United States Patent [19]

Crowe

[11] **3,861,463**

[45] **Jan. 21, 1975**

[54] **TUBING SPACING MEANS FOR SUBSURFACE VALVES**

[75] Inventor: **Talmadge L. Crowe,** Houston, Tex.

[73] Assignee: **Baker Oil Tools, Inc.,** Los Angeles, Calif.

[22] Filed: **Nov. 16, 1973**

[21] Appl. No.: **416,433**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 366,060, June 1, 1973, abandoned.

[52] **U.S. Cl.** **166/.5,** 166/73

[51] **Int. Cl.** **E21b 7/12**

[58] **Field of Search** ..... 166/.5, 73, 85, DIG. 1, 166/313, 315, 124, .6; 285/137, 137 A

[56] **References Cited**

UNITED STATES PATENTS

3,154,145	10/1964	Brown	166/73 X
3,276,793	10/1966	Crow	285/137 A
3,494,417	2/1970	Fredd	166/73
3,653,435	4/1972	Reistle et al.	166/313
3,770,053	11/1973	Martin et al.	166/.5

Primary Examiner—Ernest R. Purser
Assistant Examiner—Richard E. Favreau
Attorney, Agent, or Firm—Bernard Kriegel

[57] **ABSTRACT**

A plural tubing hanger is set in a well bore below the platform, and a plural safety valve is latched in the tubing hanger by manipulation of one of the surface tubing strings extending between the subsurface valve assembly and a tubing hanger at the platform. The surface tubing strings and the control fluid conduit for conducting control fluid to the subsurface valves from the platform are lontigudinally adjustable to properly space the surface tubing strings which extend between the subsurface tubing hanger and the tubing head on the platform. In one form, the weight of both surface tubing strings is carried by an adjustor sub, and in another form the adjustor sub is relieved of the weight of the nonoperating surface tubing string during adjustment.

24 Claims, 41 Drawing Figures

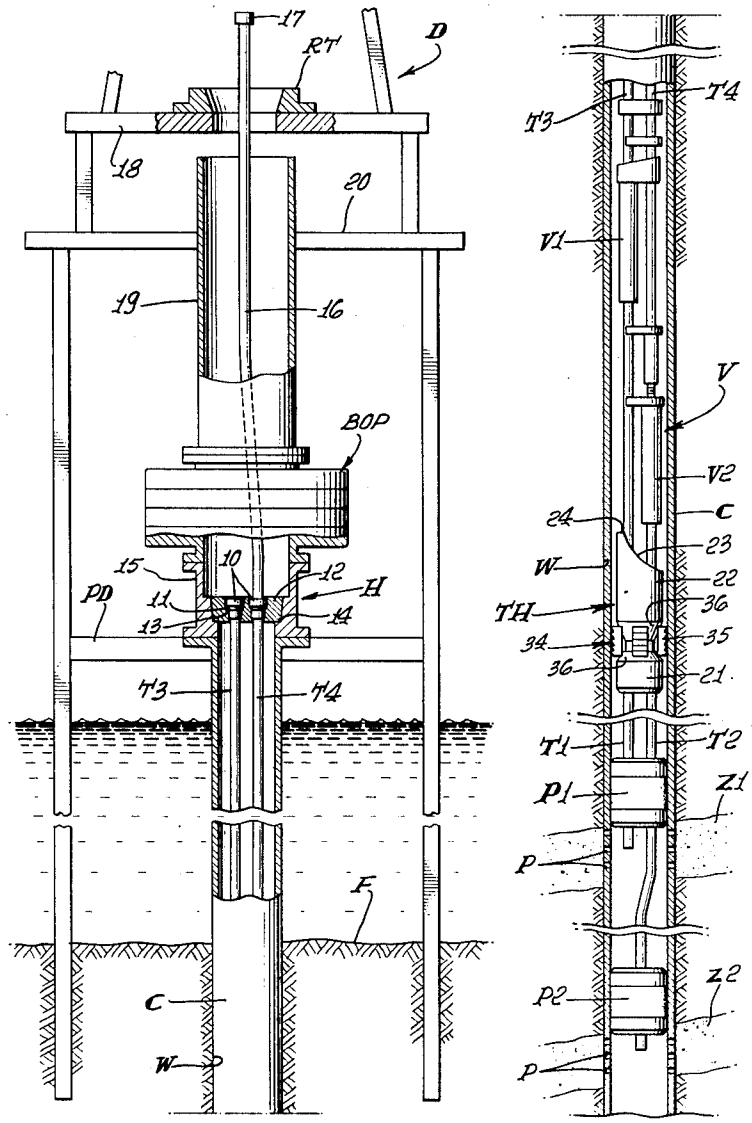
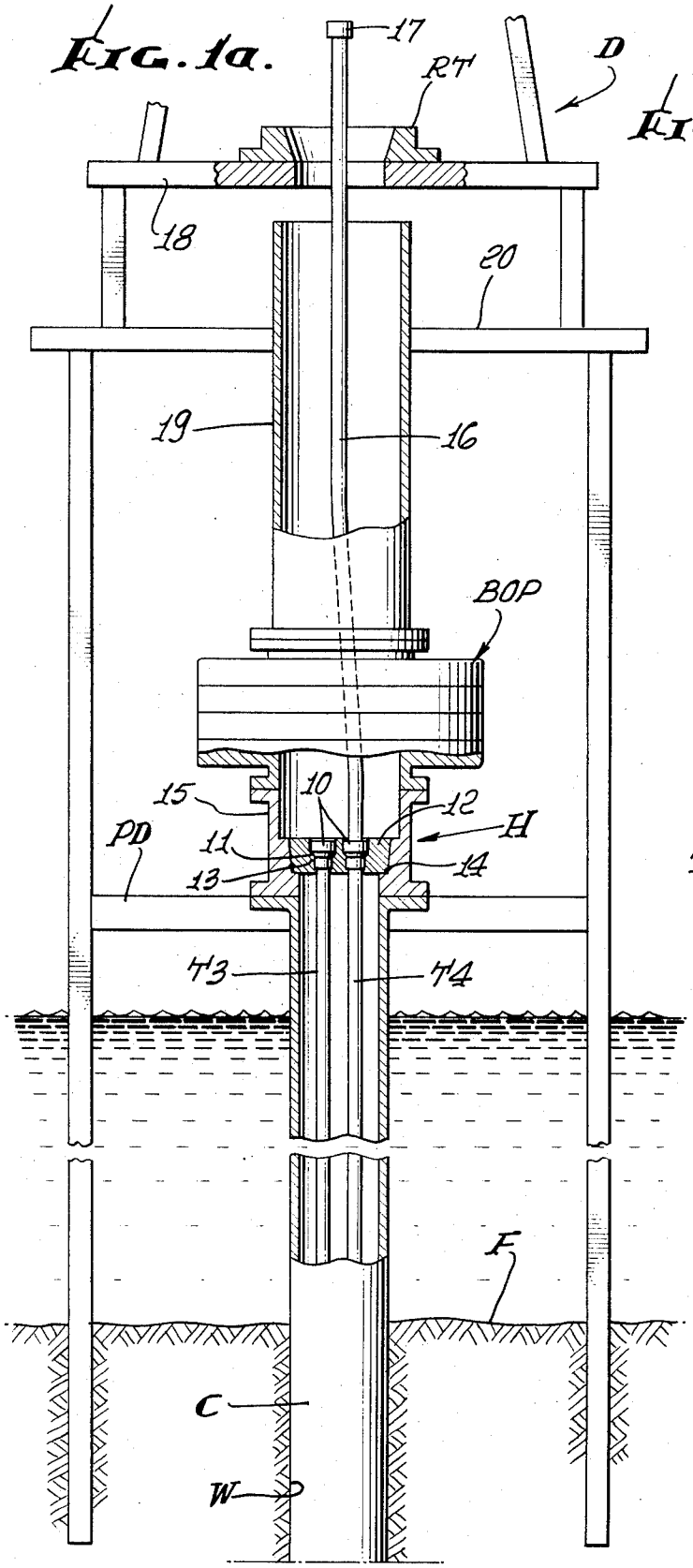


FIG. 1a.


17
RT
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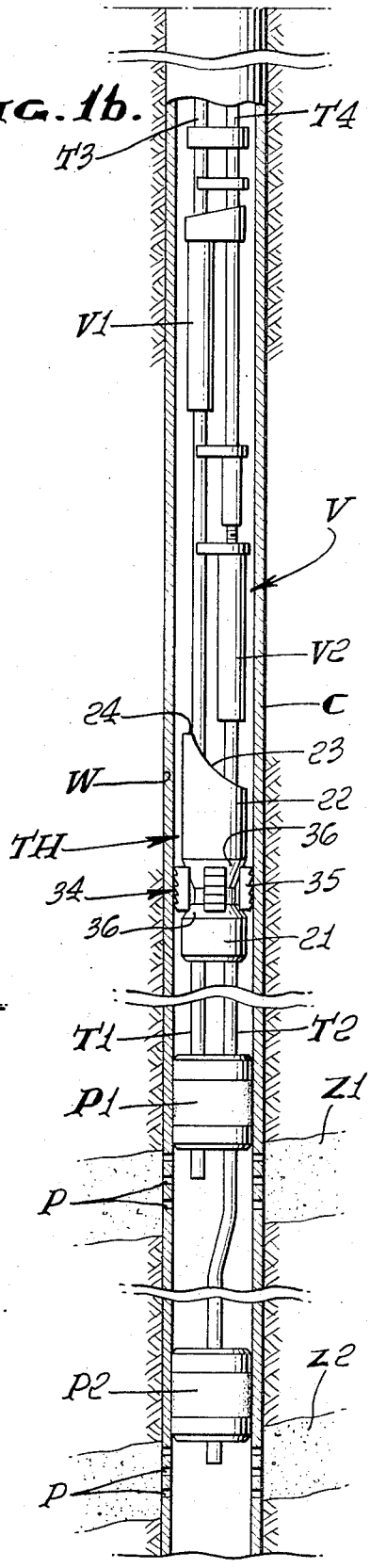
13
T3
T4
F
C
W

FIG. 1b.


T4
T3
V1
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V2
C
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23
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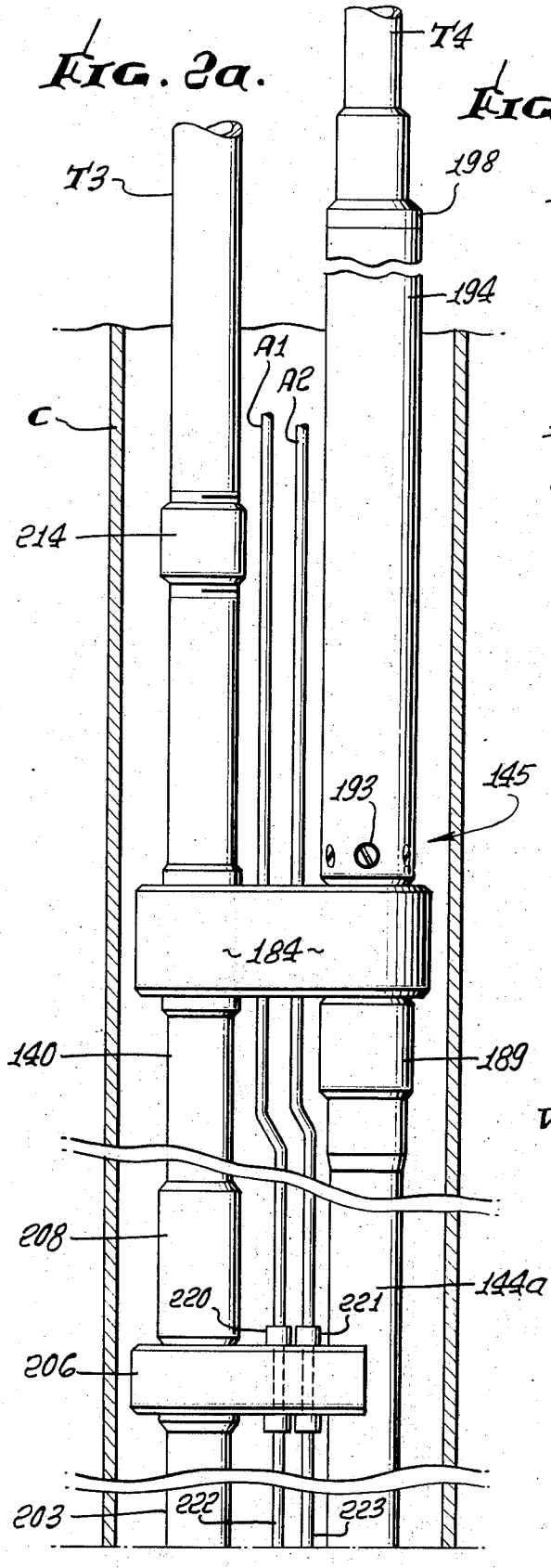
T1
T2
P1
Z1
P
Z2
P2
P

FIG. 2a.


T4
T3
198
194
A1
A2
C
214
193
145
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140
189
208
220
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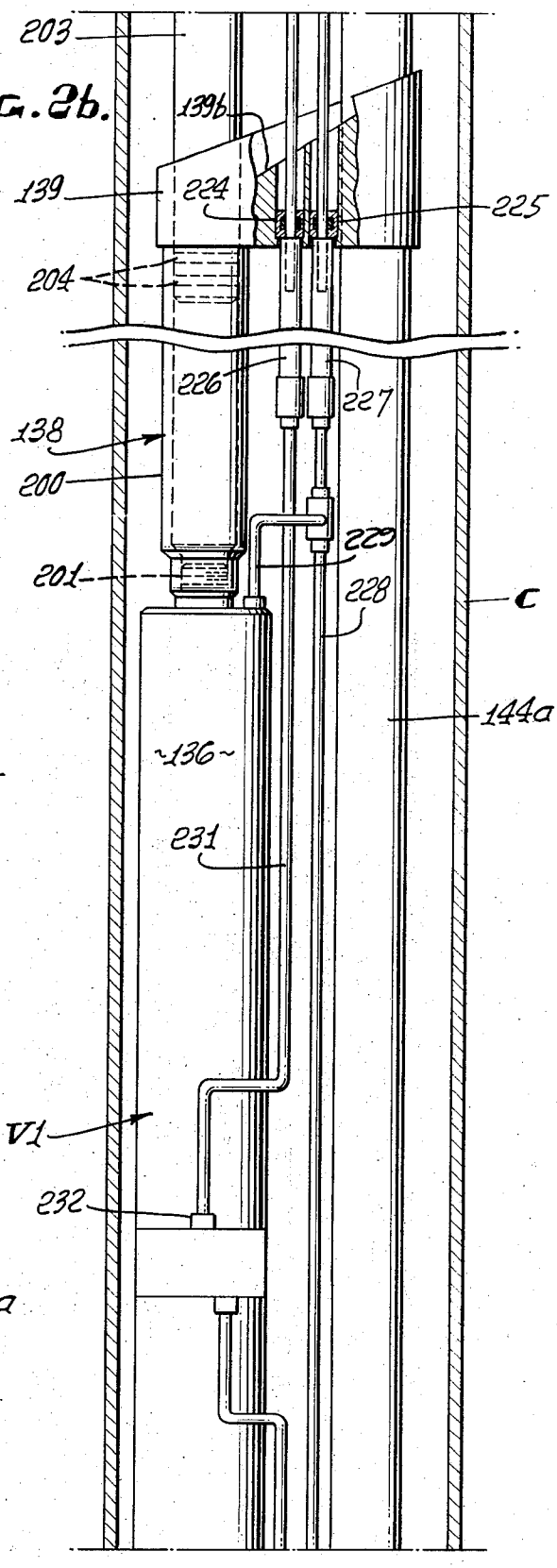
144a
206
203
222
223

FIG. 2b.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139b
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224
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V1
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FIG. 2c.

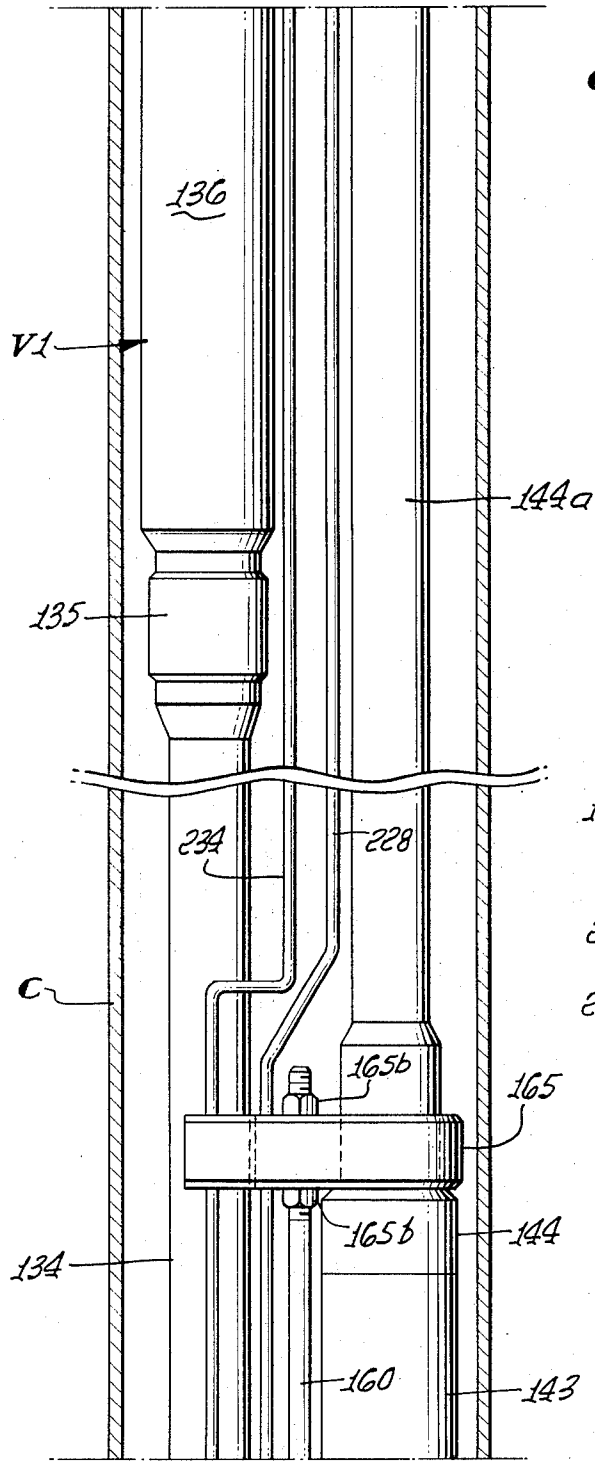
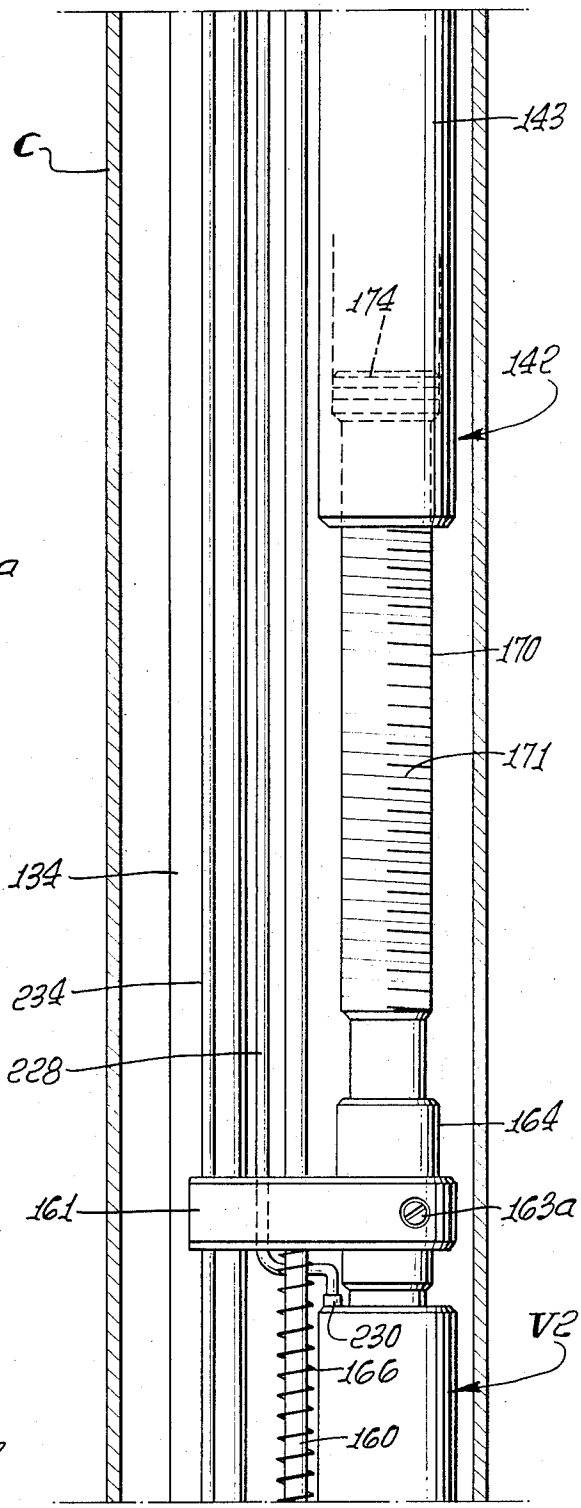

136
V1
144a
135
234
228
C
165b
165
165b
144
134
160
143

FIG. 2d.


