

Nov. 23, 1965

R. D. JOHNSTONE ETAL

3,219,117

WELL DRILLING AND PRODUCTION APPARATUS AND METHOD

Filed July 10, 1961

6 Sheets-Sheet 1

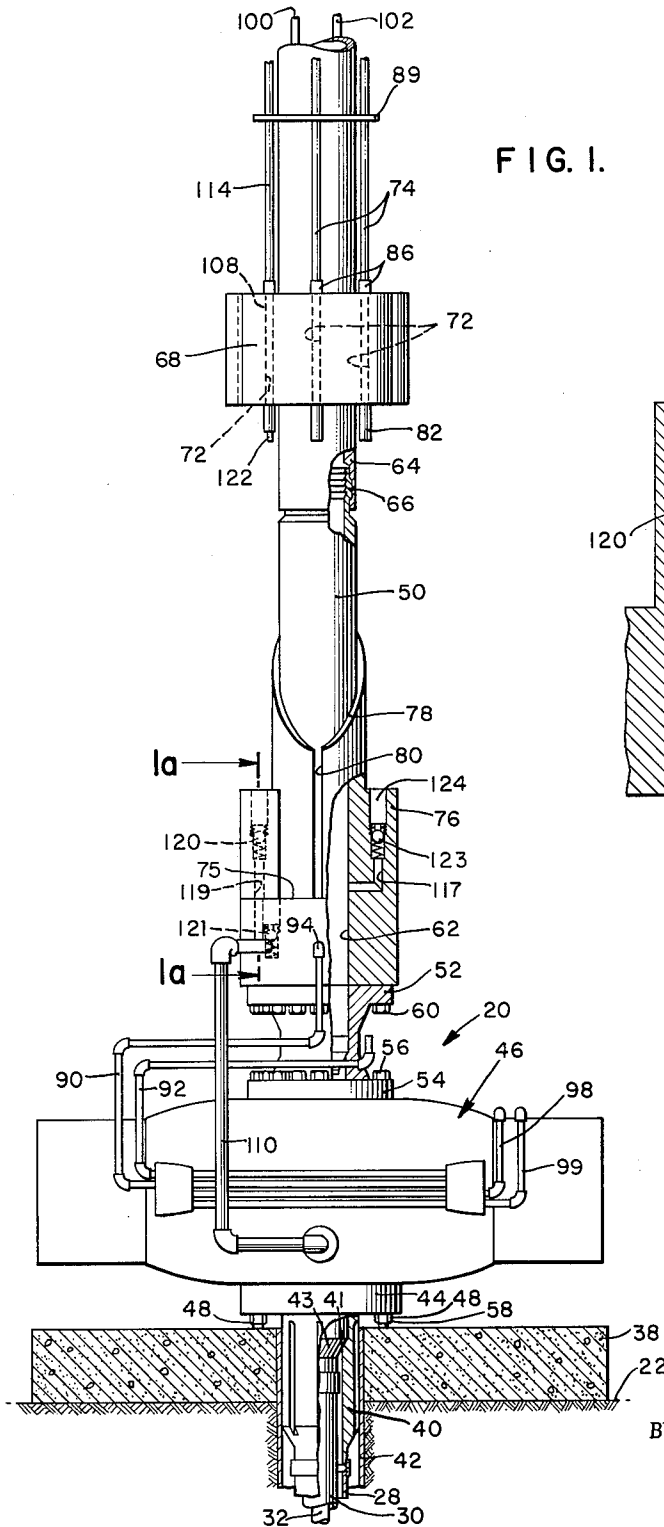


FIG. 1.

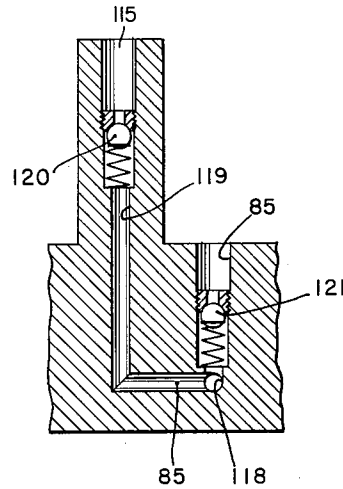


FIG. 1a.

