advantages of the present invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical section through a tubing head structure installed at a well head by following the steps of the method of the present invention.

FIGS. 2, 3, 4 and 5, are horizontal sections taken, respectively, one lines 2—2, 3—3, 4—4, and 5—5 of FIG. 1.

FIG. 6 illustrates an embodiment different from that of FIG. 1 but which includes a tubing string installed by following the steps of the subject method.

FIG. 7 is a fragmentary horizontal section taken along line 7—7 of FIG. 6.

To aid in describing the method, a completed well as-

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sembly of the invention, ready for producing, will first be described.

Referring to FIG. 1, a tubing head 10 having an upper flange 58 is secured to the upper end of a well casing (not shown). The bore 12 of the tubing head 10 is enlarged at its upper end as indicated at 14. The enlarged portion 14 merges with the bore 12 through a tapered seat 16, forming a seating bowl for two seal carriers 18 and 20 (FIGS. 1, 4 and 5). The seal carriers 18 and 20 are of sector shaped cross section and are arranged with their corresponding flat surfaces 22 and 24 in abutting relation in a manner permitting the two carriers 18 and 20 to rest as a unit within the seating bowl of the head 10.

The outer arcuate surface of the seal carrier 18 is provided with a downwardly and inwardly tapered shoulder 26, and the seal carrier 20 is provided with a similar shoulder 28. Both of the shoulders 26 and 28 rest on the tapered seat 16 within the bowl of the tubing head 10. The seal carriers 18 and 20 are provided with arcuate sealing members 30 and 32 on their tapered shoulders 26 and 28, respectively, to seal against the tapered seat 16 of the tubing head. The flat surfaces 22 and 24 of the seal carriers 18 and 20 are provided with sealing strips 34 and 36, respectively, to seal between the carriers.

As shown in FIG. 5, the seal carriers 18 and 20, when seated on the tapered seat 16 within the bowl of the tubing head 10, may be locked in position independently of each other by hold-down bolts or dogs 132 which extend radially through tubing head flange 58 into suitable recesses 134 in the seal carriers 18 and 20.

The seal carrier 18 is provided with a vertical bore 38 having a counterbore 40 at its upper end to provide an upwardly facing shoulder 42. A packing assembly 43, comprising a split ring 44, an annular packing 46, and a split ring 48, is installed in the counterbore 40 with the ring 44 seated against the shoulder 42. The ring 48 is installed in the counterbore 40 above the packing 46 and is forced against the packing by an externally threaded retaining nut 50 screwed into the upper end of the counterbore 40, so that nut 50 forms part of the seal carrier 18. A duplicate packing assembly 51, including a ring 52 is similarly mounted in the bore 54 of the seal carrier 20. A packing nut is also provided for the packing assembly 51, to form part of the seal carrier 20.

As shown in FIG. 1, the seal carrier 18 is disposed on a tubing string 90 in a manner permitting vertical movement of the string 90 through the carrier. The packing assembly 43 prevents passage of fluid between the tubing string and the seal carrier when the tubing string is at rest as well as during movement of the tubing string through the seal carrier. The seal carrier 20 is similarly mounted on a tubing string 130 and fluid flow between the seal carrier 20 and the tubing string 130 is prevented by the packing assembly 51.

Tubing hangers 76 and 78 are connected to the tubing strings 90 and 130, respectively, female threads 86 on each hanger and male threads 88 on each tubing string being provided for the purpose. Since the hangers 76 and 78 are identical, only the hanger 76 will be described in detail. The hanger 76 is a tubular member terminating at its lower end in a downwardly facing abutment surface surrounding the tubing 90. The function of this abutment surface will be explained in connection with a description of the assembly of the parts that follows this description of the completed well head. Adjacent the upper end of the hanger is a portion 80 of increased diameter providing a downwardly facing external shoulder 82. A split ring hanger retainer 84 fits around the hanger with its upper end in abutment with the downwardly facing shoulder 82 formed on the hanger. In FIG. 1, the sec-

tion is taken at the split in the hanger retainer 84 as it is mounted on hanger 76.