C
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174
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164
161
163a
230
V2
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FIG. 2e.

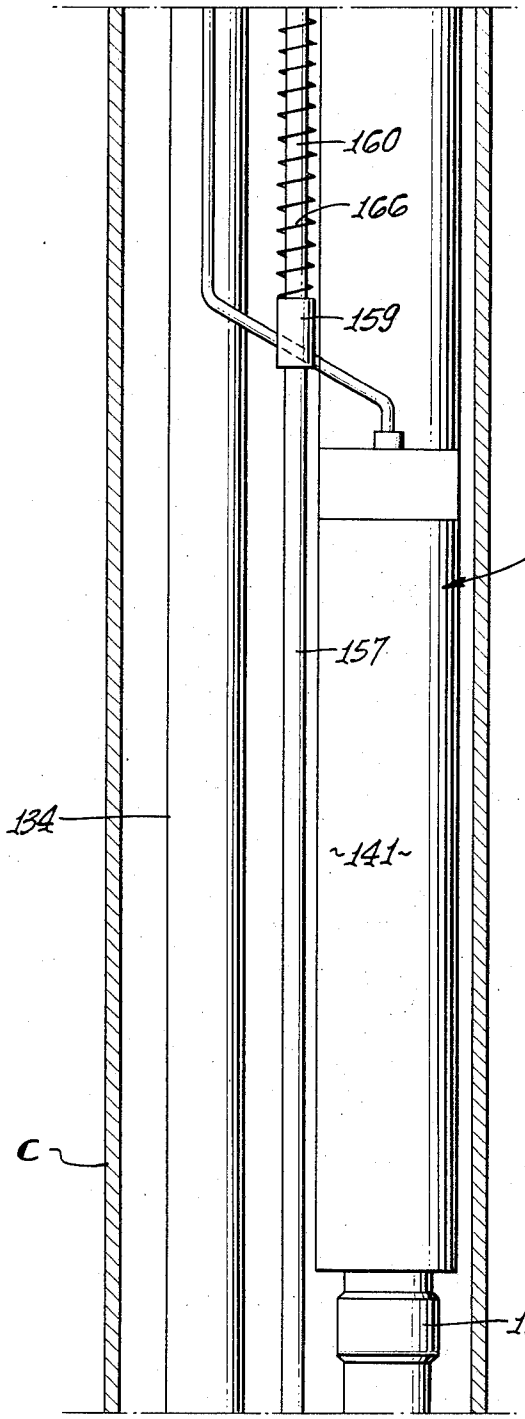
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FIG. 2f.

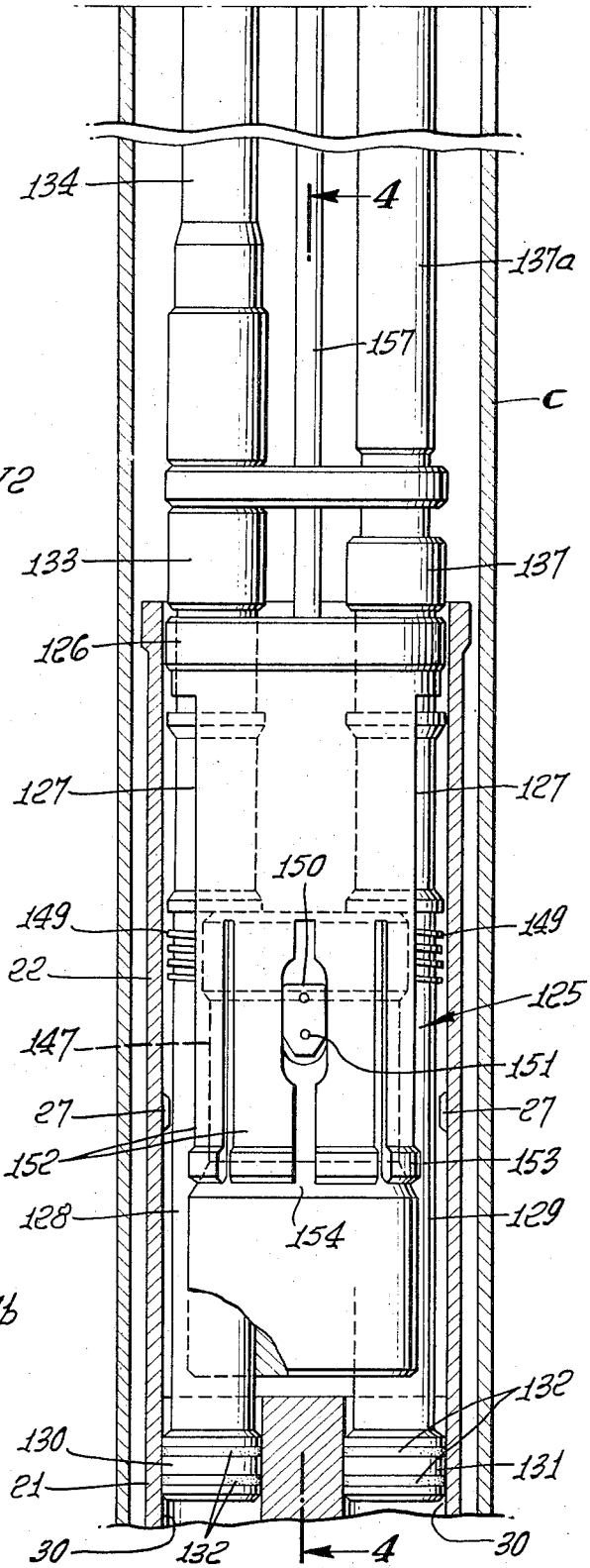
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FIG. 3a.

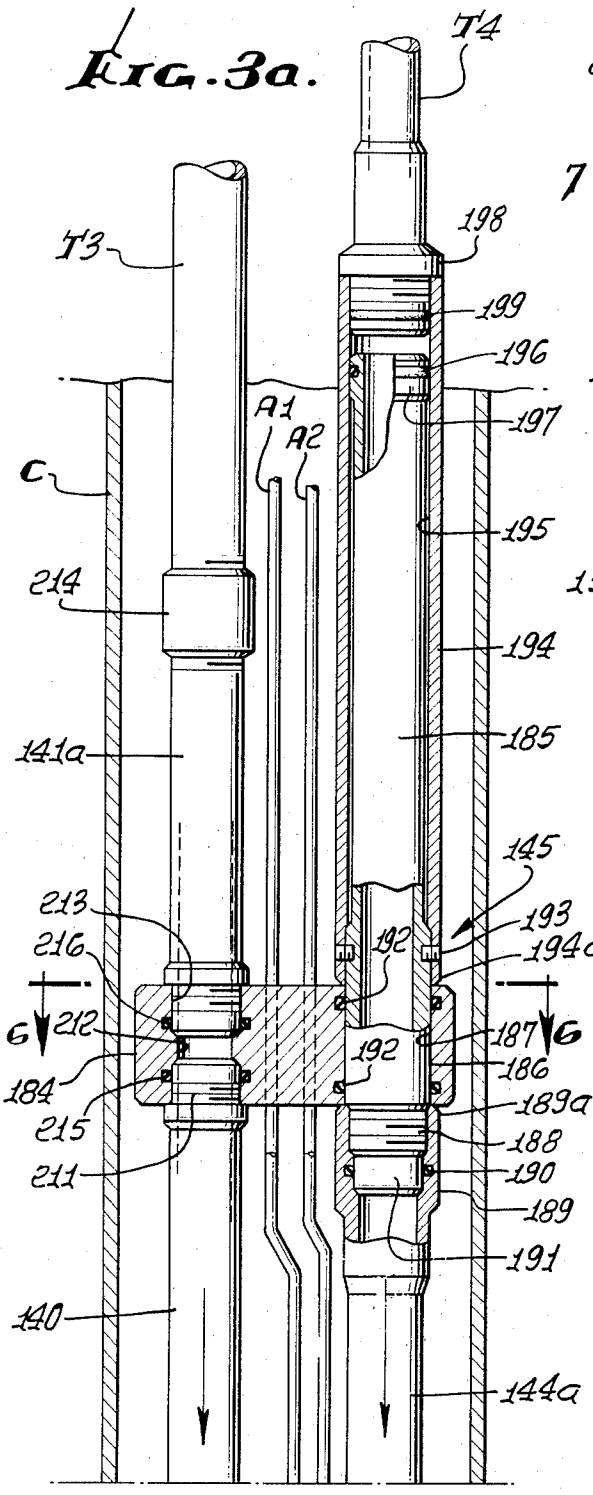
T4
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FIG. 3b.

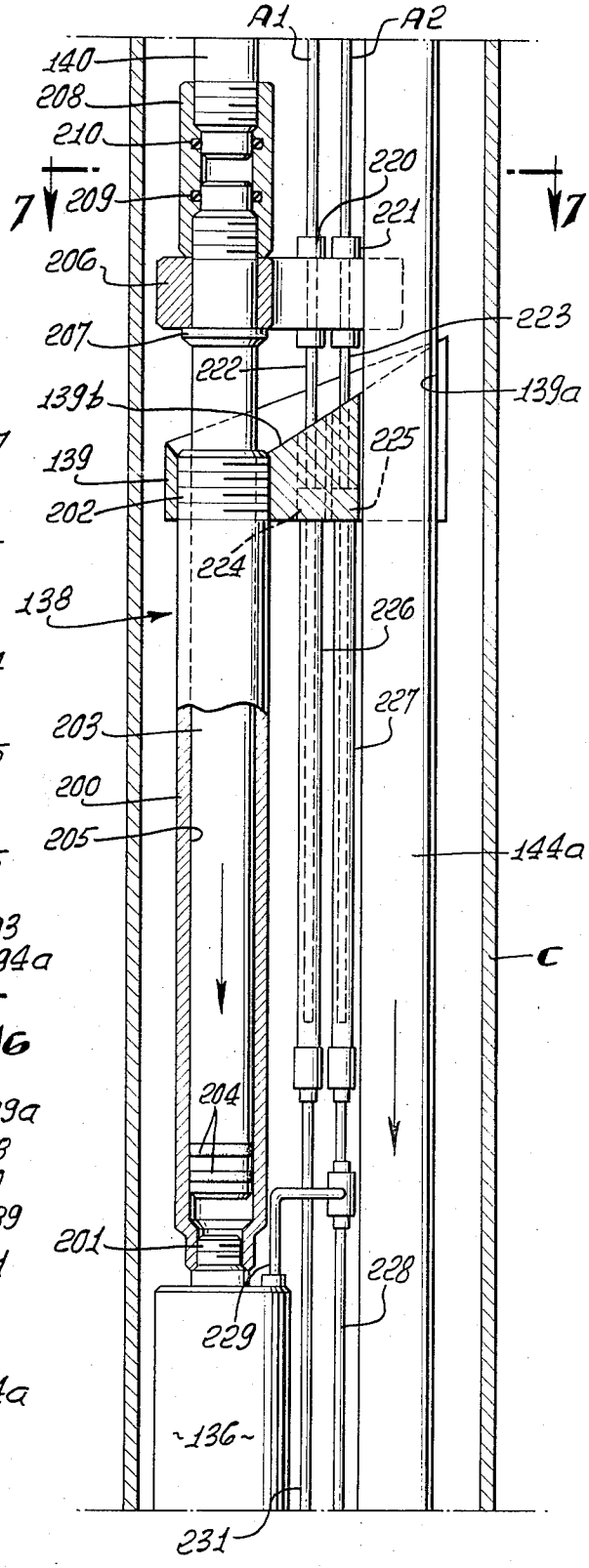
A1
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FIG. 3c.

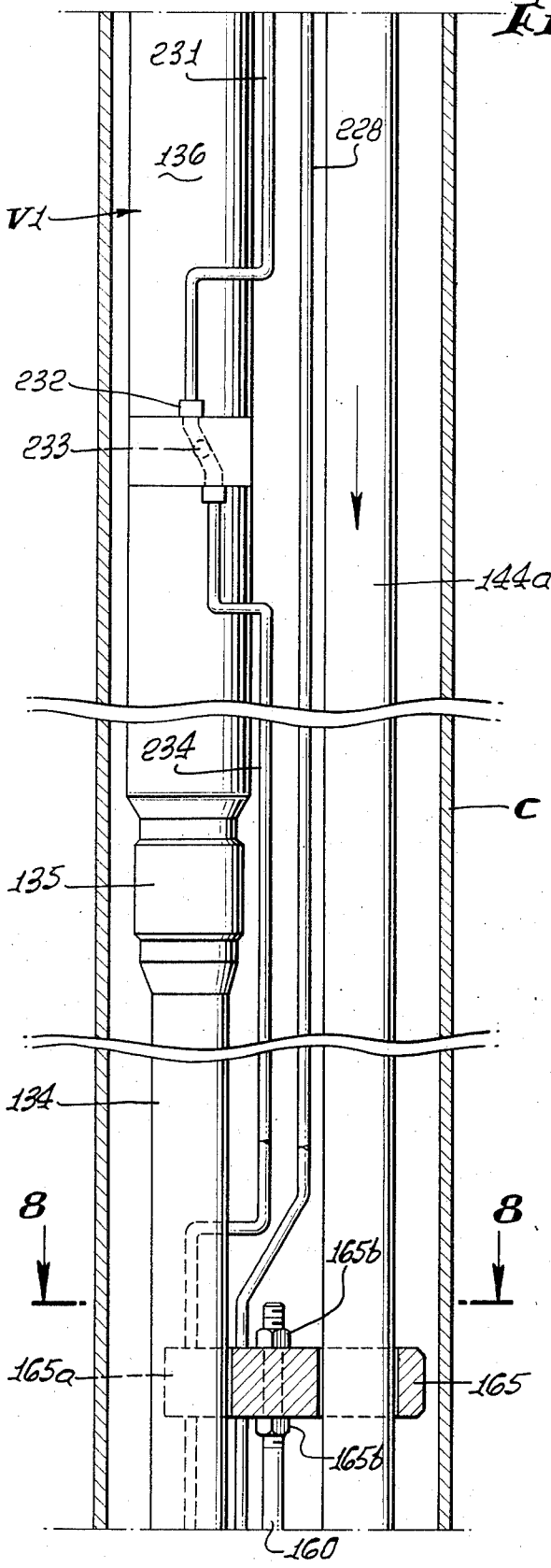
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FIG. 3d.

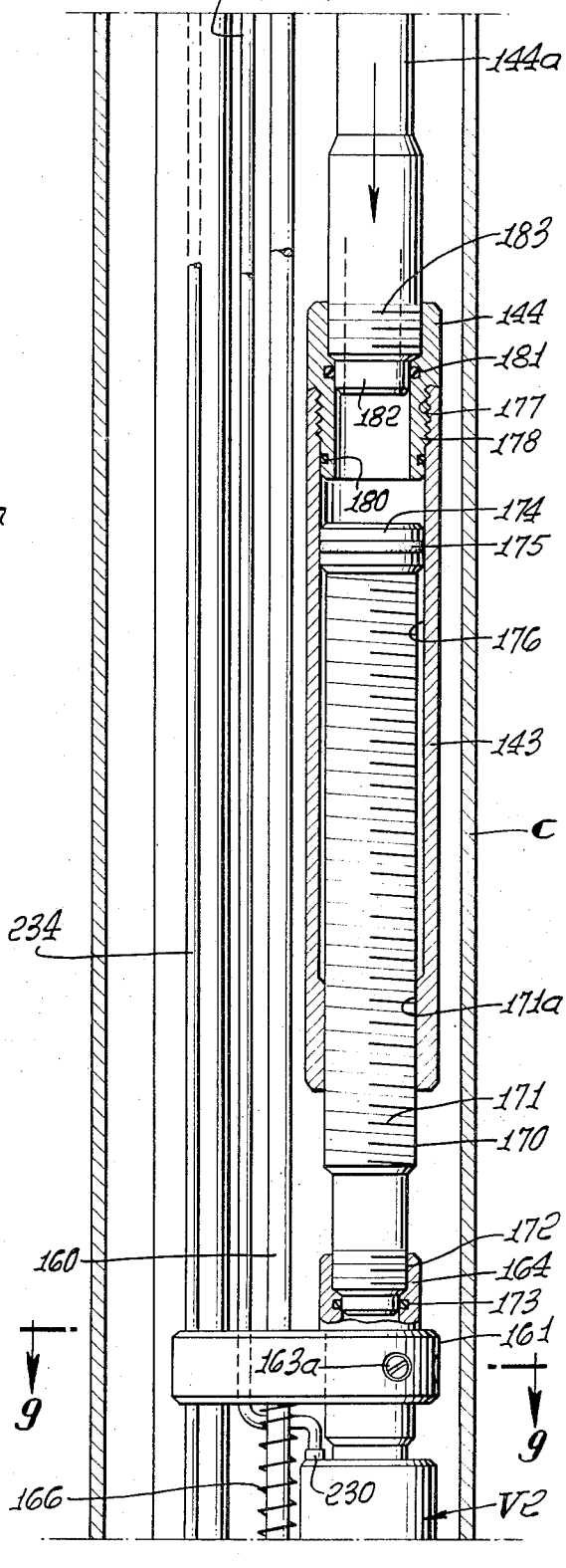
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FIG. 3e.