INVENTORS.
ROBERT D. JOHNSTONE
DAVID C. KOFAHL

BY

Donald W. Canady
ATTORNEY.

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R. D. JOHNSTONE ETAL

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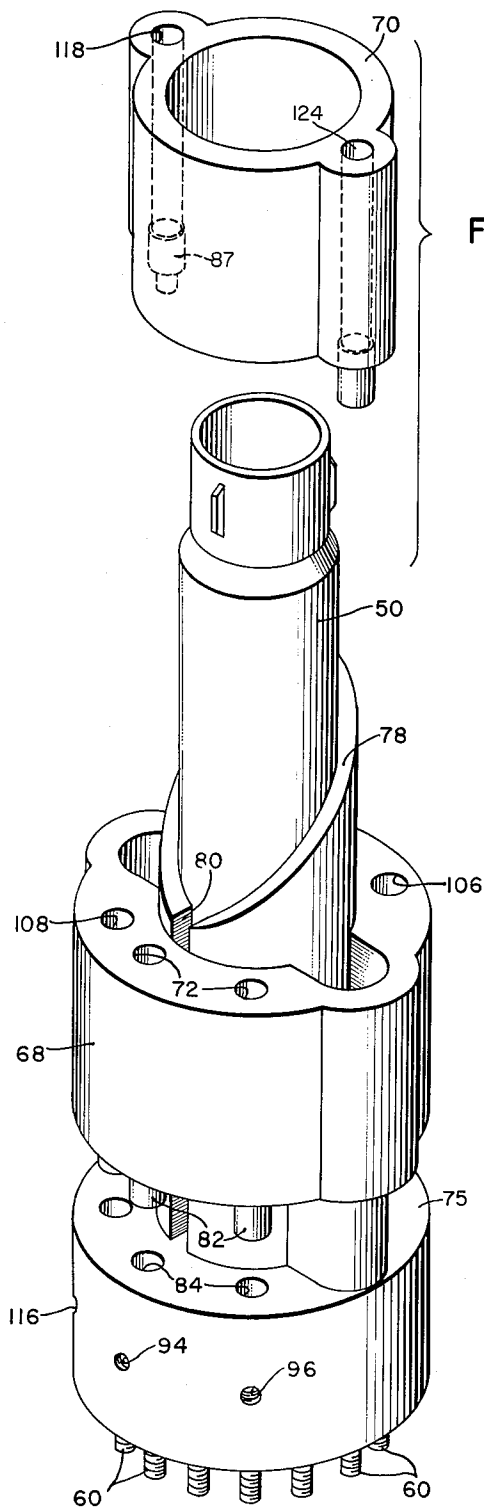


FIG. 2.

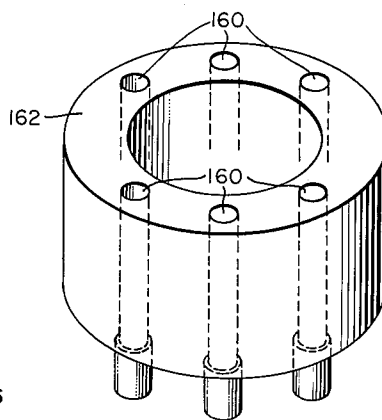


FIG. 3.

INVENTORS.
ROBERT D. JOHNSTONE
DAVID C. KOFAHL

BY

Donald W. Canady

ATTORNEY

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R. D. JOHNSTONE ETAL

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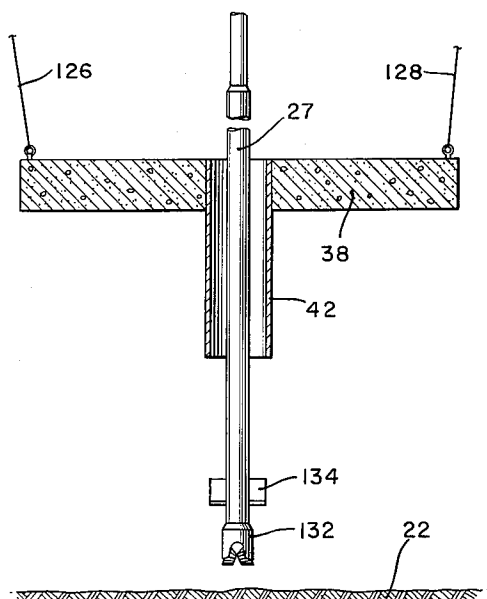


FIG. 4.