A combined tubing hanger and Christmas tree support member 56 is mounted above the upper flange 58 of the tubing head 10 and is sealed therewith by a sealing ring 59 seated in opposed annular grooves 60 and 62 formed in the opposed faces of the head 10 and the support member 56, respectively. The tubing head 10 and the support member 56 are bolted together by studs 63 threaded into the support member 56 and provided with nuts 64 beneath the flange 58 of the tubing head 10.

Two vertical bores 65 and 66 extend through the support member 56 to receive the hangers 76 and 78. The upper portion of the support member 56 is formed with a large counterbore 68 and an upwardly facing flat supporting shoulder 72 is formed at the upper ends of bores 65 and 66 upon which the tubing hangers 76 and 78 are supported by means of the abovementioned split ring hanger retainers 84. As previously mentioned, the downwardly facing shoulders 82 on the hangers rest on the upper edges of the split ring hanger retainers 84. An annular boss 92 is formed on the outer surface of the lower portion of the hanger 76 and is provided with an annular groove 94 containing an O-ring seal 96 engaging the bore 65 in the support member 56.

In accordance with conventional practice the bore 98 through the hanger 76 is contoured to receive, in removably locking and sealing engagement, a conventional tubing back pressure valve, used in a manner to be hereafter explained, during the installation of the tubing hanger. The hanger 78 has a similar bore for receiving another back pressure valve. Since FIG. 1 shows a completed well head assembly, the back pressure valves, which are removed for producing, do not appear in the figure.

The upper end of the hanger 76 is provided with an internal thread 100 to which a hoisting tool (not shown) is connected during installation of the hanger. The upper end of the hanger 76 also has a tapered seat 102. A sealing ring 104 rests on the seat 102 and a tubular connector 106 has a downwardly and inwardly sloping conical surface 108 that rests on the sealing ring 104. At its upper end, the connector 106 has an upwardly and inwardly tapered surface 110 upon which a sealing ring 112 rests. A similar sealing ring and tubular connector are provided for the hanger 78.

A Christmas tree 114 of the type commonly employed in this type of well completion is fastened to the upper end of the support member 56 by means of studs 116 threaded in the upper portion of the support member 56 and nuts 117 drawn down on a flange 118 of the Christmas tree. A sealing ring 122 is seated in annular grooves 125 and 126 in the opposed faces of the support member 56 and the Christmas tree 114, respectively. The Christmas tree 114 is provided with a bore 119 which registers with the bore 65 in the support member 56 and with a bore 120 which registers with the bore 66 in the support member.

The lower end of each of the bores 119 and 120 in the Christmas tree is tapered downwardly and outwardly to form a conical seating surface 128 which rests on its associated sealing member 112, thereby sealing with the associated tubular connector.

The method of completing a well with the above-described apparatus will now be described.

At the beginning of the completion procedure, a conventional blowout preventer is attached to the upper flange 58 of the tubing head 10 and has control of any pressure in the well. Since FIG. 1 shows the completed well head assembly, the blowout preventer does not appear in that figure. Continued pressure control of the well during its completion with use of the above described apparatus and a conventional blowout preventer is maintained in the following manner.

As the tubing string 90 is made up, all but the last section is lowered through the blowout preventer, and in ac-

cordance with common practice, the blowout preventer controls the pressure in the well during this part of the completion procedure. The seal carrier 18 is then slipped over the last section of tubing 90 and the hanger 76 is connected to the upper end of the tubing 90.

A hoisting device (not shown) is connected into threads 100 of hanger 76. The assembled tubing string 90, carrier 18 and hanger 76 are then lowered, passing the seal carrier and hanger through the blowout preventer until the seal carrier 18 is received into the bowl of the tubing head 10 with the sealing member 30 and the shoulder 26 seated upon the seat 16. The seal carrier 18 is then secured in position by dogs 132 that are provided in the tubing head (FIG. 5).

The hoisting device is removed, leaving the tubing string 90 temporarily supported in suspended position from the seal carrier 18 with the lower end of the hanger forming an abutment surface that rests on the upper end or face of the seal carrier. Thus, the hanger 76, the primary purpose of which is to support the tubing string 90 from the support member 56, has a preliminary function of supporting the tubing string 90 upon the seal carrier 18. At this stage, the blowout preventer still controls the pressure in the well. Although the abutment surface at the lower end of hanger 76 is shown spaced from the upper end of the seal carrier 18 in FIG. 1, this is because FIG. 1 shows the completed assembly. The other tubing string 130, seal carrier 20, and hanger 78 are then lowered into the well in the manner described in connection with the seal carrier 18 and the hanger 76. Back pressure valves are now installed in the bores in the hangers 76 and 78 provided for such valves. Since FIG. 1 shows a completed well ready for producing, these valves do not appear in that figure.