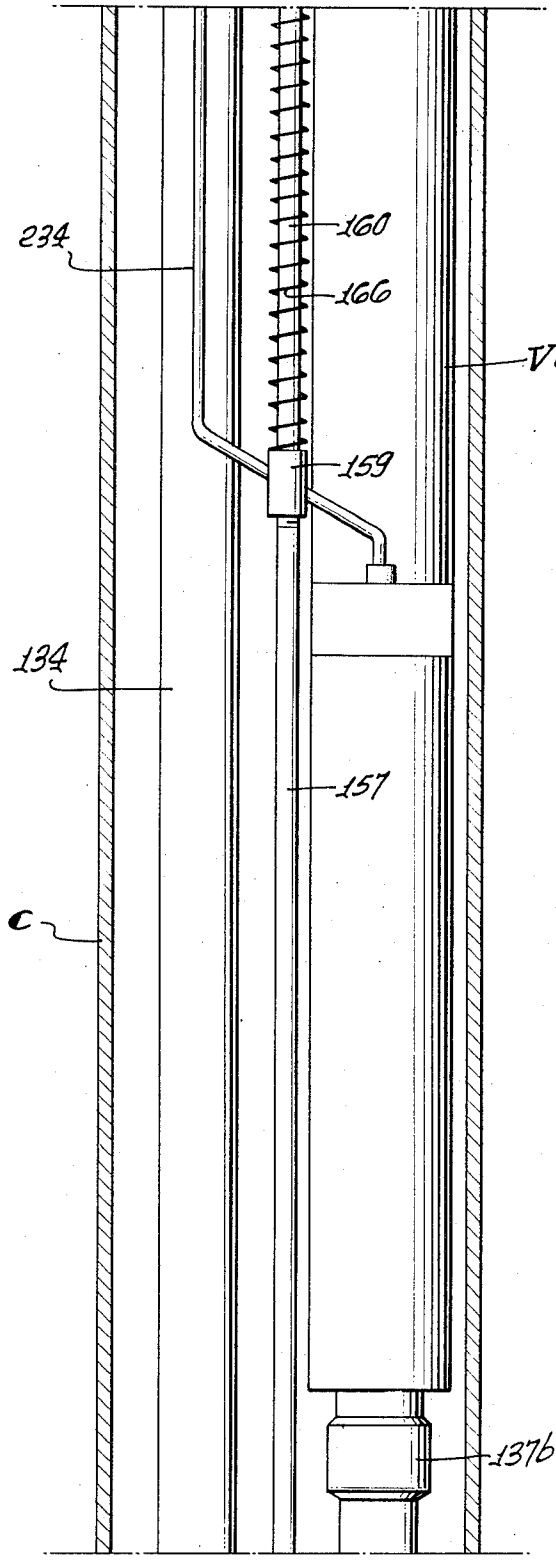
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FIG. 3f.

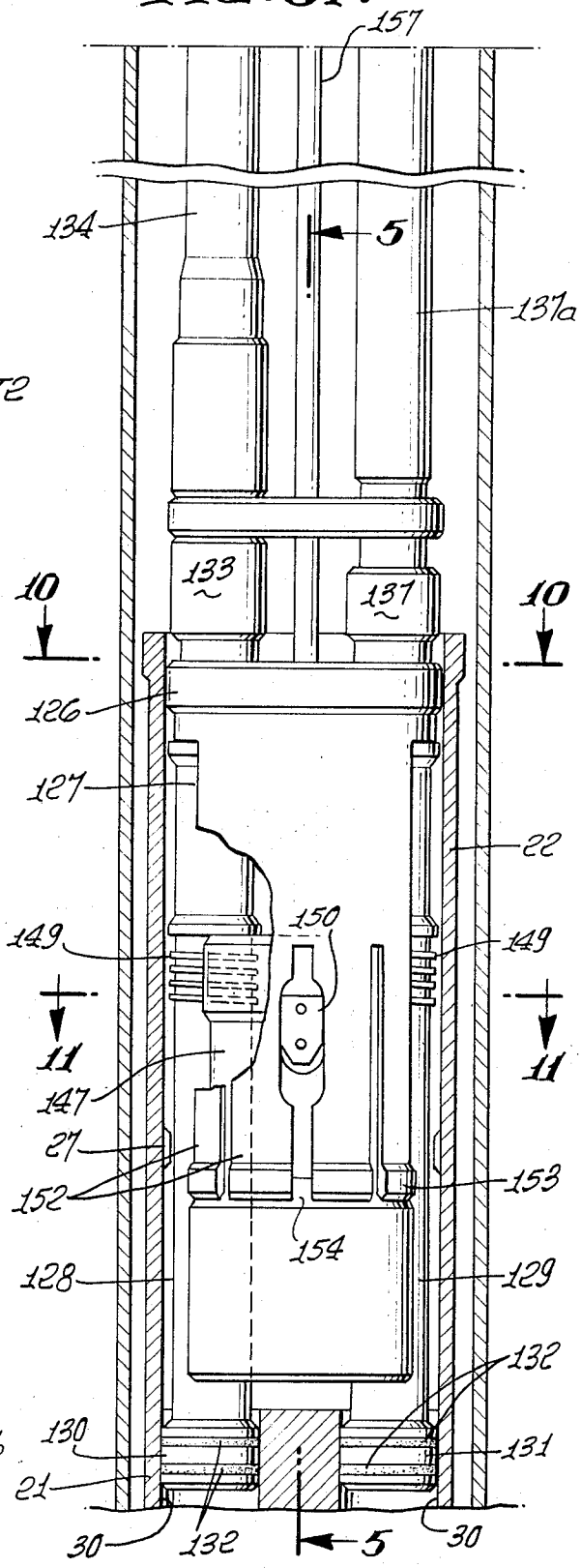
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FIG. 4.

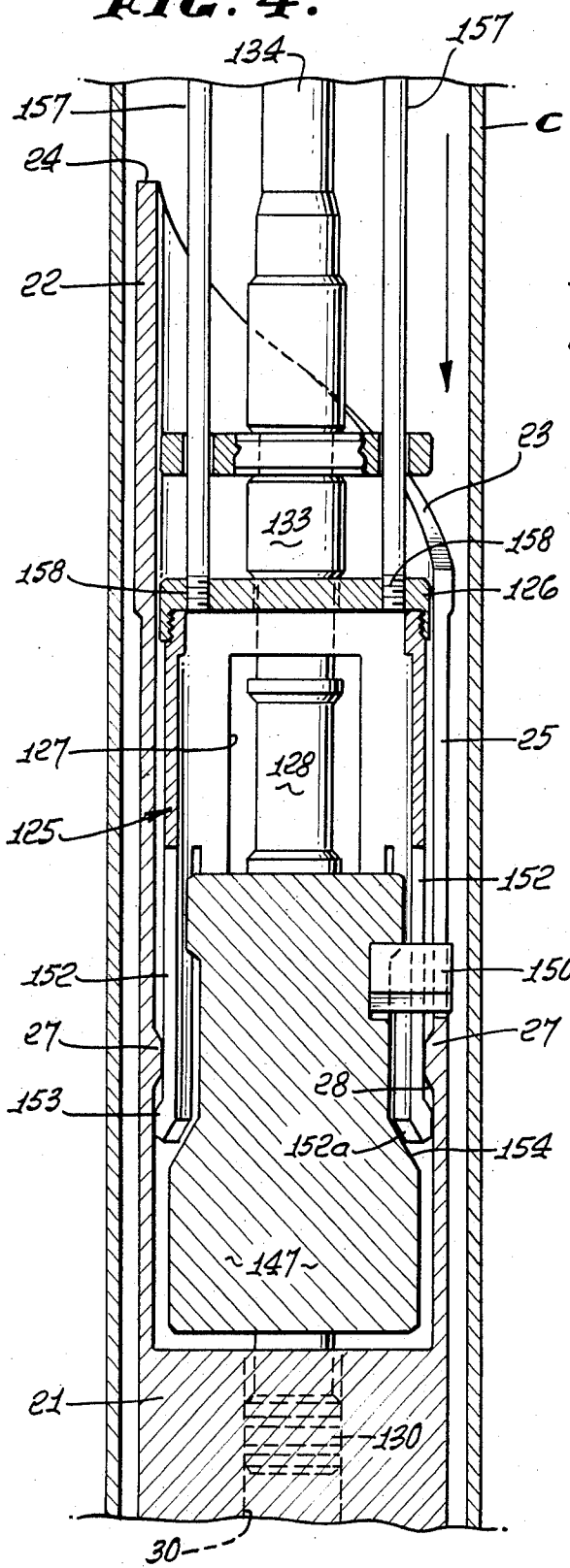
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FIG. 5.

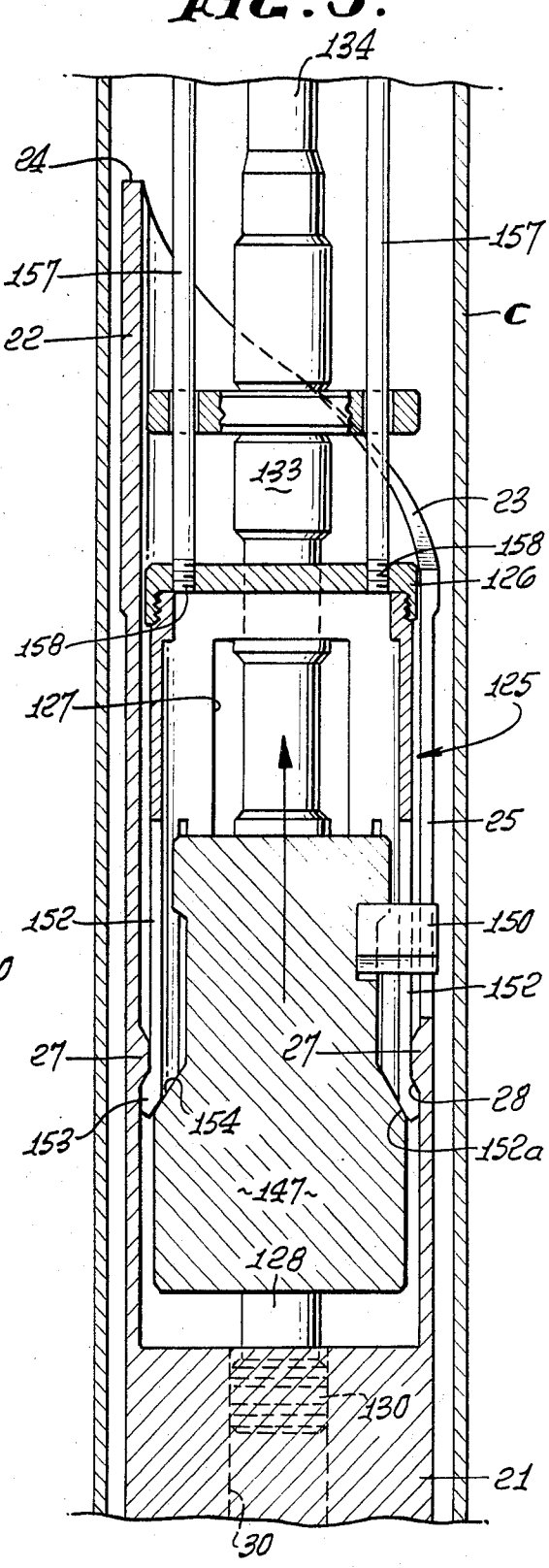
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FIG. 6.

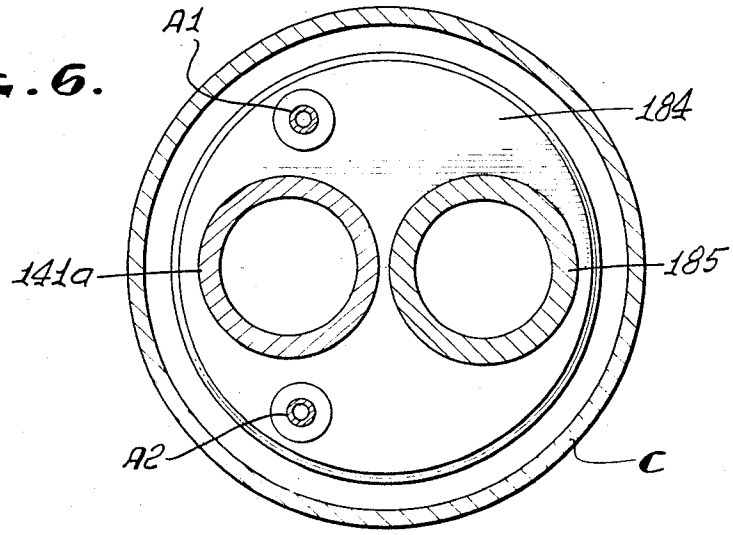


FIG. 7.

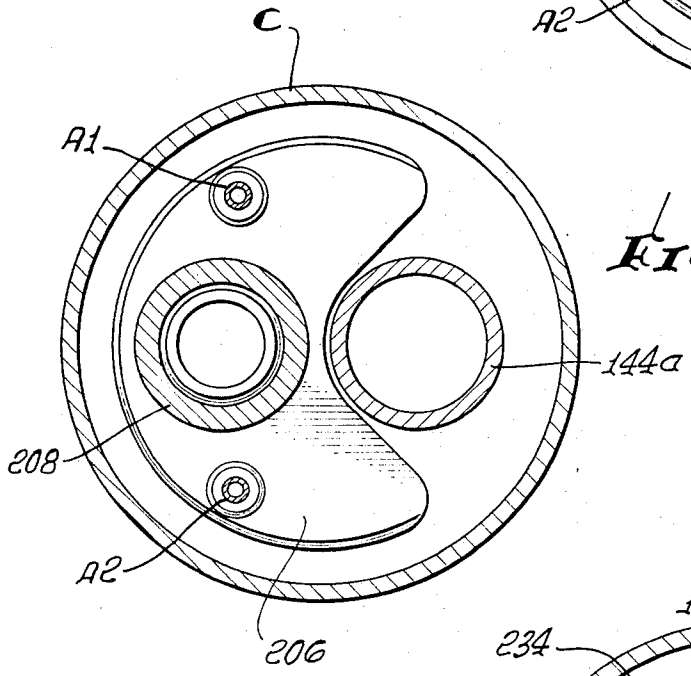
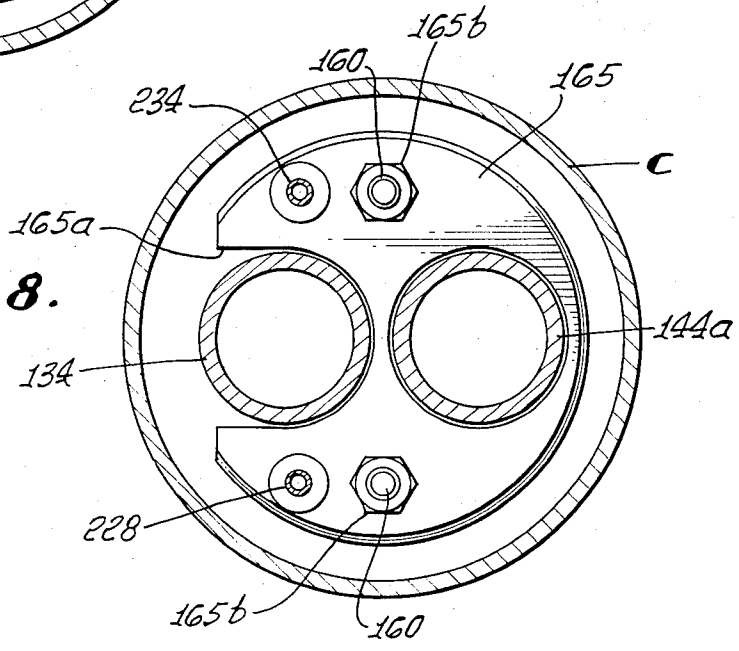


FIG. 8.



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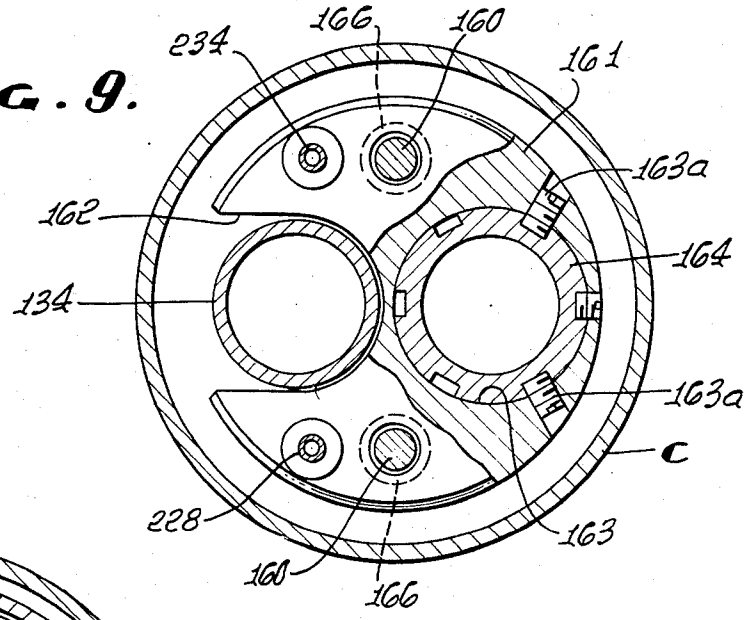


FIG. 10.

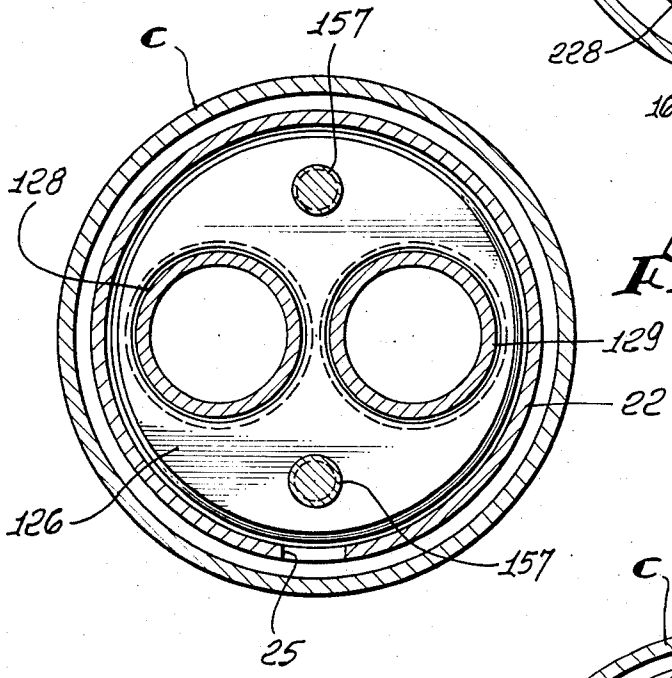


FIG. 11.