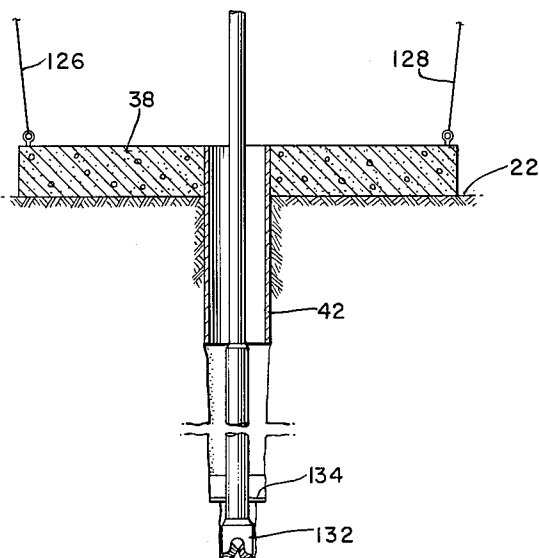


FIG. 5.

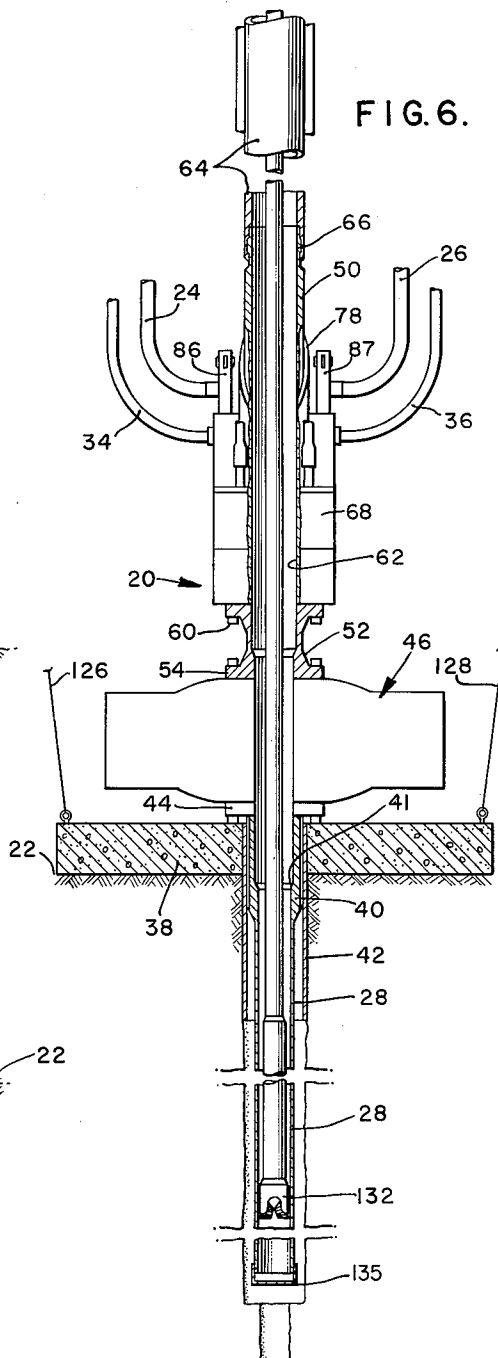


FIG. 6.

INVENTORS,
ROBERT D. JOHNSTONE
DAVID C. KOFAHL

BY

Donald W. Canady

ATTORNEY.

Nov. 23, 1965

R. D. JOHNSTONE ETAL

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FIG. 7.