At this stage the seal carriers 18 and 20 are sealed off with the tubing head 10 by seals 30 and 32, and the seal carriers themselves are sealed together by seals 34 and 36. The tubing strings 90 and 130 are slidably sealed to the respective seal carriers by packing assemblies 43 and 51, and the bores of the tubing strings are sealed off by back pressure valves. Since the hangers, seal carriers and valves as thus installed control the pressure in the well, the blowout preventer can now be removed without loss of control of pressure within the well.

At this stage in the well completion operation, the hangers 76 and 78 project upwardly from the tubing head 10 ready to receive the support member 56, which is then lowered over the hangers 76 and 78 and is attached to the tubing head 10.

The hanger 76 is then raised by the hoisting device through the bore 65 in the support member 56 a distance sufficient for the split ring hanger retainer 84 to be placed around the hanger below the shoulder 82. The hanger 76 is then lowered until the retainer 84 abuts both the shoulder 82 on the hanger and the shoulder 72 on the support member 56. The hanger 76 and tubing string 90 are thereby finally supported from support member 56, and the seal carrier 18 continues to provide a seal between the tubing string 90 and the tubing head 10.

The hanger 78 is hoisted in similar manner and another split ring hanger retainer 84 placed in supporting relation between the hanger shoulder as previously described in connection with the hanger 76, whereupon the hanger 78 is lowered until the hanger retainer 84 supports the hanger in the support member 56.

Connectors 106 are then placed in the seats 102 in the hangers, and the Christmas tree 118 is installed on the support member 56, with the bores 119 and 120 in the Christmas tree in respective registry with the bores of the hangers 76 and 78. The Christmas tree is secured in position by means of the studs 116 and nuts 117. The connectors 106 and associated seals establish a sealed joint between the Christmas tree and each of the hangers. The back pressure valves are then removed from the hangers 76 and 78 through the Christmas tree.

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The Christmas tree and its attachments at this stage are controlling the pressure through the tubing strings, and the inner and outer seals of the seal carriers continue to control the pressure in the casing. Also, as shown in FIG. 1, the sealing rings 59 and 122 provide control of the pressure within the casing for any fluid that might leak between the two seal carriers, or between the seal carriers and the tubing head.

It is desirable at times to raise the tubing strings to release the tubing from packers situated within the well, or to unseat packers within the well which may be connected to one or both of the tubing strings. In order to accomplish this, the support member 56 is detached from tubing head 10 and the assembly comprising the Christmas tree 114, the support member 56 with the hangers 76 and 78, and the tubing strings 90 and 130 connected thereto are raised as a unit. During this operation, the tubing strings 90 and 130 slide through their respective packings 43 and 51, preserving control of the pressure in the well. Fluid may then be circulated through either or both of tubing strings 90 or 130 to kill the well, to wash out the well, or for other procedures, as desired.

It is obvious from reference to FIGS. 1 and 4 that, if the well need be completed with only one tubing string, a seal carrier and an exterior seal therefor could be provided of circular rather than of sector shape. This circular seal carrier need have but one bore, and the Christmas tree and support member need have only one corresponding passageway.

Thus, in accordance with the present invention continued pressure control of the well and tubing strings is maintained throughout the entire well completion operation, even though the blowout preventer is removed before installation of the Christmas tree.

Another important feature of the invention is that the tubing strings 90 and 130 are firmly connected to the Christmas tree 114 by means of the hangers 76 and 78. Consequently, after the nuts 64 have been released, the Christmas tree and the tubing strings and hangers attached thereto may be safely raised and lowered as a unit with respect to the well casing as may be required, without destroying the seal therebetween.

In the modification shown in FIGS. 6 and 7, a tubing string 140 is mounted in the same manner as described above with respect to FIGS. 1 to 5 and is movable with the Christmas tree 114. However, the tubing 142 on the left is fixed within the tubing head 10. In this installation, the seal carrier 18 for the tubing 140 is the same as the corresponding carrier shown in FIG. 1. The companion member 144 is formed with the same external configuration as the seal carriers shown in FIG. 1, but its inner configuration is the same as that of one of the hangers of FIG. 1.