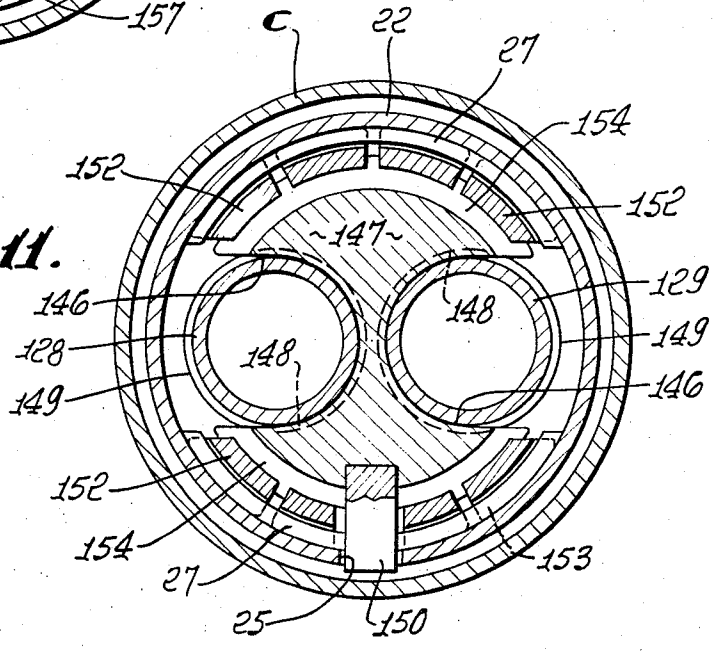


FIG. 12a.

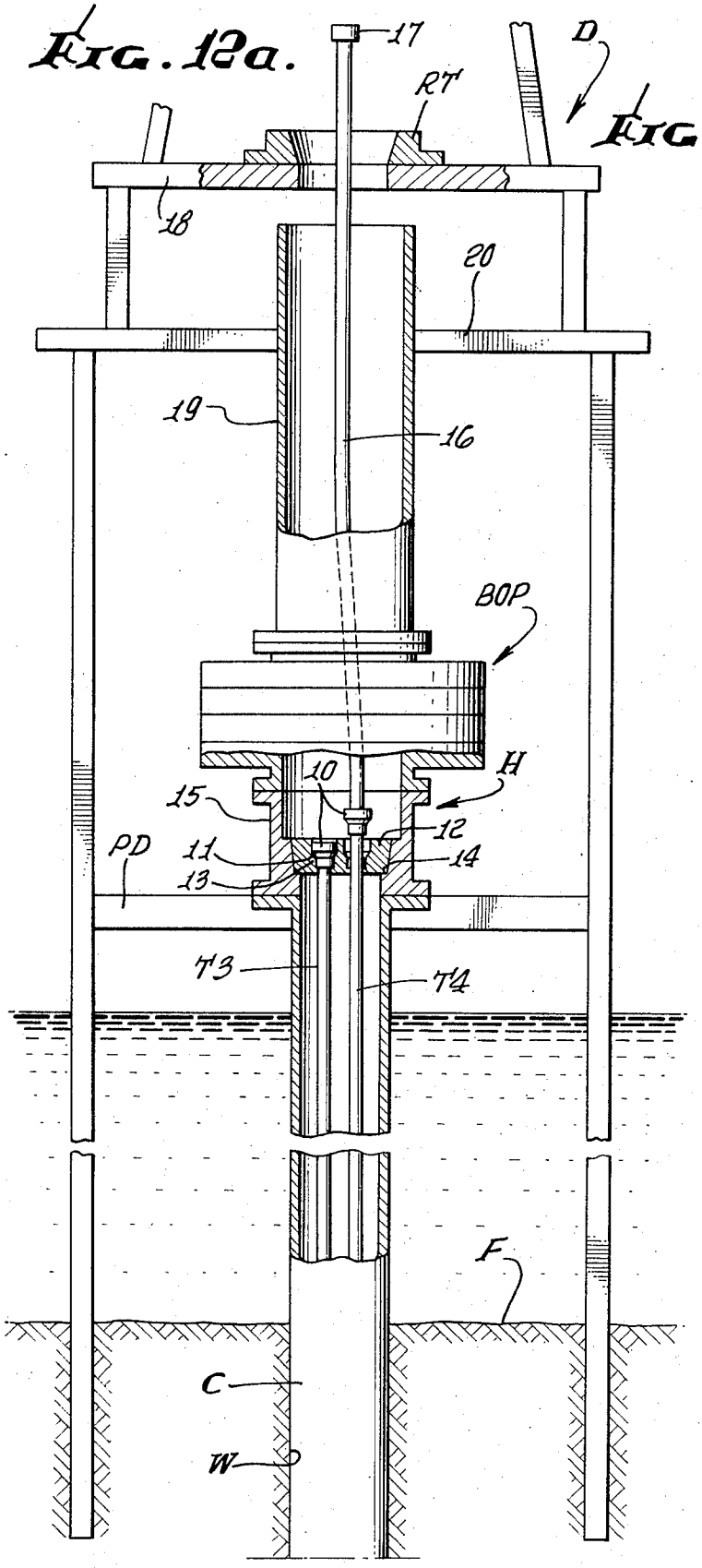


FIG. 12b.

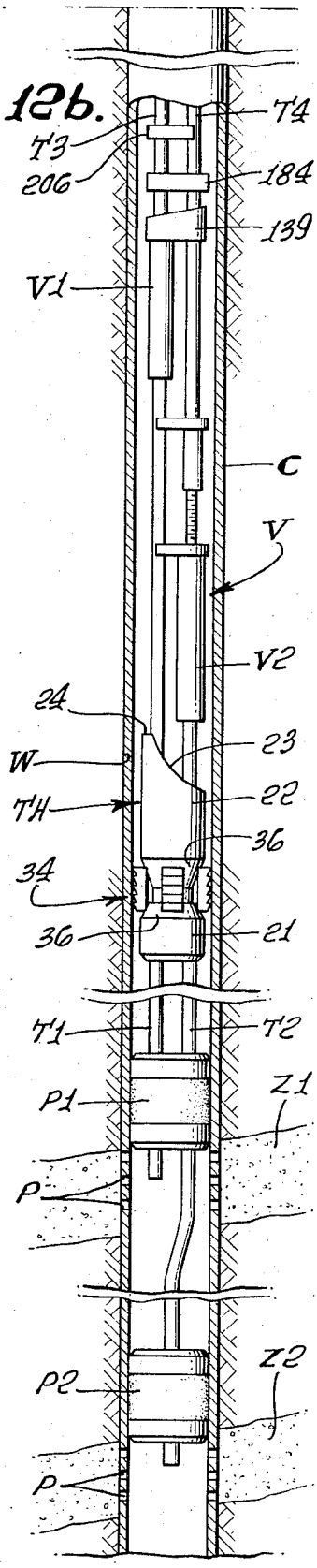


FIG. 13a.

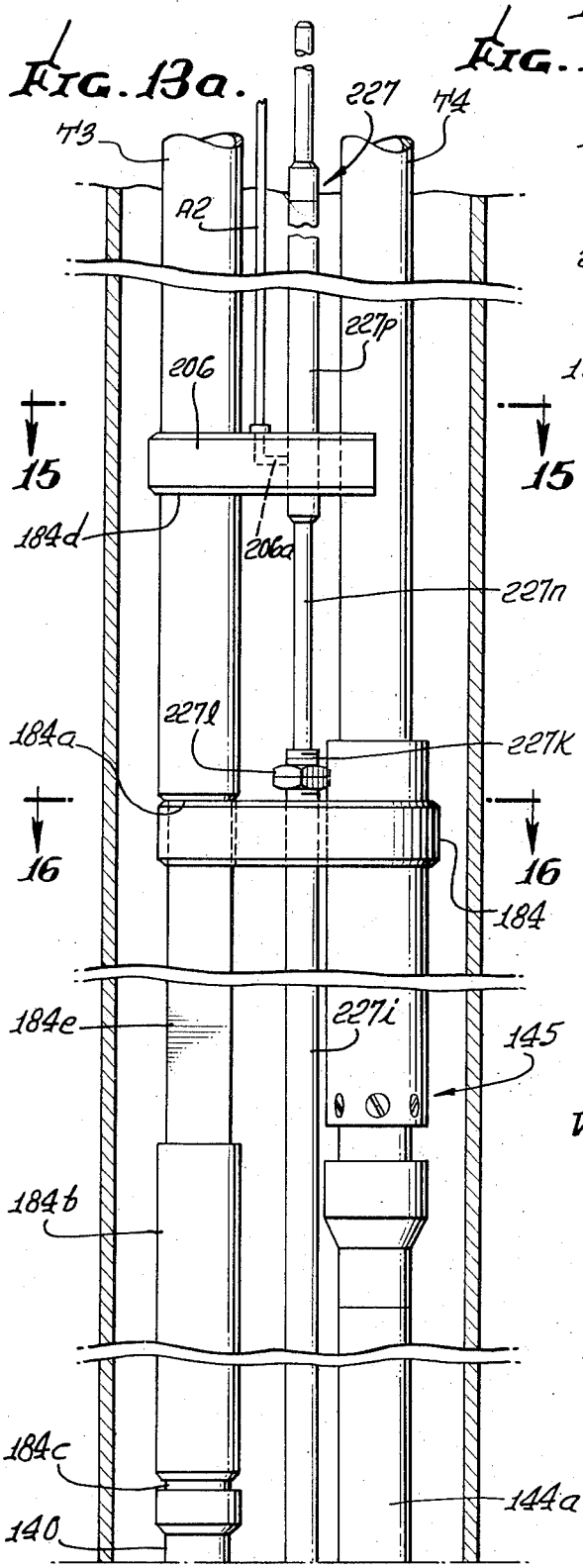
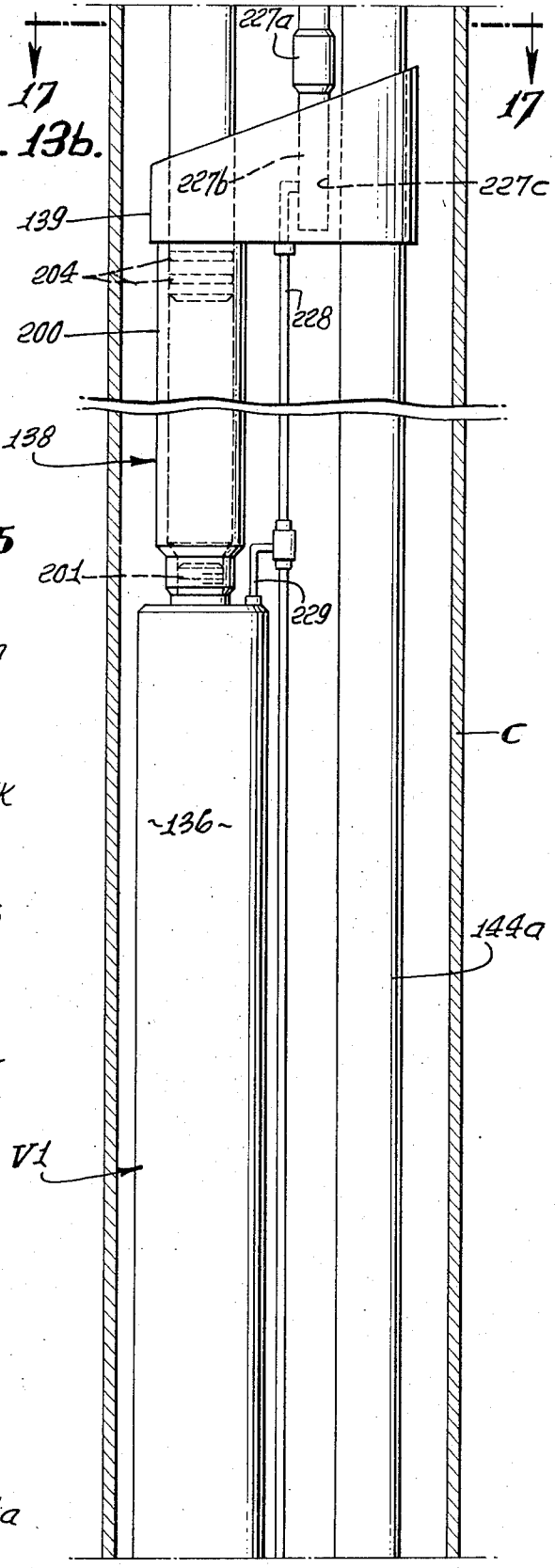


FIG. 13b.



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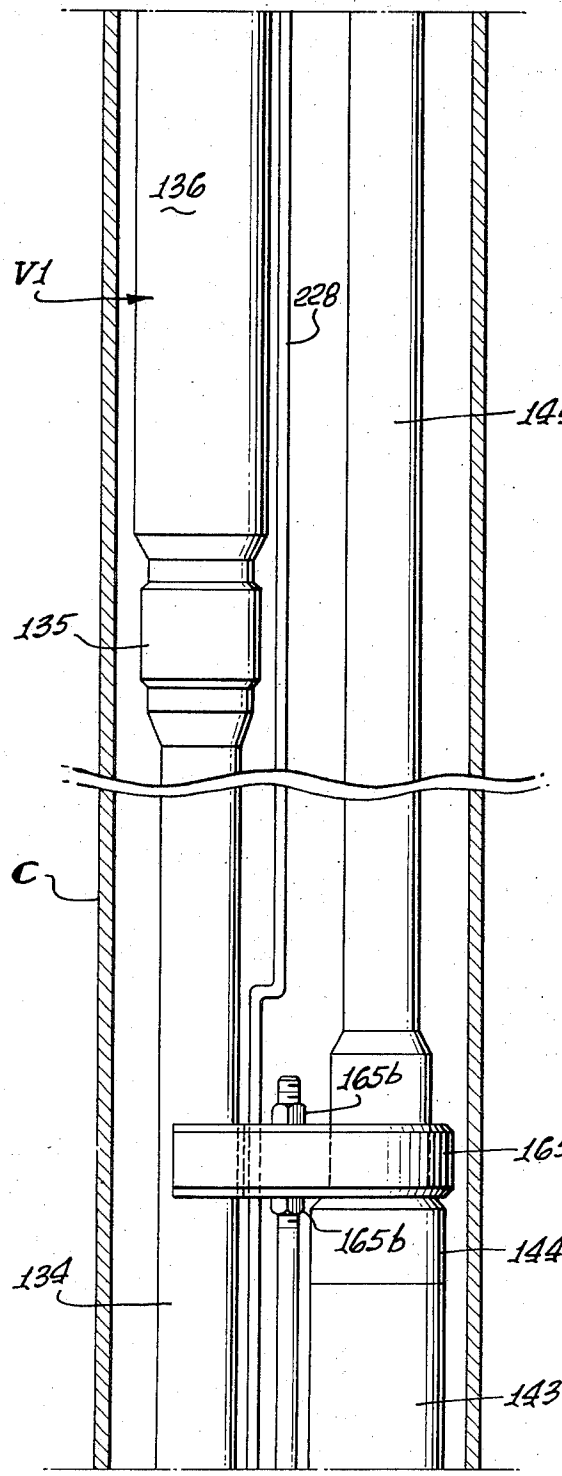


FIG. 13d.

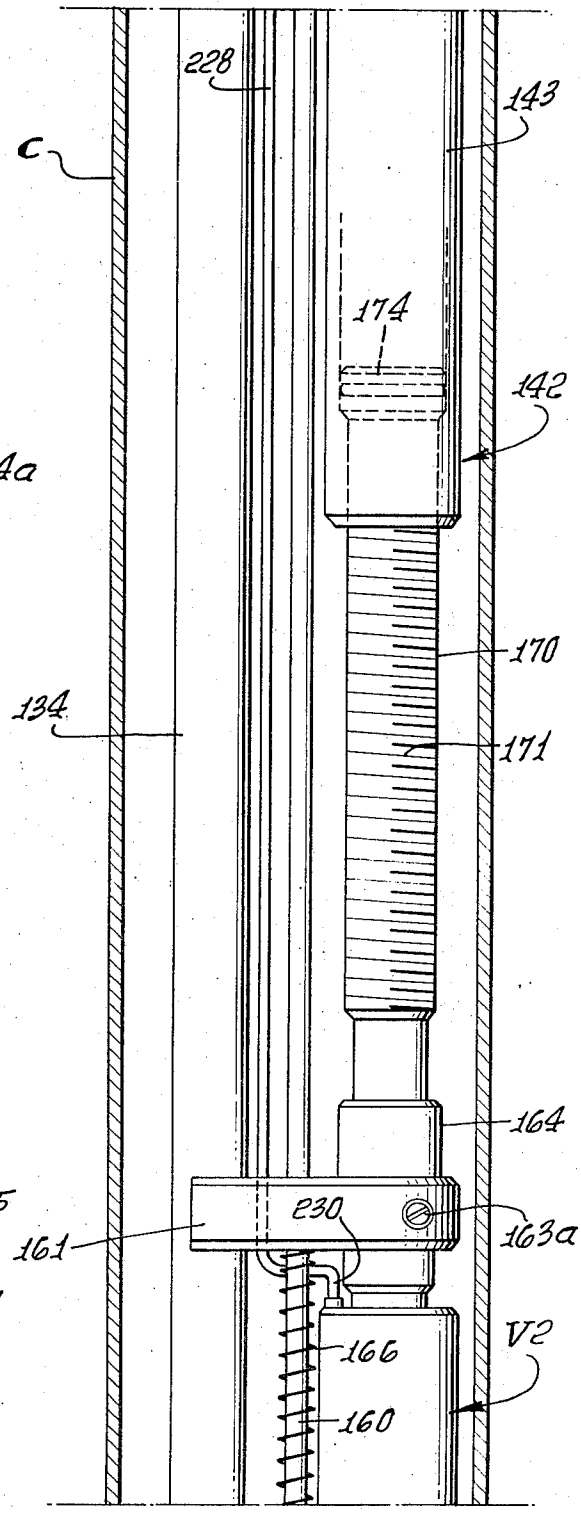


FIG. 13e.