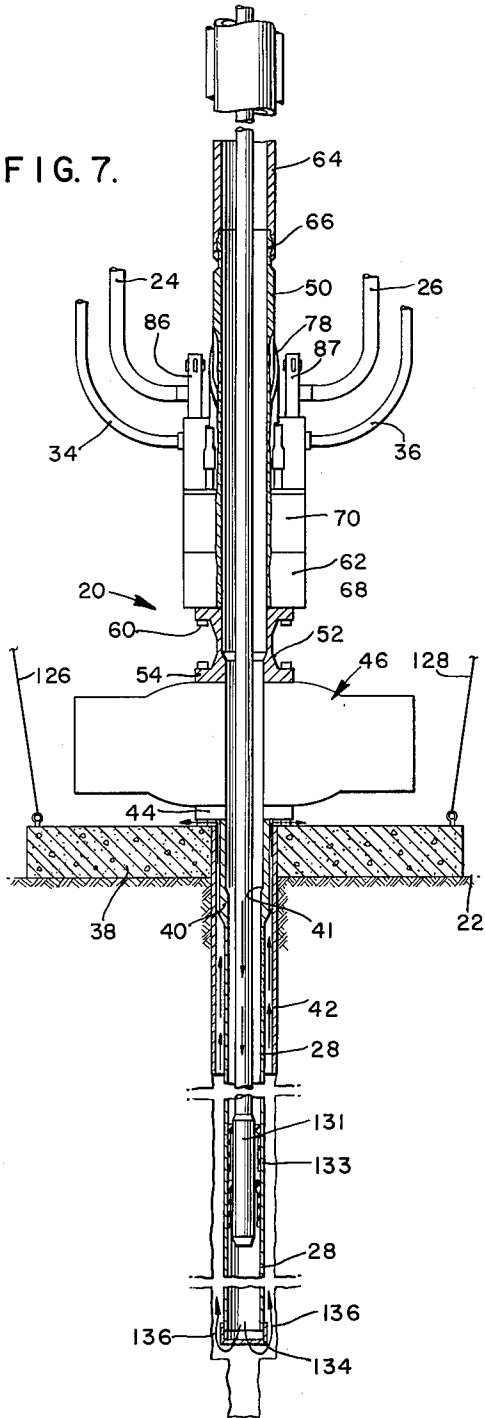
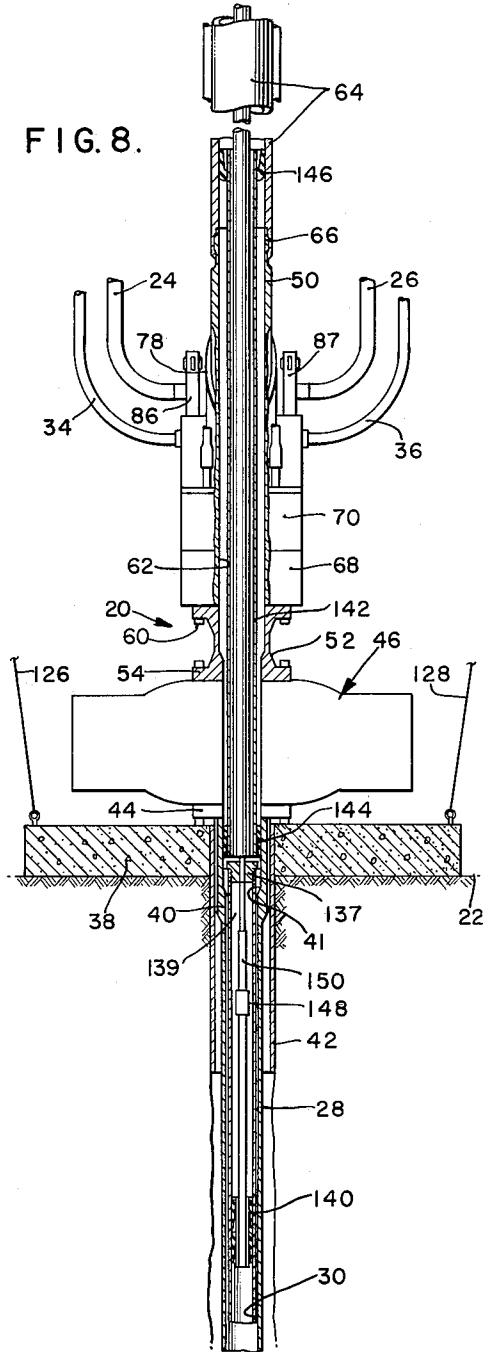


FIG. 8.



INVENTORS.
ROBERT D. JOHNSTONE
DAVID C. KOFAHL

BY *Donald W. Canady*

ATTORNEY.

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R. D. JOHNSTONE ET AL

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FIG. 9.