The companion member 144 is thus, in effect, a combined carrier-hanger member. The tubing 142 is threaded into the bottom of the member 144 as indicated at 146. The tubing hanger support member 56a, in this instance, is formed with one bore 148 similar to the bore 65 in the first described form of the invention and is formed with a recess 68a to provide an upwardly facing flat surface 72a. The support member 56a is formed with a second bore 150 having tapered seats 152 and 154 at its upper and lower ends to receive connectors 156 and 158 which provide connection to a bore 160 of the Christmas tree 114 and the bore through the combined carrier-hanger member 144, respectively.

In this latter installation, only the tubing 140 is connected to the Christmas tree 114 and is movable therewith. Before the support member 56a is disconnected from the well casing 10 to manipulate the tubing 140, therefore, a back pressure valve may be installed through the Christmas tree and into the member 144 to seal the upper end of tubing 142.

Installation of this embodiment is made in a manner similar to that described in connection with the embodi-

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ment of FIG. 1 except that the carrier-hanger 144 is not lifted through and suspended by a retainer from the support member 56a. Also, in this instance, only the tubing 140 may be lifted through a seal carrier to unseat from a packer within the well for circulation of fluids. It is to be noted, however, that continuous pressure control is attained with this embodiment as with that of FIG. 1.

It is manifest that the assembly procedure described with reference to FIGS. 1 and 6 may be reversed to replace the support member 56 or 56a with a blowout preventer, if desired, and still maintain continuous pressure control of the well.

It will be understood that various changes and modifications may be made in the details of the subject method without departing from the spirit and scope of the invention as defined in the appended claims.

The invention having thus been described, what is believed to be new and desired to be protected by Letters Patent is:

1. A method of hanging a string of pipe in a well after the string is temporarily supported on a head and fluid flow upwardly through the string and between the string and the head is precluded, comprising the steps of connecting an attachment to the head in laterally adjacent relation to the upper end of the string while maintaining said string stationary, lifting the string relatively to the attachment while maintaining connection of the attachment to the head and while continuing to preclude upward fluid flow between the string and head, and imposing the weight of the string on the attachment so that subsequent disconnection of the attachment from the head and elevation of the attachment will cause the string to be elevated with the attachment.

2. A method of hanging a string of pipe in a well after the string is temporarily supported on a head member of the well and fluid flow upwardly through the string and between the string and the head member is precluded, comprising the steps of supporting an attachment on the head member in surrounding relation to the upper end of the string, lifting the string through the attachment while maintaining the attachment stationary and while continuing to preclude upward fluid flow between the string and the head, and imposing the weight of the string on the attachment.

3. In a method of manipulating a string of tubing in a well wherein the string of tubing is lowered through a blowout preventer and a tubing head and wherein the string is closed to upward fluid flow, the steps of establishing a seal between the string and the tubing head while the blowout preventer remains in place, removing the blowout preventer and replacing it with a hanger attachment, connecting said attachment to the tubing head, lifting the string with respect to the attachment, supporting the tubing string on the attachment while maintaining the seal between the string and the tubing head, connecting a Christmas tree to the attachment, opening the string to the passage of fluid upward therethrough, disconnecting the attachment from the tubing head, lifting the Christmas tree, whereby the attachment and the string are lifted therewith, to facilitate well operations, and lowering the Christmas tree to support the attachment once again on the tubing head and to enable its connection thereto.

4. In a method of manipulating a tubing string in a well while maintaining continuous control over pressure in the well and without ever opening the well to the atmosphere during such manipulation, wherein the string is initially closed to the flow of the fluid upward therein and wherein the string is initially lowered through a blowout preventer and a tubing head into the well, the steps of establishing a seal between the string and the tubing head and temporarily supporting the string by the tubing head while controlling the pressure in the well with the blowout preventer, removing the blowout preventer, releasably connecting an attachment to the tubing head around the tubing string, lifting the tubing string, support-

ing the tubing string on the attachment, releasing the attachment from the tubing head, and successively raising and lowering the attachment thereby correspondingly to raise and lower the string, while maintaining the seal between the string and the tubing head.