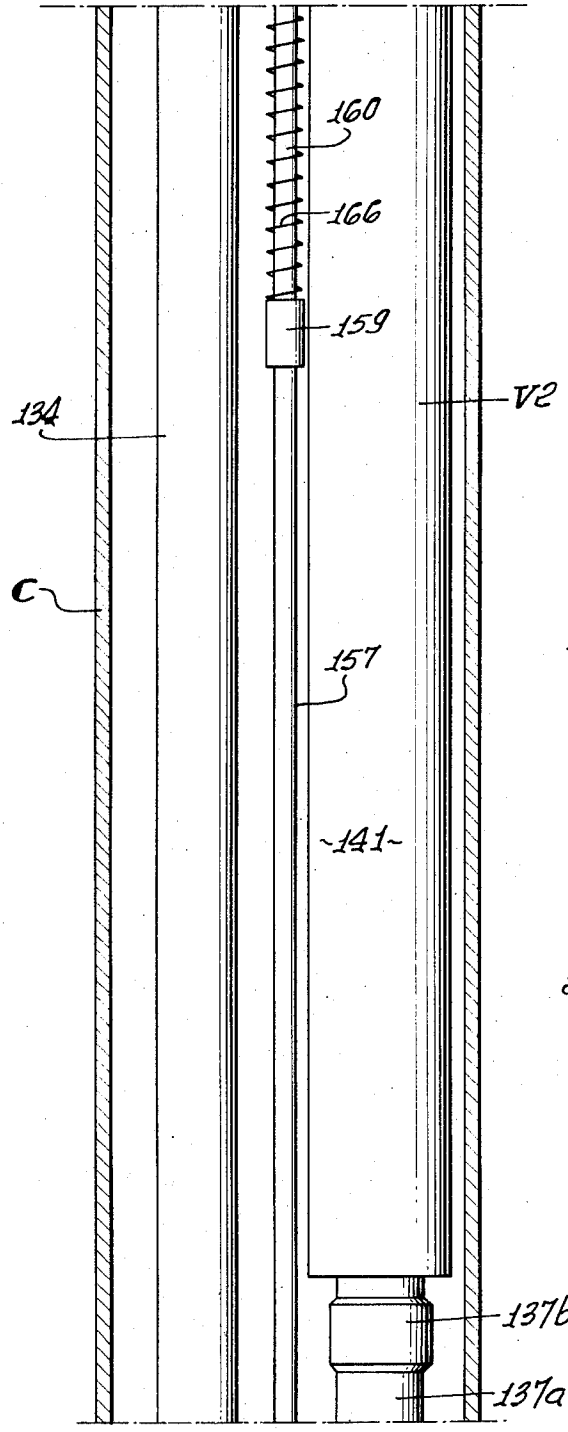


FIG. 13f.

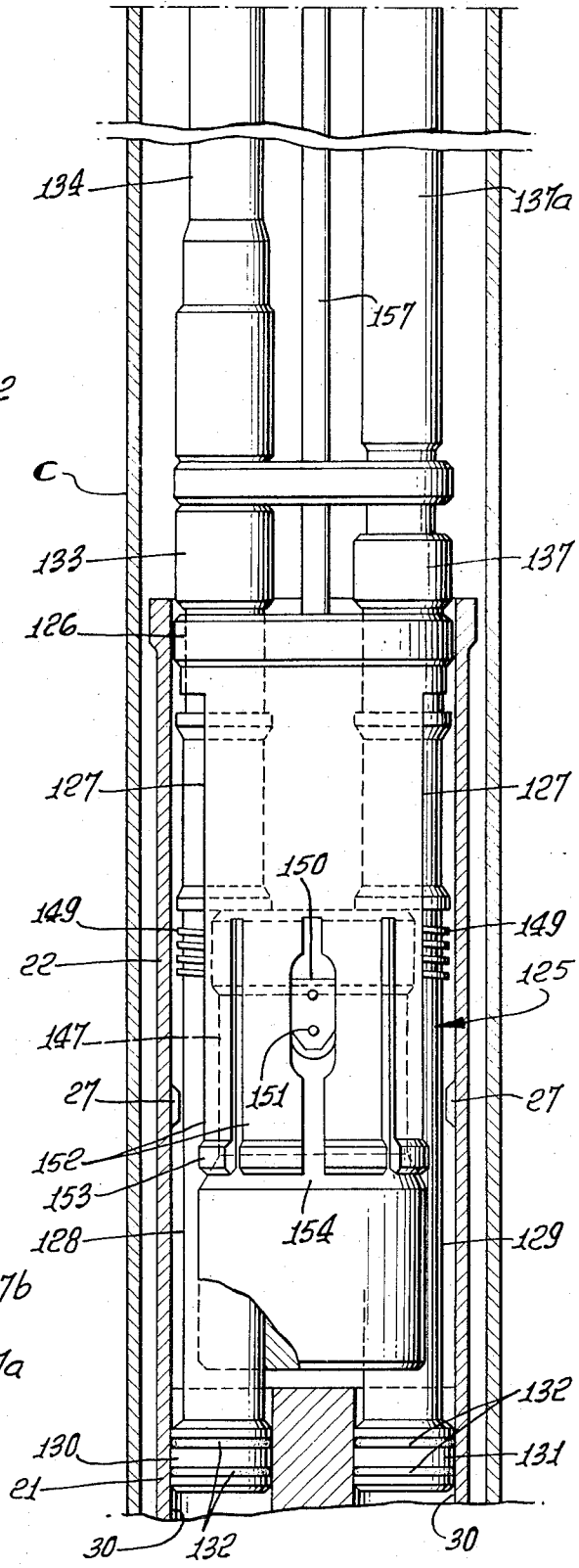


FIG. 14a.

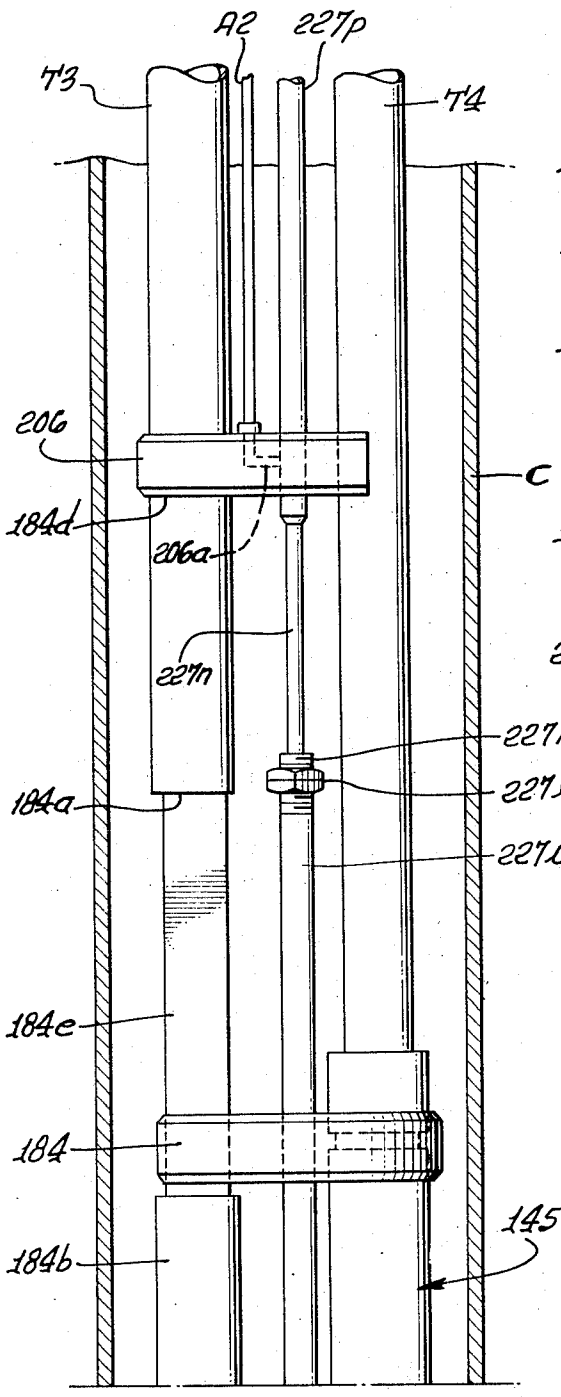
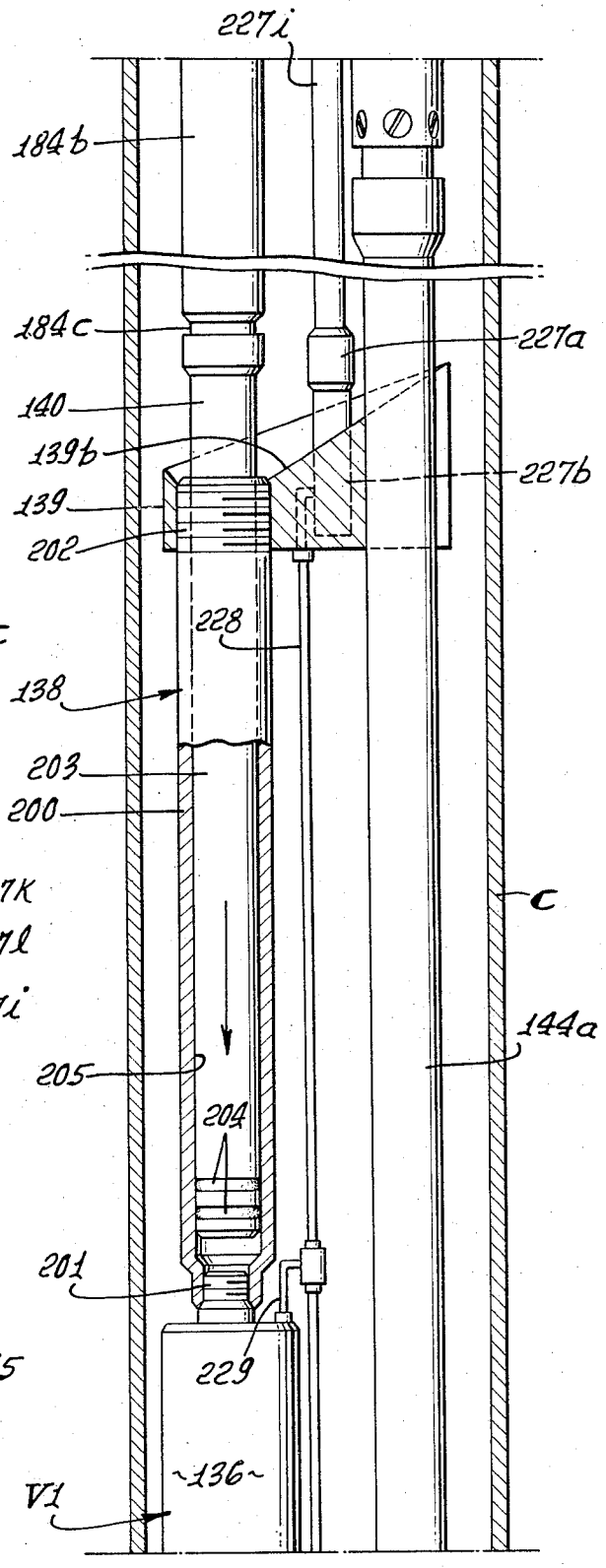


FIG. 14b.



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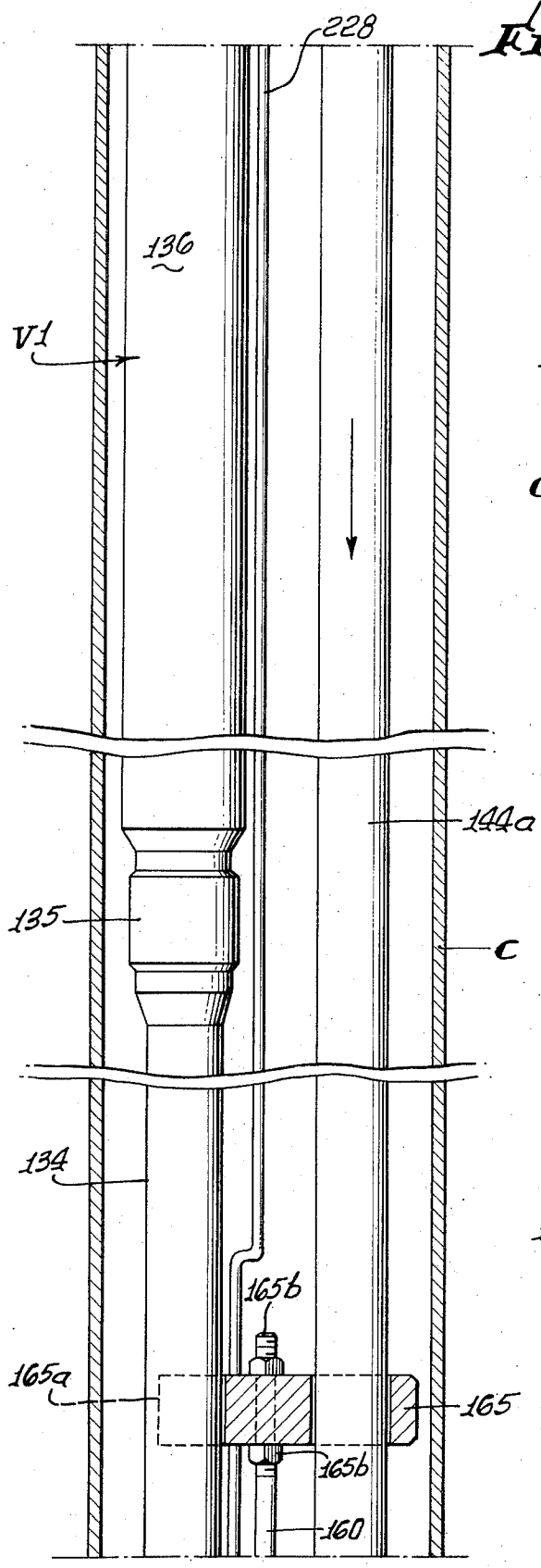


FIG. 14d.

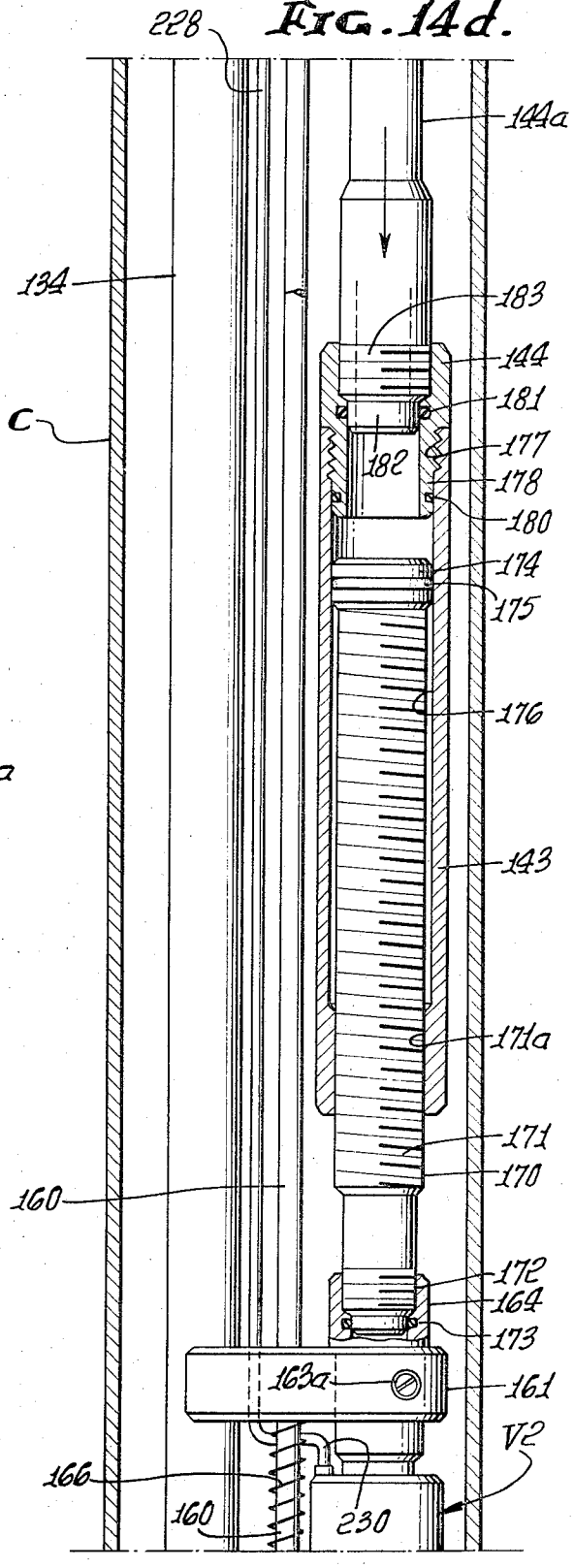


FIG. 14e.

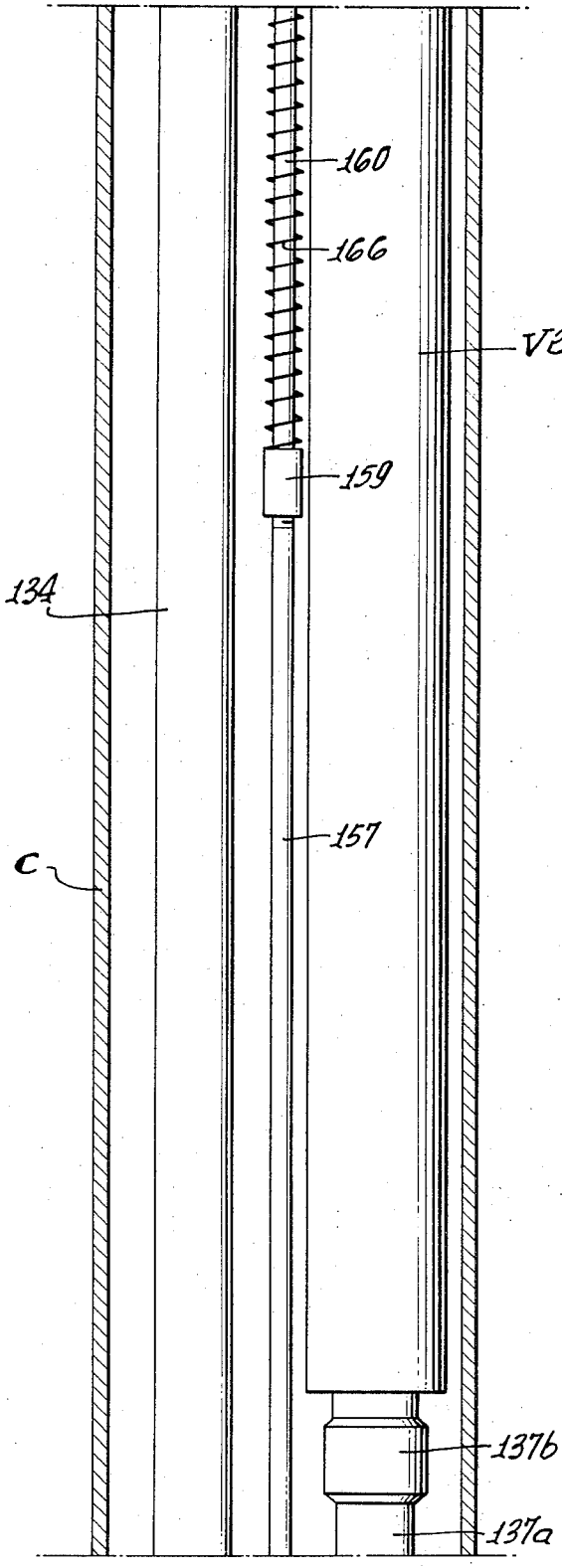


FIG. 14f.

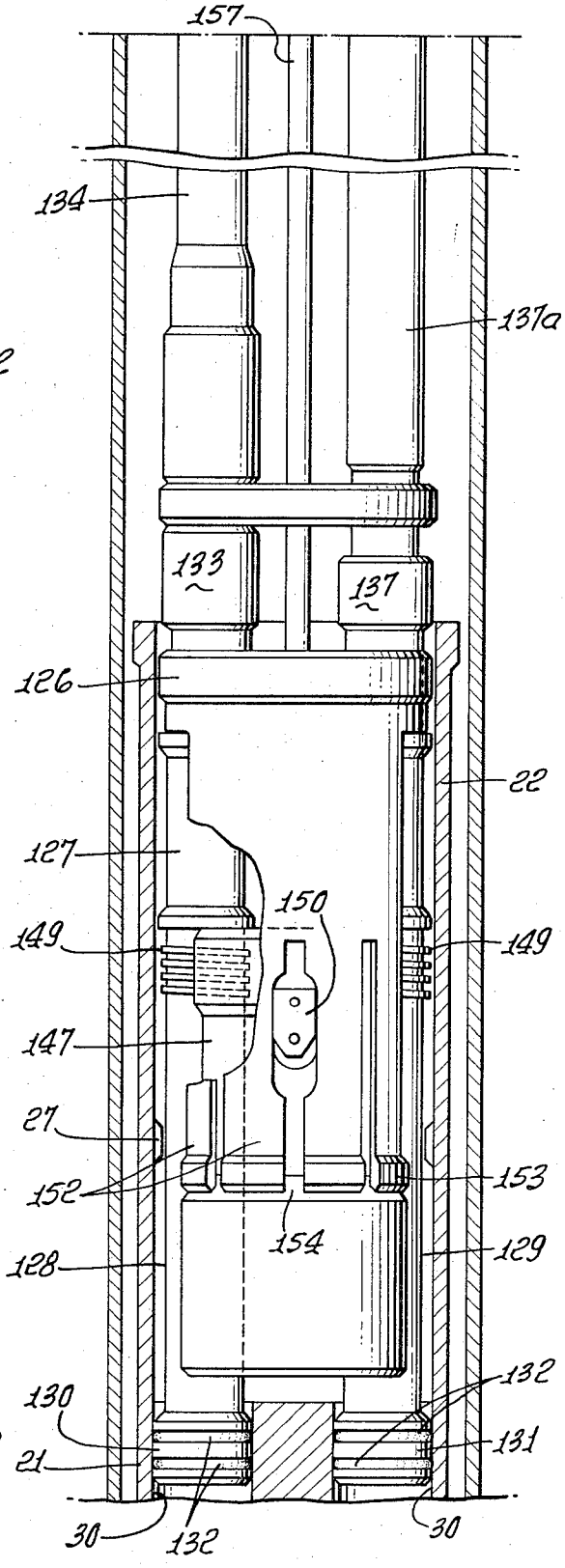


FIG. 15.

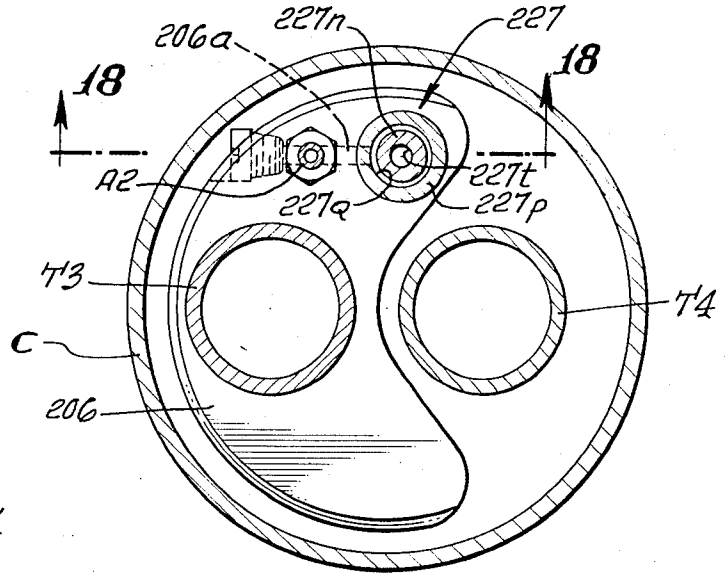


FIG. 16.

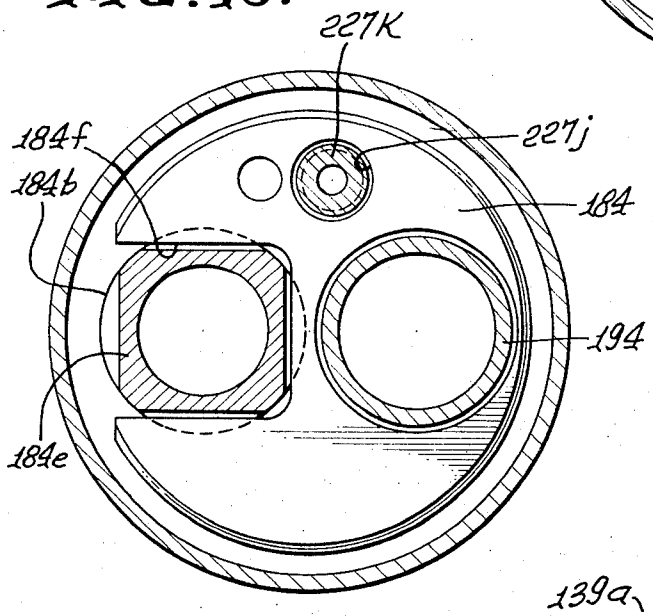


FIG. 17.

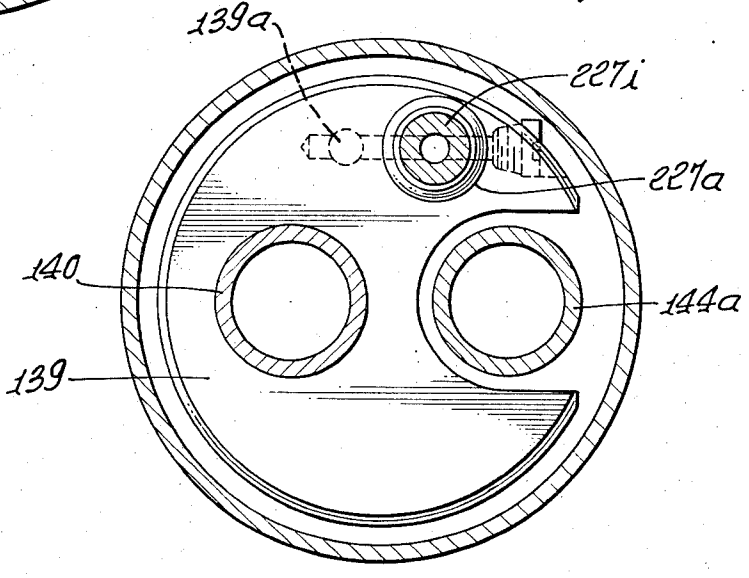


FIG. 18a.

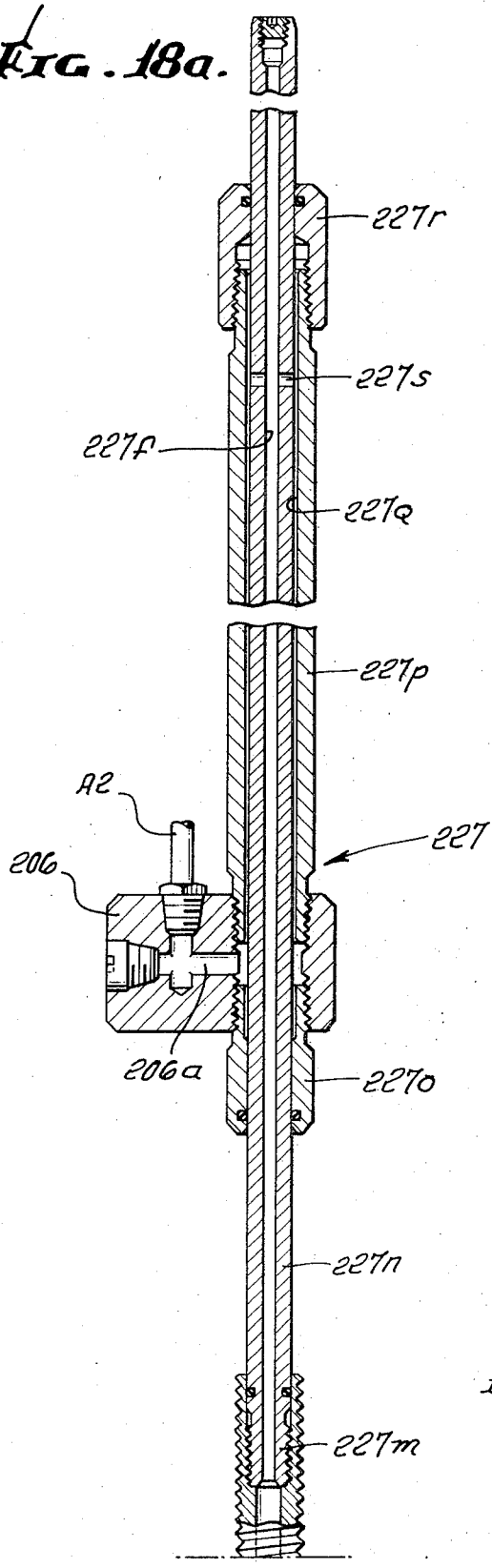
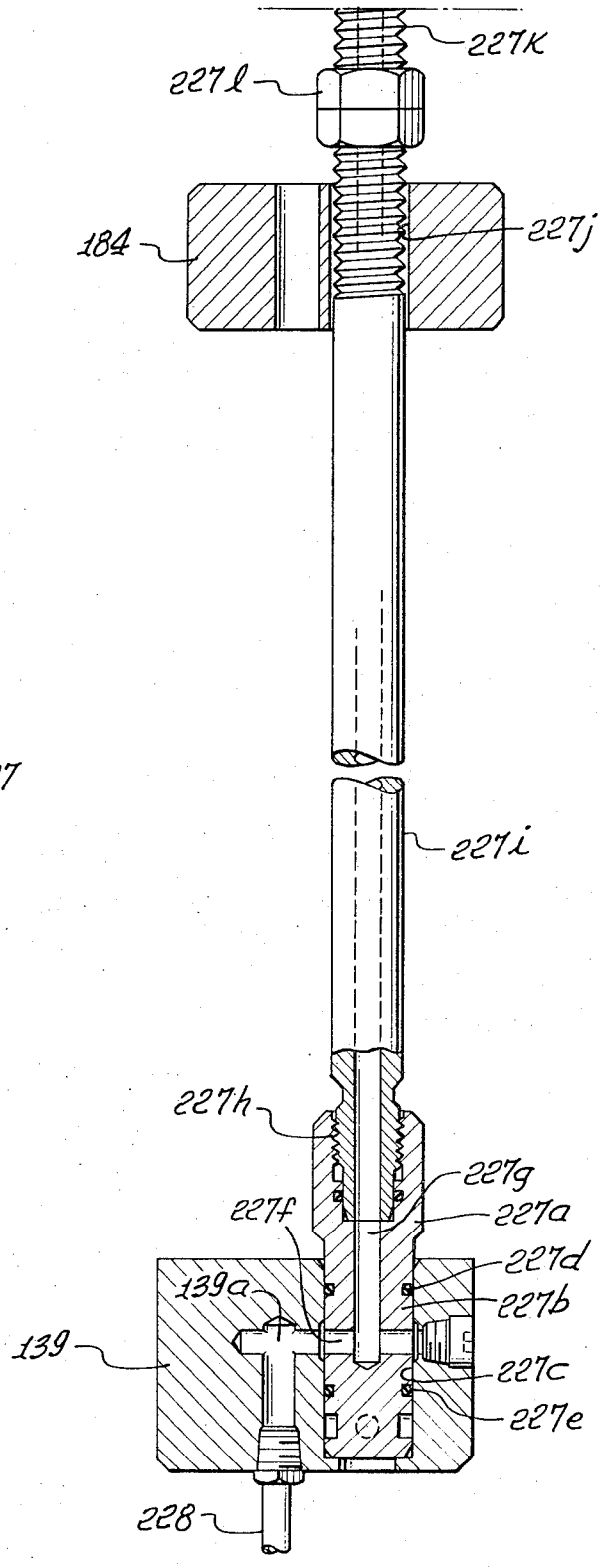


FIG. 18b.



TUBING SPACING MEANS FOR SUBSURFACE VALVES

This application is a continuation-in-part of application Ser. No. 366,060, filed June 1, 1973, now abandoned.

In the production of well fluids, such as oil and/or gas, from wells, it has been the practice to provide automatically closeable shutoff or safety valves which are located downhole in the well and are held open by control fluid pressure, the valves closing automatically when control fluid pressure is purposely reduced to allow the valves to close or damage occurs to the control fluid system at the well head or on an offshore platform.

Such valves are employed below the well head and in the case of offshore wells, the valves are installed below the mudline at such depth as may be desired or established by regulation, so that in the event of damage to the well caused by shifting earth or subsidence, the wells can be shut in to avoid loss of valuable well fluids into the water and, also to avoid contamination of the water and the shore.

In my prior application Ser. No. 275,911, filed July 28, 1972, there is disclosed a tubing hanger which supports the greater weight of the downwardly extended production tubing strings, in a plural zone well, and which provides a seat for removable plural safety valves. Thus a comparatively light hoist apparatus may be employed to run and retrieve the valve assembly, and costly workover or pulling rigs need not be utilized.

The tubing hanger with the production tubing for a plurality of well zones depending therefrom is run into the well casing on a setting tool to a desired location, say to a prescribed depth below the mudline in the case of an offshore well. The tubing hanger provides a seat for a plural safety or shutoff valve assembly which is run into the well on an upward extension of the production tubing and landed in the tubing hanger, with the tubing in the well below the tubing hanger in communication with the tubing above the tubing hanger. Control fluid is supplied to open the respective safety valves, but in the event of a sufficient decrease in the control fluid pressure, the safety valves will automatically close to shutoff the flow of production fluid.

In such installations, the surface tubing strings which extend between the subsurface valve assembly and the tubing head which is located above in the derrick substructure, must be of a predetermined length, since the interval between the subsurface tubing hanger and the tubing head, when the subsurface tubing hanger is located at a shallow depth below the mudline, is so short that discrepancies cannot be compensated for by the resilience or ability of the surface tubing itself to stretch or be compressed as would be possible where long tubing strings are involved when the subsurface hanger is set at a greater depth.

In offshore operations, difficulty is encountered in properly spacing out the tubing strings between the subsurface valve assembly and the tubing hanger in the tubing head on the production deck of the offshore platform. While adjustable spacing devices are known which could be employed in the respective surface tubing strings to make the necessary adjustments, in the use of such devices, for example, Baker Oil Tools, Inc., Product 441-25, Adjustable Spacer Sub with Rotational Lock, practical problems of handling the equipment are encountered. The derrick floor may be thirty to fifty feet above the production deck at which the tubing head is located, and a blowout preventor and riser pipe are between the production deck and the derrick floor, making visual location of the surface tubing hanger bushings and the seat for the bushings in the tubing head very difficult. The handling tubing string used for raising and lowering the subsurface valve assembly may be marked for reference to the rotary table on the derrick floor, but if an error is made which requires adjustment of the surface tubing length, then the tubing must be elevated above the rotary table to enable adjustment of such adjustable spacer subs, a time consuming and costly operation. Where the subsurface tubing hanger is set shallow, errors on the order of two inches, can require such adjustment of the length of the surface tubing strings.

The present invention provides a subsurface safety valve assembly with integral spacing means, so that the subsurface safety valve and the surface tubing head can be adjusted lengthwise, without requiring pulling of the valve from the subsurface hanger, to properly locate the tubing hanger with respect to the seat of the tubing head.

More particularly, the invention provides spacing means operable responsive to rotation of the surface tubing string which extends from the subsurface valve to the tubing head, to adjust the tubing length and properly locate the landing hanger thereon for engagement in the seat of the tubing head.

As disclosed herein, the subsurface valve assembly is a dual valve assembly adapted to be landed and latched in a subsurface tubing hanger and having dual surface tubing strings respectively communicable through a shutoff valve with a tubing string extending downwardly in the well into spaced productive earth zones. The subsurface valve assembly is latched into the subsurface tubing hanger responsive to rotation of one of the surface tubing strings, called an operating string herein, and both the operating and non-operating surface strings have a telescopic sub enabling the tubing strings to be adjusted responsive to rotation of the operating string, to properly locate the landing hangers on the tubing strings with respect to the seat in the tubing hangers.

The control fluid conduit which leads from the subsurface valve assembly to the production platform also has a telescopic sub enabling it to be adjusted lengthwise, along with the surface tubing strings.

To preclude inadvertent release of the subsurface tubing hanger in the event of subsequent application of excessive tensile forces to the surface tubing string, or to the operating string, a safety joint is provided to establish a location for separation in the operating string. Incorporated in the safety joint is a fishing neck adapted for engagement by a fishing tool or a reconnecting tool which also is adapted to engage in the sealing receptacle of the non-operating string.

According to one form, the plural surface tubings are interconnected by an adjusting sub for simultaneous adjustment responsive to rotation of the control string, to properly space the landing hangers with respect to the subsurface tubing hangers. In this form, the weight of the non-operating surface tubing string is carried through the adjusting sub by the operating string. In another form, the surface tubing strings are enabled to have limited relative longitudinal motion by means of

a sliding connection between a motion limiting mandrel and plate. In the use of this form, the weight of the non-operating string is supported by the operating string during lowering of the subsurface safety valve apparatus through the tubing head bushing, but the landing hanger of the non-operating string lands in its seat transferring the non-operating tubing string weight to the tubing head bushing, before the subsurface safety valve assembly lands in the subsurface tubing hanger, so that no weight of the non-operating string affects adjustment of the spacing system.