5. In a method of installing strings of tubing in a well wherein the strings are lowered through a blowout preventer and a tubing head into the well and wherein the upper end of each string is closed to upward fluid flow and has a hanger connected thereto, the steps of placing seal means in slidable sealing engagement around each tubing string at a position above the blowout preventer, lowering the seal means on each string in succession through the blowout preventer and into circumferential sealing engagement with the head, temporarily supporting the strings on the tubing head with the seal means sealing between the strings, removing the blowout preventer and connecting a hanger attachment above the tubing head in place of the preventer, lifting each string in order to move its hanger upwardly in said attachment, imposing the entire weight of each string, through the hanger, on the attachment, and connecting a Christmas tree to the attachment.

6. In a method of installing a plurality of strings of tubing in a well wherein the strings are lowered into the well through a blowout preventer and a tubing head and wherein the strings are closed to fluid flow upward therein, the steps of precluding flow of fluid upward between the strings of tubing and between the tubing head and said strings while controlling the pressure in the well with the blowout preventer, removing the blowout preventer and replacing it with a hanger attachment, supporting the tubing strings on the attachment while still precluding upward flow between the strings and between the strings and the tubing head, and connecting a Christmas tree to the attachment.

7. In a method of installing multiple strings of tubing in a well wherein the strings are lowered into the well through a blowout preventer and a tubing head and wherein the strings are closed to fluid flow upward therein, the steps of establishing fluid seals between the strings and between the tubing head and the strings and temporarily supporting the strings by the tubing head while the blowout preventer remains in place, removing the blowout preventer and replacing it with a hanger attachment, lifting the strings and supporting them on the attachment while maintaining said seals, connecting a Christmas tree to the attachment, and opening the strings to the flow of fluid upward therethrough.

8. In a method of lowering and raising a plurality of tubing strings in a well while maintaining continuous control over pressure in the well and without ever opening the well to the atmosphere during such lowering and raising, wherein the strings are initially closed to the flow of fluid upward therein and are lowered through a blowout preventer and a tubing head into the well, the steps of establishing seals between the strings and between the tubing head and the strings while controlling the pressure in the well with the blowout preventer, removing the blowout preventer and coupling flow control equipment to the strings in place of the blowout preventer while controlling the pressure in the well by said seals and said closure of the strings, and simultaneously raising and lowering the flow control equipment and the strings while maintaining said seals.

9. In a method of simultaneously manipulating multiple tubing strings in a well while maintaining continuous control over pressure in the well and without ever opening the well to the atmosphere during such manipulation, wherein the strings are initially closed to the flow of the fluid upward therein and are initially lowered through a blowout preventer and a tubing head into the well, the steps of establishing seals between the strings and between the tubing head and the strings and temporarily supporting

the strings by the tubing head while controlling the pressure in the well with the blowout preventer, removing the blowout preventer, lifting the strings and supporting them above the tubing head while maintaining said seals, coupling flow control equipment to the strings in place of the blowout preventer, opening the tubing strings to the flow of fluid upward therein, and raising and lowering the strings and the flow control equipment as a unit while maintaining said seals.

10. In a method of completing a well under continued pressure control, said well having a tubing head provided with an inside support seat and a blowout preventer on the tubing head, the steps of lowering a tubing string into said well through the blowout preventer, mounting a tubing seal carrier onto said tubing string in sliding sealing relation therewith, connecting a tubing hanger to the upper end of the tubing string, mounting a back pressure valve in the hanger, lowering the hanger and carrier through the blowout preventer until the carrier is supported by said tubing head seat in sealing relation therewith and said hanger is supported by said carrier, controlling the pressure in the well by said blowout preventer until the seal carrier is seated, removing the blowout preventer, lowering a hanger support member over said hanger into connection with the tubing head, raising the hanger through the hanger support member and fitting a hanger retainer onto the hanger, lowering the hanger to bring the hanger retainer into finally supported relation within said support member, attaching a Christmas tree to said support member, and removing said back pressure valve from the hanger through the Christmas tree, the pressure in said well being controlled by said Christmas tree after removal of the back pressure valve.

11. In a method of completing a well under continued pressure control, said well having a tubing head provided with an inside support seat and a blowout preventer on the tubing head, the steps of lowering a first tubing string into said well through the blowout preventer, mounting a first seal carrier onto said first tubing string in sliding, sealing relation therewith, connecting a tubing hanger to the upper end of said tubing string, lowering said hanger and seal carrier through the blowout preventer until said seal carrier is supported by said tubing head seat in sealing relation therewith and said hanger is supported by said seal carrier, lowering a second tubing string into the well through the blowout preventer, mounting a second seal carrier onto said second tubing string in sliding, sealing relation therewith, connecting a second tubing hanger to the upper end of said second tubing string, lowering said second hanger and said second carrier through the blowout preventer until said second seal carrier is supported by said tubing head seat in sealing relation therewith and said second hanger is supported by said second seal carrier, installing removable back pressure valves in said hangers, controlling the pressure in the well by said blowout preventer until said first and said second seal carriers are seated, removing said blowout preventer, lowering a hanger support member over said first and said second hangers and into connection with the tubing head, raising said first hanger and said first tubing string and placing a hanger retainer on said first hanger, lowering said first hanger to bring the hanger retainer into finally supported relation within the support member, raising said second hanger and said tubing string and placing a second hanger retainer on said second hanger, lowering said second hanger into finally supported relation within the support member, installing a Christmas tree with said support member, and removing said back pressure valves through the Christmas tree.

12. The method of completing a multiple well while maintaining pressure control thereof, which comprises lowering all but an upper portion of a first tubing string through a blowout preventer and a tubing head on which

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the blowout preventer is mounted, slidably mounting a seal carrier upon said upper portion of the tubing string, attaching a tubing hanger to said tubing string above the seal carrier, arranging a fluid seal within the seal carrier in sliding sealing relation with said tubing string, further lowering the tubing string to pass the seal carrier and tubing hanger through the blowout preventer while controlling pressure within the well with the blowout preventer, sealing the carrier in the tubing head with the hanger and tubing string supported on the seal carrier, lowering all but an upper portion of a second tubing string through the blowout preventer and tubing head, slidably mounting a second seal carrier upon said upper portion of said second tubing string, attaching a second tubing hanger to said second tubing string above said second seal carrier, arranging a fluid seal within said second seal carrier in sliding relation with said second tubing string, further lowering said second tubing string to pass said second seal carrier and tubing hanger through the blowout preventer while controlling pressure within the well with the blowout preventer, sealing said second carrier in the tubing head with said second hanger and said second tubing string supported on said second seal carrier, installing a back pressure valve in each of said hangers while controlling pressure within the well by passing said valves through the blowout preventer, removing the blowout preventer from the tubing head and replacing it with a hanger support member, raising both of said hangers and the tubing strings suspended therefrom while maintaining sliding sealing relation between the tubing strings and their respectively associated seal carriers, disposing a hanger retainer on each of said tubing hangers, lowering said hangers and tubing strings to seat the hanger retainers upon the support member, installing a Christmas tree upon the support member while maintaining pressure within the tubing strings by said back pressure valves, and removing the back pressure valves through said Christmas tree.

13. In a method of completing a well under continued

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pressure control, said well having a tubing head provided with an inside support seat and a blowout preventer connected to the tubing head, the steps of lowering a first tubing string into said well, connecting a tubing carrier-hanger to the upper end of said first tubing string, lowering said carrier-hanger through the blow-out preventer until the carrier-hanger is supported by said tubing head seat, lowering a second tubing string into said well, mounting a seal carrier in sliding sealing relation around said second tubing string, connecting a tubing hanger to the upper end of said tubing string, lowering said hanger and said seal carrier through said blowout preventer until said seal carrier is supported by said tubing head seat in sealing relation therewith and said hanger is supported by said carrier, installing back pressure valves in said carrier-hanger and said seal carrier, controlling the pressure in said well by said blowout preventer while said hanger and said carrier-hanger are being seated and while the back pressure valves are being installed, removing said blowout preventer, lowering a hanger support member over said hanger and into connection with said tubing head, raising said hanger and fitting a hanger retainer on said hanger, lowering said hanger to bring the hanger retainer into finally supported relation against said support member, attaching a Christmas tree to said support member, and removing said back pressure valves through said Christmas tree.

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