This invention possesses many other advantages, and has other purposes which may be made more clearly apparent from a consideration of the forms in which it may be embodied. These forms are shown in the drawings accompanying and forming part of the present specification. They will now be described in detail for the purpose of illustrating the general principles of the invention; but it is to be understood that such detailed descriptions are not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Referring to the drawings:

FIGS. 1*a* and 1*b*, together, constitute a diagrammatic illustration of a dual safety valve assembly, with tubing spacing means, installed in a subsurface tubing hanger, with the surface tubing extending downwardly from the tubing head and a handling tubing extending through the rotary table of the derrick and through the blowout preventor and connected to the operating surface tubing string, FIG. 1*b* being a downward continuation of FIG. 1*a;*

FIGS. 2*a* through 2*f*, together, constitute an enlarged view showing the subsurface valve assembly landed in the subsurface tubing hanger prior to operation of the spacing means to space the surface tubing and lock the latch;

FIGS. 3*a* through 3*f*, together, constitute a view, with parts broken away, generally corresponding with FIGS. 2*a* through 2*f*, but with the spacing means adjusted and the latch locked on the subsurface tubing hanger;

FIG. 4 is a longitudinal section, as taken on the line 4—4 of FIG. 2*f*, through the latch;

FIG. 5 is a longitudinal section, as taken on the line 5—5 of FIG. 3*f*, through the latch;

FIG. 6 is a transverse section, as taken on the line 6—6 of FIG. 3*a;*

FIG. 7 is a transverse section, as taken on the line 7—7 of FIG. 3*b;*

FIG. 8 is a transverse section, as taken on the line 8—8 of FIG. 3*c;*

FIG. 9 is a transverse section, as taken on the line 9—9 of FIG. 3*d;*

FIG. 10 is a transverse section, as taken on the line 10—10 of FIG. 3*f;*

FIG. 11 is a transverse section, as taken on the line 11—11 of FIG. 3*f;*

FIGS. 12*a* and 12*b*, together, constitute a diagrammatic illustration of a dual safety valve assembly with tubing spacing means of a somewhat modified construction, but generally corresponding to FIGS. 10*a* and 10*b*, FIG. 12*b* being a downward continuation of FIG. 12*a;*

FIGS. 13*a* through 13*f*, together, constitute an enlarged view showing the subsurface valve assembly landed in the subsurface tubing hanger prior to operation of the spacing means to space the surface tubing and lock the latch;

FIGS. 14*a* through 14*f*, together, constitute a view generally corresponding to FIGS. 13*a* through 13*f*, but with the spacing means adjusted;

FIG. 15 is a transverse section as taken on the line 15—15 of FIG. 13*a;*

FIG. 16 is a transverse section as taken on the line 16—16 of FIG. 13*a;*

FIG. 17 is a transverse section as taken on the line 17—17 of FIG. 13*a;* and

FIG. 18*a* and 18*b*, together, constitute a detail view partly in longitudinal section, as taken on the line 18—18 of FIG. 15, and partly in elevation showing a modified control fluid seal assembly.

As seen in the drawings, referring first to a form of the invention as shown in FIGS. 1*a* and 1*b*, a well bore W extends downwardly into the earth below the ocean floor F through vertically spaced well fluid producing zones Z1 and Z2. A casing C is set in the well bore and perforations P in the casing establish communication between the productive zones Z1 and Z2 and the casing C. Set in the casing C is an upper packer P1 located above the productive zone Z1 and a lower packer P2 located in the casing between the productive zones Z1 and Z2. A first production tubing string T1 extends through the packer P1 and opens into the casing therebelow to communicate with the productive zone Z1, and a second production tubing string T2 extends downwardly through the lower packer P2 into the casing therebelow for communication with the productive zone Z2. The tubing strings T1 and T2 may extend a number of thousands of feet downwardly in the casing to the packers P1 and P2 and the tubing strings T1 and T2 are supported by tubing hanger means TH, which may be as more particularly described and claimed in my prior application Ser. No. 275,911, filed July 28, 1972, and which is set or anchored in the well casing and forms a seat for a subsurface shutoff valve assembly V which comprises dual shutoff valves V1 and V2 for the respective tubing strings T1 and T2. The tubing hanger TH and the valve assembly V are located below the ocean floor or the mudline of a body of water, at a desired or required depth of say up to 1,000 feet, more or less. The casing C extends upwardly through the water to a derrick D, as shown in the typical diagrammatic illustration. However, as is well known, the well may be completed at the ocean floor and one or a number of additional casings (not shown) may be set in larger diameter well bores, and the casing C may be suspended or hung from a casing hanger located at the ocean floor, in which case, a conductor pipe or other casing (not shown) may extend to the derrick D. In any event, upper production fluid tubings T3 and T4 extend upwardly from the respective valves V1 and V2 of the valve assembly V and are adapted, as shown in the aforementioned pending application, to be connected to suitable flow lines through which production fluids from the zones Z1 and Z2 can be conducted to a suitable reservoir, after the valve assembly V has been set in the tubing hanger means TH and the valves V1 and V2 opened by control fluid pressure supplied from a suitable source.

The present invention is more particularly concerned with means for properly spacing out the tubings T3 and T4 between the upper end of the valve assembly and the surface tubing hanger head H which is located in

the illustrated installation, at the production deck PD of the derrick D, the production deck PD being located above the water.

In order to support or hang the tubing strings T3 and T4, they are provided with mandrel type landing hangers **10** which, as is well known, provide shoulders **11** engageable in the tubing head master bushing **12** which provides seats **13** for the landing hangers **10.** The bushing **12** in turn is disposed in a seat **14** provided in the body **15** of the tubing head H. The landing hangers provide means (not shown) for connection with the flow lines referred to above, and, in the illustrated embodiment, the tubing string T4 is connected by its landing hanger **10** with a handling tubing **16** having a collar **17** at its upper end, whereby the valve assembly V, as will be hereinafter described, is adapted to be lowered through the rotary table RT on the upper platform **18** of the derrick D, downwardly through usual riser pipe **19** which extends downwardly from below the rotary table, through an upper deck **20,** and is connected to the usual blowout preventer BOP, the latter being connected to the tubing head H.

The respective subsurface valves V1 and V2, which are normally closed, are adapted to be held open, to enable the flow of production fluids therethrough, by means of control fluid pressure supplied through a control fluid conduit, or through a pair of such conduits, as will be later described, from a source of control fluid pressure. So long as the control fluid pressure is adequate to maintain the subsurface valves V1 and V2 open, well fluids may flow from the zones Z1 and Z2 to respective flow lines but, if it is desired for any reason to close either of the shutoff valves V1 or V2, or in the event of damage of the control fluid tubing, the control fluid pressure may be reduced so that the subsurface valves V1 and V2 are automatically closed, thereby shutting the well in at a location below the ocean floor, to prevent continued production fluid flow, as more particularly described, for example, in my prior application Ser. No. 286,151, filed Sept. 5, 1972.

The tubing hanger assembly TH and the tubing strings T1 and T2 are adapted to be lowered from the platform PP downwardly through the casing C on a setting tool, as more particularly disclosed in my prior application Ser. No. 275,911, filed July 28, 1972, and the valve assembly V is thereafter adapted to be lowered through the casing C into the tubing hanger TH on the upper tubing strings T3 and T4, or by one of them, and on the handling tubing **16.** Likewise, the valve assembly V can be retrieved from the tubing hanger TH, so that under normal circumstances requiring repair or service of the subsurface valve assembly V, it is not necessary to pull the entire dual tubing strings T1 and T2. Since only the comparatively short upper tubing strings T3 and T4 need be pulled from the well to remove the valve assembly V, and the substantially longer tubing strings T1 and T2 remain in the well, the derrick D need not be equipped with or supplied with high-powered hoisting apparatus. Instead, the derrick D may simply be provided with a small low-powered hoist mechanism or a gin pole hoist. In addition, the tubing strings T1 and T2 can be plugged off at or below the tubing hanger TH to enable the service or repair of the valves V1 and V2 without requiring that the well be killed.

As seen in FIG. 1*b*, the tubing hanger TH comprises a body section **21** having an upwardly extended tubular guide section **22,** the upper end edge **23** of which is arched downwardly from a peak **24,** in opposite directions, to a vertically extended slot **25** (see FIGS. **4** and **5**) at the side of the guide section **22** diametrically opposite the peak **24.** Internally of the guide section **21,** is an internal flange **27** which provides a downwardly facing shoulder **28,** for purposes to be later described. Extending downwardly into the body section **21** from the guide section **22,** are a pair of diametrically spaced fluid passages at the upper end of which is a pair of cylindrical receptacles or sockets **30** which are in fluid communication with the tubing strings T1 and T2.

The tubing hanger means TH is anchored in the casing C by anchor means **34,** including normally retracted, expansible casing engaging slip elements **35** actuatable by opposed cones **36** when the tubing anchor is set in the casing on a setting tool as shown and described in my aforementioned application Ser. No. 275,911.

The valve assembly V is run into the casing C by means of suitable, well known elevator equipment and landed in the tubing hanger means TH, and then latched in place by manipulation of the tubing string T4. Manipulation of the tubing T4 is accomplished by the handling tubing **16.**

At its lower end, as seen in FIGS. 2*f*, 3*f*, **4** and **5,** the valve assembly V is adapted to be received in the upper tubing hanger body section **22** and to be latched in place by releasable latch means **125** beneath the internal flange **27** in the hanger body section **21.** At diametrically spaced locations in a cross-head **126** of the latch means **125,** the latch means **125** has elongated laterally opening spaces **127, 127** accommodating flow tubes **128** and **129** which are respectively adapted to establish communication between the tubing strings T1 and T2 and the valve assemblies V1 and V2, respectively.

At their lower ends, the flow tubes **128** and **129** have sealing end portions **130** and **131,** respectively, each having sealing ring means **132** engageable within the bores or receptacles **30** in the tubing hanger body **21.** The flow tube **128** extends upwardly from the cross-head **126** and is connected at **133** to a length of tubing **134** which extends further upwardly a suitable distance, and is connected at **135** to the lower end of the valve housing **136** of the upper valve assembly V1. Above the housing **136** of the valve V1 is a telescopic sealing assembly **138** which is connected beneath a guide member **139** above which is a tubular assembly **140** which is connected at its upper end to the tubing string T3. The flow tube **129** also extends upwardly from the cross-head **126** and is connected at **137** to a length of tubing **137***a* which, in turn, is connected at **137***b* to the housing **141,** the valve assembly V2, which is spaced downwardly from the valve assembly V1 to enable utilization of valve assemblies V1 and V2 having full bore flow passages. Extending upwardly from the valve housing **141** are rotational spacer sub means **142** including a rotatable tubular member **143** which is connected at its upper end by a coupling **144** to a length of tubing **144***a* which extends upwardly alongside the valve V1 through the guide **139** and is connected to the tubing string T4 by safety joint means **145.** Rotation of the tubing string T4 and, thus, the tubular member **143** of the spacer sub **142** is utilized to engage and release the latch means **125** when the valve assembly V is run

into the tubing hanger TH, as well as to properly space the tubings T3 and T4, as will be later described.

The flow tubes are retained in parallel, assembled relation by the cross-head **126** and extend through side openings **146** in the body **147** having internal grooves or threads **148** which receive annular ribs or threads **149** on the flow tubes **128, 129** to hold the latter against relative axial movement (FIG. **11**).

When the valve assembly V is being lowered into the tubing hanger TH, a key **150,** secured on one side of the body **147** by fasteners **151** and engageable with the peak **24** of the hanger body section **22** will cause rotation of the valve assembly V, as the key **150** rides downwardly on the inclined surface **23** and is guided into the vertical slot **25,** whereby the lower ends **130, 131** of the flow tubes **128, 129** will be properly positioned or oriented so as to be stabbed into the bores or receptacles **30** in the hanger body **22.**

The latch means **125** referred to above, comprises a plurality of resilient, normally retracted collett fingers **152** depending from the cross-head **126** and having outwardly projecting latch lugs **153** at their lower ends. The lower ends of the latch fingers **152** are adapted to be held outwardly by a wedge surface **154** on the body **147** when the cross-head **126** is moved downwardly relative to the body **147,** from the position of FIGS. **2***f* and **4** to the position of FIGS. **3***f* and **5.** Means are provided for normally holding the latch fingers **152** in the upper positions, and spring means are provided for actuating the cross-head **126** downwardly to engage the fingers **152** with the holding surface **154.**

More particularly, a pair of lower control rods **157** are connected to the cross-head **126** at their lower ends **158** to hold the head **126** in an upper position, as seen in FIG. **4.** These rods **157** are connected at their upper ends to couplings **159** which are also connected to upper control rods **160,** the rods **160** extending upwardly and slideably through a plate **161,** having a notch **162** for straddling the tubing **134** (FIG. **9**). The plate **161** has a bore **163,** in which a complemental non-rotatable sub **164** is disposed and held by shear screws **163***a*. At their upper ends, the control rods **160** are connected to a control yoke **165** which is, as best seen in FIG. **8,** longitudinally shiftably mounted on the tubing **144***a* and notched at **165***a* to accommodate the tubing **134.** Adjusting nuts **165***b* engage the threaded ends of the rods **160** on opposite sides of the yoke **161.**

Spring means are operable to force the cross-head **126** downwardly and comprises a pair of coiled compression springs **166** disposed about the control rods **160** and seating at their lower ends on the couplings **159** and at their upper ends against the plate **161.**

When the cross-head **126** moves downwardly, as will be later described, under the control of the handling tubing **16,** and under the influence of the springs **166,** the lower end surfaces **152***a* of the latch fingers **152** engage the conical holding surfaces **154** on the body **147** and are held against flexing inwardly. Thus, the latch lugs **153** are engageable beneath the shoulder **27** in the tubing hanger body to retain the valve assembly seated in the tubing hanger, as seen in FIG. **5.** Initially, however, the control yoke **165** is held in an upper position by abutting engagement with the coupling **144,** as seen in FIG. **2***c*, by which the tubing **144***a* is connected to the rotatable tubular body **143** of the spacing sub **142** which is rotatable by the handling tubing **16.**

Referring to FIGS. **2***d* and **3***d*, the spacing sub **142** comprises a non-rotatable tubular member or mandrel **170** provided with a left-hand thread **171** on which the rotatable member **143** is threadedly engaged at **171***a* so as to be adjustable longitudinally or telescopically on the mandrel **170.** At its lower end **172,** the non-rotatable mandrel **171** is fixedly threaded and sealed by a sealing ring **173** in the coupling or nipple **164** which is fixed in the plate **161** by the set screws **163***a*, previously referred to. At its upper end, the fixed mandrel **170** has a cylindrical section **174** provided with a seal ring **175** slideably and sealingly engaged in the unthreaded bore **176** of the rotatable tubular member **143** of the spacing sub means **142.** At the upper end of this outer tubular member **143,** it is internally threaded at **177** to receive an externally threaded end **178** of the coupling **144** which carries a seal ring **180** engaged in a bore **176** of the tubular member **143** and another seal ring **181** which engages the lower sealing end portion **182** of the upwardly extending tubing **144***a*, the latter being threadedly connected at **183** to the coupling **144.**

This tubing **144***a*, as will later be more fully apparent, is the operating tubing adapted to rotate the outer tubular member **143** of the spacing sub **142,** and the tubing **144***a* extends rotatably through an opening **139***a* (FIG. **3***b*) in the guide **139** and, in the form now being described, is rotatably connected by the safety joint means **145** to a fixed string adjustor sub or plate **184,** as seen in FIG. **3***a*.

More particularly, the safety joint means **145** comprises an inner tubular mandrel **185** having a cylindrical section **186** rotatable in a bore **187** in the plate **184** and a lower end **188** threaded into the upper, coupling end **189** of the tubing **144***a*. A ring seal **190** is provided between the coupling **189,** and a cylindrical end portion **191** of the mandrel **185,** and additional sealing ring means, shown as a pair of ring seals **192,** are disposed in the bore **187** of the plate **184** and engage the cylindrical mandrel section **186.** Above the plate **184** and connected to the mandrel **185** by shear screws **193** is an outer, tubular joint section **194** having an internal bore **195** into which the mandrel **185** extends and is sealed at its upper end by a ring seal **196** on an enlargement **197,** the latter having a function to be later described.

At its upper end, the outer tubular safety joint member **194** is secured by a coupling **198** to the tubing T4 which extends upwardly to the tubing head H and is connected to the handling tubing **16,** the coupling **198** having a sealing end portion having a ring seal **199** engaged in the upper end of the bore **195** of the safety joint member **194.** Thus, it will be seen that the plate **184** is connected to the operating tubing **144***a* between opposed shoulders **189***a* and **194***a* on the coupling **189** and the safety joint member **194** for longitudinal movement with the operating string, for lowering the valve assembly V into the tubing hanger TH, but the operating tubing **144***a* is rotatable by the tubing string T4 and the handling tubing **16.**

The telescopic seal means **138,** which is disposed between the upper end of the body **136** of the valve V1 and the guide **139,** includes an outer, tubular body **200,** as best seen in FIGS. **2***b* and **3***b*, threadedly connected at its lower end at **201,** to the valve body **136,** and, at its upper end at **202,** to guide **139.** Telescopically disposed in the tubular body **200** is a tubular mandrel **203,** having one or more seal rings **204** adjacent to its lower

end and slideably and sealingly engaged in the bore **205** of the tubular body **200.** At its upper end, the mandrel **203** is connected to a plate **206,** having a function to be later described, by a shoulder **207** and an opposed coupling **208** which connects the mandrel **203** with the upwardly extending tubing **140.** The coupling **208** has internal seals **209** and **210** sealingly engaged with the mandrel **203** and the tubing **140,** respectively.

The tubing **140** is attached to the previously described plate **184** by a threaded connection **211** in a bore **212** in the plate **184,** a short length of tubing **141***a* also being threaded at **213** into the bore **212** and being connected by a coupling **214** with the tubing T3 which extends upwardly to the tubing head H. Suitable seal rings **215** and **216** engage the tubings **140** and **141***a* in the bore **212.**

As is now apparent, the plate **184** effectively interconnects the telescopic seal mandrel **203** and the tubing T3 with the operating tubing T4, which in turn is connected with the tubular outer body **143** of the spacing means, whereby rotation of the operating tubing T4 to effect threaded adjustment of the spacing means **142** is adapted to effect corresponding telescoping of the telescopic seal means **138** in the tubular conduits between the valve V1 and the tubing head H. Thus, depending upon the length of the adjustability of the spacing means the effective lengths of both tubing leading from the valves V1 and V2 so the tubing head H can be adjusted, so that the landing hangers **10** at the top of the tubings T3 and T4 are adapted to land in the tubing head bushing **12** when the latch means **125** are engaged as seen in FIG. **5.**

Shifting of the control yoke downwardly to permit the latch springs **166** to lock the latch fingers is permitted when the coupling **144** at the top of the spacer means **142** moves downwardly responsive to rotation of the operating string T4 and rotation of the outer spacer means body **143** on the threaded mandrel **171,** from the position of FIG. **2***d* towards the position of FIG. **3***d.* Thereafter, the tubing **144***a* moves further downwardly through the yoke **165,** and the subsurface valve-to-tubing head-length of the two strings of tubings can be properly spaced.

The specific structure of the valves V1 and V2 of the present application are not germane to the present invention, and they may be as shown in the aforementioned pending application Ser. No. 286,151. Typically, however, such subsurface valves are actuated to an open position by the pressure of control fluid supplied to the respective subsurface valves from a suitable source through control fluid conduits. In addition, to control fluid, other fluid may be supplied by another auxiliary conduit to the valves from the derrick of platform, such as a lubricant or balancing fluid.

Thus, in accordance with the invention, auxiliary tubings A1 and A2 are shown as extending downwardly in the casing C, in association with the valves V1 and V2 and connected at **220** and **221** to the previously described plate **206** which is carried by the tubing **140.** Extending downwardly from the plate **226** are first and second auxiliary fluid seal mandrels **222** and **223,** respectively, communicating through the plate **206** with the conduits A1 and A2. These mandrels **222** and **223** extend slideably through respective sealing or packing glands **224** and **225** into downwardly extending sealing receptacles **226** and **227,** so that, together, the mandrels **222** and **223** and the sealing receptacles **226** and **227** constitute telescopic sealing means for the auxiliary tubings which allow for adjustment of spacing of the main tubings, as previously described.

In the illustrated embodiment, the seal receptacle **227** is connected to a tubing **228** which extends downwardly and is connected by a branch **229** to the safety valve V1 and is connected at **230** to the safety valve V2 for conducting control fluid pressure to the respective valve to hold the same open, as is well known. The seal receptacle **226** is connected to a tubing **231** which is also connected to the valve V1 at **232** which has suitable porting **233,** as is well known, leading to a further downwardly extending tubing **234,** which is connected to the valve V2, whereby the respective valves V1 and V2 can be supplied with a lubricant or with a balancing fluid, also as well known.

In operation, in the case of this form of the invention, the safety valve assembly V is run in the hole and located on the previously set dual string tubing hanger TH, by the use of dual slips and elevators or with the fixed string T3 piggy back on the control string T4. All control or auxiliary lines are fastened to the fixed string. An accurate measurement of the distance from the rotary table RT to the landing shoulder of the hanger in the tubing head H should be made to ascertain the amount of tubing to be removed to properly position the tubing hanger TH. In offshore operations the distance between the rotary table and the tubing head may be in the neighborhood of 50 feet more or less, requiring accurately determining measurements to insure that after locating the subsurface dual string hanger TH, the tubing strings can be picked up and the tubing hanger installed to position same in the casing to insure simultaneous landing in the subsurface dual string hanger and the tubing head when the tubing is lowered. Proper spacing out of the tubing strings in the aforementioned manner is quite difficult and a nominal error of a couple of inches more or less can require adjustment which, prior to this invention, was time consuming, as it normally required not only removing the surface tubing hanger, but pulling another 60 feet plus or minus from the well to make the necessary adjustments in the prior adjustable subs. Conversely spacing out within plus or minus 8 inches is not difficult and is adequate with the spacing means of the invention.

The landing hangers are positioned in the tubing strings T3 and T4, to be a suitable distance above their seat in the tubing head H, at the time the lower valve assembly V has been landed on the subsurface dual tubing hanger TH. The control lines are fastened to the assembly and it is lowered, locating the safety valve V on the subsurface dual tubing hanger TH. The control string T4 is then rotated to the left sufficiently to place the latch **125** in the locked position in the receptacle of the subsurface hanger, this can be checked by taking a nominal strain against the anchored tubing hanger TH. Left hand rotation of the control string T4 will move the member **143** of the rotational spacer sub **142** in a downward direction. The latch control yoke **165** is then free to move downward as the supporting shoulder on the coupling **144** of the rotational spacer sub **142** moves downward. This enables the latch springs **166** to force the latch **125** against the cone **154** completing the locking of the safety valve assembly V in the receptacle of the subsurface dual tubing hanger TH. Continued left hand rotation of the control string T4 will telescope the rotational spacer sub member **143** moving the con-

trol string downward and through the adjusting sub **184,** the non-operating string will be pulled down, telescoping the telescoping seal mandrel **203,** auxiliary line telescoping mandrels **222,** and **223,** and control tubings A1 and A2. Thus, left hand rotation of the control string will enable lowering both the control string and non-operating strings T3 and T4 to effect the landing of the tubing hangers **10** in the tubing head. Conversely, right hand rotation of the control string T4 will jack the tubing strings T3 and T4 up lifting the tubing hangers **10** out of the tubing head H and retracting the latch **125** to the unlocked position, to facilitate removal from the subsurface dual tubing hanger TH and retrieval from the well.

To insure that some future event does not result in tensile forces of sufficient magnitude to inadvertently release the subsurface dual tubing hanger and/or release the integral spacing system with safety valves from the subsurface dual tubing hanger, the safety joint **145** is incorporated to assure a preplanned failure point. Should failure occur in the safety joint **145,** the control string T4 and the non-operating string T3 can be retrieved leaving the safety joint mandrel **185,** which constitutes a fishing neck extending upwardly on the control string side, and the guide **139** and non-operating string seal receptacle **200** in the non-operating string, which facilitates reconnecting with a suitable tool, guided into place by guide surface **139***b*, to plugs or perform other operations through the valves V1 and V2.

The release of the safety valve V from the subsurface dual tubing hanger TH is accomplished by right hand rotation of the control or operating string T4. The safety valve V can also be released from the subsurface dual tubing hanger TH in the event it is impossible to jack the latch **125** up in the conventional manner. This is accomplished by applying sufficient right-hand torque to the control string T4 to shear the shear screws **163***a* which rotationally lock the coupling **164** to the valve V2. Such an unconventional release might be caused by inability to rotate the seal mandrel **171** with respect to the body **143,** perhaps due to corrosion. Another cause might be because of failure of control rods **160** or **157.** In the latter event, torque required to shear the screws **163***a* could only be transmitted to the seal mandrel **171** after right-hand rotation had threaded the body **143** upward until it is moved upward, as shown in FIG. **2***d*. In either event, after the screws **163***a* have sheared, mandrel **137** would turn and move upward relative to the cone **154** because of the left-hand threads **149.** In the process, it would pick up the latch **125** with respect to the cone **154,** thus releasing the latch fingers **152.**

Referring now to the modified construction of FIGS. **12***a*, **12***b* through **18***a*, **18***b*, the spacing means and the safety valve latching mechanisms are essentially the same as in the previously described embodiment and, therefore, the same reference numbers and detailed descriptions are applicable, in general. However, this modified construction is such that when the apparatus is being lowered on the handling tubing **16** into the subsurface tubing hanger TH, the weight of the non-operating tube string T3 is supported, as before by the plate **184,** as seen in FIG. **13***a*, at the shoulder **184***a*, but when the landing hanger **10** of the non-operating string T3 lands in the tubing head master bushing **12,** the weight of the non-operating string T3 is then fully supported by the tubing head bushing. Thus, the operating string T4 can be adjusted more readily or easily from the position shown in FIG. **12***a* by rotation of the handling string **16** to effect threaded adjustment of the spacer sub means **142,** as previously described, since the thread **171** on which the rotatable adjustor member **143** is adjusted in response to the rotation of the handling tubing **16** is not subjected to the extra weight of the non-operating tubing to cause binding thereof. The longer the non-operating string T3, the more significant becomes this modification, inasmuch as the handling tubing **16** is rotated to the left for effecting adjustment of the spacer sub **142,** and if excessive resistance to adjustment of the spacer means is encountered the usual threaded coupling in the handling tube **16** or in the operating string T4 may tend to become unscrewed at the right hand threaded connections.

In order to allow the weight of the non-operating string T3 to be wholly supported by the tubing head bushing **12** during the adjustment of the spacer sub **142,** the plate **184,** which, in the previously described embodiment, rigidly interconnects the operating and non-operating strings together, in this modified construction has, as best seen in FIGS. **13***a*, **14***a* and **16,** a slidable connection between the non-operating string T3 and the plate **184** comprising a tubular mandrel **184***b* connected at **184***c* to the downwardly extending tubular assembly **140** and connected at its upper end at **184***d* to the plate **206,** later to be described. Below its shoulder **184***a*, the mandrel **184***b* has a body portion **184***e* which is square in cross section (see FIG. **16**), whereby the plate **184,** which has a laterally opening notch **184***f* receiving the square body **184***e*, is free to move vertically downwardly from the shoulder **184***a*, but the mandrel **184***b* is restrained against rotation.

From the foregoing, it will be apparent that when the apparatus is being lowered downwardly into the well and the tubing hanger **10** of the non-operating tubing T3 seats in the tubing head bushing **12,** as seen in FIG. **12***a*, the non-operating string T3 will be suspended as the remainder of the apparatus remains free for further downward movement to the extent necessary for the valve assembly V to be seated and anchored in the tubing hanger TH. Thereafter, rotation of the handling tubing **16** is adapted to effect axial adjustment of the spacer sub **142** to land the tubing hanger **10** of the operating string T4 in the tubing head bushing **12.**

Furthermore, in this embodiment the control fluid line and its connections are somewhat modified to eliminate buckling, and to insure that the control fluid pressure will be exhausted from the control line to automatically close the valves V1 or V2 before the tubing strings T3 and T4 are disengaged, as well as to eliminate a change in volume in the control fluid system as a result of adjustment of the spacing means.

The control fluid supply line A2 is connected to the above mentioned plate **206** and by a passage **206***a* in the latter to a sealing assembly **227,** the details of which are shown in FIGS. **18***a* and **18***b*. At its lower end the seal assembly **227** seats in the guide **139,** which has a passageway **139***a* leading to the downwardly extending control tubing **228,** which has the branch **228** communicating with the safety valve V1, and which is connected at its lower end at **230** to the safety valve V2.

The seal assembly **227** extends slidably through the plate **184** as seen in FIG. **16,** and has a lower body member **227***a* provided with a cylindrical sealing sec-

tion 227*b* adapted to be installed in a bore 227*c* in the guide 139, with an upper O-ring seal 227*d* and a lower O-ring seal 227*e* straddling lateral passages 227*f* which communicate with the passage 139*a*, previously referred to, and with an axial passage 227*g* in the body member 227*a*. Threadedly and sealingly connected at 227*h* with the body 227*a* is an upwardly extended tubular member 227*i*, which extends through the bore 227*j* in the plate 184 and has a threaded upper section 227*k* on which is adjustably mounted a stop nut 227*l*. Threadedly and sealingly engaged at 227*m* in the upper end of the tubular member 227*i* is a further upwardly extended reduced tubular member 227*n*, which slidably extends through a sealing bushing 227*o* and through a further upwardly extending nipple 227*p* carried by the plate 206 and having an inner chamber 227*q* in communication with the passage 206*a* of the plate 206. At its upper end, the nipple 227*p* has a sealing nut 227*r* through which the upper extremity of the member 227*n* extends. Normally, within the chamber 227*q*, the tubular member 227*n* has radial ports 227*s* which communicate with the axially extended passage 227*t* provided within the member 227*n* and the body 227*i*, through which control fluid communicates between the auxilliary line A2 and the valve connector line 228.

It will be apparent that separation of the sealing structure 227 either at the guide 139 or at the tubes 227*n* and 227*p* will result in the automatic exhausting of control fluid pressure which would tend to hold the safety valves V1 and V2 open.

From the foregoing, it will now be apparent that the present invention provides well production apparatus including means whereby a subsurface safety valve assembly can be lowered and anchored in a tubing anchor which has set in the well casing, and the tubing string or strings between the subsurface tubing hanger and the tubing head can be properly spaced, without necessitating precise measurement and prospective elevation of the valve V from the tubing hanger TH to effect adjustments, since such adjustment can be accomplished by the adjustable spacing sub and the telescopic tubing connectors.

I claim:

1. In well production apparatus: subsurface tubing hanger means anchorable in engagement within a well casing and having a seat for a subsurface shutoff valve, shutoff valve means seated in said seat, said valve means having a passage for communicating with subsurface tubing extending downwardly in the well from said tubing hanger means, tubing head means spaced above said valve means, surface tubing extending between said valve means and said tubing head, said surface tubing and said tubing head having landing means for supporting said surface tubing, and spacing means incorporated in said surface tubing for adjusting the space between said valve and said landing means while said valve means is seated in said tubing hanger means.

2. In well production apparatus as defined in claim **1,** said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means thereon, said spacing means being incorporated in one of said surface tubing strings, and telescoping said seal means in response to rotation of said one of said tubing strings, and including connector means interconnecting said surface tubing strings for enabling said shutoff valve means to be lowered into said tubing hanger means on a handling tubing connected to said one of said tubing strings.

3. In well production apparatus as defined in claim **2,** said connector means comprising a plate fixedly connected to said other of said tubing strings and rotatably connected to said one of said tubing strings.

4. In well production apparatus as defined in claim **2,** said connector means comprising an abutment member longitudinally shiftably connected to said other of said tubing strings and rotatably connected to said one of said tubing strings, said other of said tubing strings having abutment means engageable above said abutment member whereby said other of said tubing strings is supported on said abutment member by said abutment means as said shutoff valve means is being lowered, said abutment member being movable downwardly with respect to said other of said tubing strings upon operation of said spacing means.

5. In well production apparatus as defined in claim **2,** said connector means comprising an abutment member longitudinally shiftably connected to said other of said tubing strings and rotatably connected to said one of said tubing strings, said other of said tubing strings having abutment means engageable above said abutment member whereby said other of said tubing strings is supported on said abutment member by said abutment means as said shutoff valve means is being lowered, said abutment member being movable downwardly with respect to said other of said tubing strings upon operation of said spacing means, said abutment member and said other of said tubing strings having cooperable non-circular surfaces extending longitudinally for enabling said abutment member to move downwardly with respect to said other of said tubing strings while preventing relative rotation thereof.

6. In well production apparatus as defined in claim **1,** said spacing means comprising a telescopic sealing assembly including a threaded mandrel and an outer member adjustable responsive to relative rotation therebetween.

7. In well production apparatus as defined in claim **1,** said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, and said spacing means telescoping said seal means in response to rotation of one of the surface tubing strings.

8. In well production apparatus as defined in claim **1,** auxiliary fluid conduit means extending from said valve means upwardly alongside said surface tubing.

9. In well production apparatus as defined in claim **1,** auxiliary fluid conduit means extending from said valve means upwardly alongside said surface tubing and including telescopic sealing means adjustable responsive to adjustment of said spacing means.

10. In well production apparatus as defined in claim **1,** said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, control fluid conduit means extending along and connected to one of said surface tubing strings and having adjustable telescopic sealing means adjustable responsive to adjustment of said spacing means, and said spacing means telescoping said seal means in response to rotation of one of the surface tubing strings.

11. In well production apparatus as defined in claim **1,** said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each

having telescopic seal means therein, control fluid conduit means extending along and connected to one of said surface tubing strings and having adjustable telescopic sealing means adjustable responsive to adjustment of said spacing means, and said spacing means telescoping said seal assemblies in response to manipulation of one of said surface tubing strings.

12. In well production apparatus as defined in claim **1**, said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, control fluid conduit means extending along and connected to one of said surface tubing strings and having adjustable telescopic sealing means adjustable responsive to adjustment of said spacing means, and said spacing means telescoping said seal means in response to rotation of one of the surface tubing strings, said spacing means comprising a telescopic sealing assembly including a threaded mandrel and an outer member adjustable responsive to relative rotation therebetween.

13. In well production apparatus as defined in claim **1**, said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, and said spacing means telescoping said seal means in response to rotation to one of the surface tubing strings, each of said telescoping seal means being axially separable.

14. In well production apparatus as defined in claim **1**, said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, and said spacing means telescoping said seal means in response to rotation to one of the surface tubing strings, each of said telescoping seal means being axially separable, and said one of the surface tubing strings including axially separable safety joint means separable to allow removal of said surface tubing strings.

15. In well production apparatus as defined in claim **1**, said valve means comprising a plural valve assembly, said surface tubing including plural tubing strings each having telescopic seal means therein, and said spacing means telescoping said seal means in response to rotation to one of the surface tubing strings, each of said telescoping seal means being axially separable, and said one of the surface tubing strings including axially separable safety joint means separable to allow removal of said surface tubing strings, said safety joint means including a mandrel having fishing neck thereon connected to said valve means.

16. In well production apparatus as defined in claim **1**, said tubing hanger means and said valve means having cooperative latch means for releasably holding said valve means in said tubing hanger means and operable responsive to operation of said spacing means.

17. In well production apparatus as defined in claim **1**, said tubing hanger means and said valve means having cooperative latch means for releasably holding said valve means in said tubing hanger means and operable responsive to operation of said spacing means, said latch means including a shoulder on said tubing hanger means, latch fingers on said valve means and means for releasably holding said fingers in engagement with said shoulder.

18. In a subsurface safety valve assembly adapted to be lowered into a well through a tubing head and landed in a subsurface tubing hanger spaced below the tubing head, comprising: an elongated valve housing, latch means at one end of said housing operable for latching engagement with the tubing hanger, and telescopic spacing means carried at the other end of said body including a pair of threadedly connected tubular members, one of said members having means for connection with a string of operating tubing for relatively rotating said members.

19. In a subsurface safety valve assembly as defined in claim **18**, means for operating said latch means responsive to relative rotation of said members.

20. In a subsurface safety valve assembly as defined in claim **18**, a second elongated valve housing, having tubular means at one end connectable with a non-operating tubing and including a telescopic sealing assembly and means interconnecting said spacing means and said telescopic sealing assembly for simultaneous telescoping responsive to relative rotation of said members.

21. In a subsurface safety valve assembly as defined in claim **18**, a second elongated valve housing, having tubular means at one end connectable with a non-operating tubing and including a telescopic sealing assembly and means interconnecting said spacing means and said telescopic sealing assembly for simultaneous telescoping responsive to relative rotation of said members and means for operating said latch means responsive to relative rotation of said members.

22. In a subsurface safety valve assembly as defined in claim **18**, a second elongated valve housing, having tubular means at one end connectable with a non-operating tubing and including a telescopic sealing assembly and means interconnecting said spacing means and said telescopic sealing assembly for simultaneous telescoping responsive to relative rotation of said members and means for operating said latch means responsive to relative rotation of said members including control means engaged with said latch means and one of said members and shiftable in one direction by said one of said members upon telescoping movement of said members in one direction.

23. In a subsurface safety valve assembly as defined in claim **18**, a second elongated valve housing, having tubular means at one end connectable with a non-operating tubing and including a telescopic sealing assembly and means interconnecting said spacing means and said telescopic sealing assembly for simultaneous telescoping responsive to relative rotation of said members and means for operating said latch means responsive to relative rotation of said members including control means engaged with said latch means and one of said members and shiftable in one direction by said one of said members upon telescoping movement of said members in one direction, and spring means for shifting said control means in the other direction upon telescoping movement of said members in the other direction.

24. In a subsurface safety valve assembly as defined in claim **18**, a second elongated valve housing, having tubular means at one end connectable with a non-operating tubing and including a telescopic sealing assembly and means interconnecting said spacing means and said telescopic sealing assembly for simultaneous telescoping responsive to relative rotation of said members, and control fluid tubing means connected to said valve housings and including a telescopic sealing assembly operable responsive to relative rotation of said members.

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