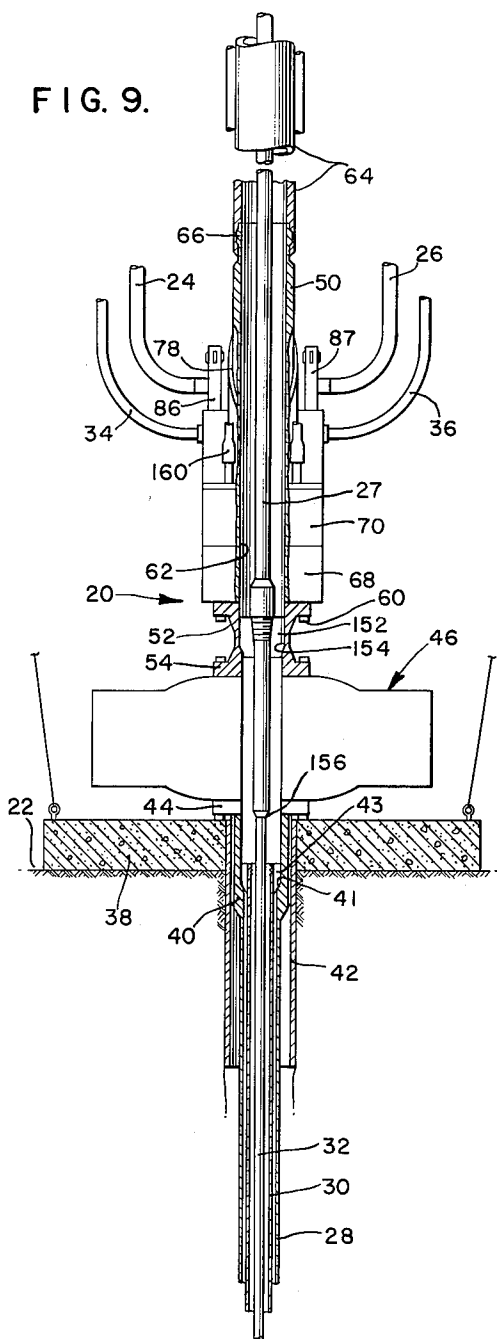
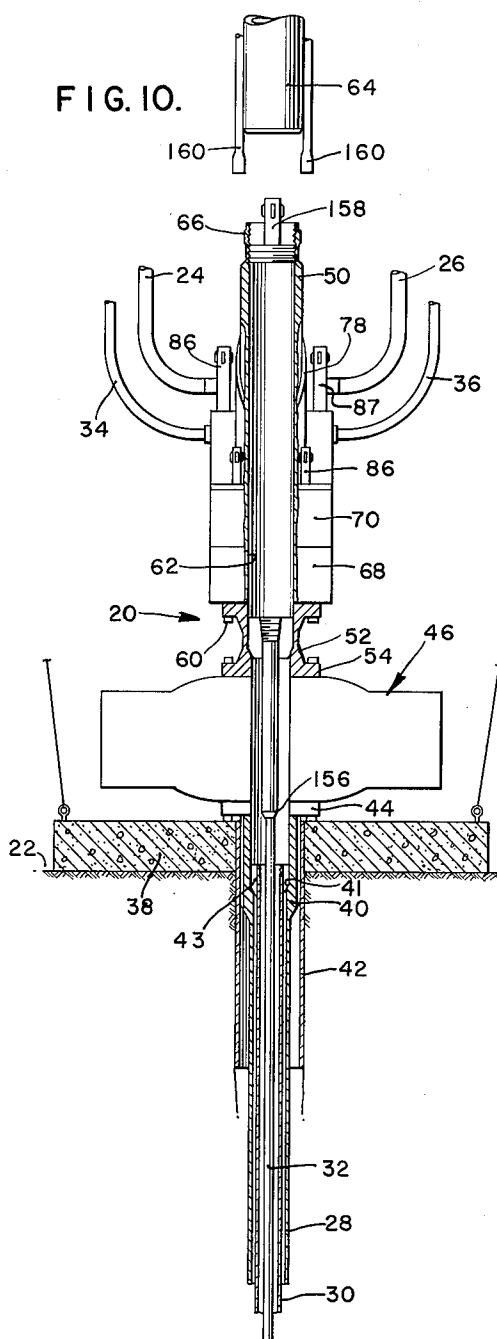


FIG. 10.



INVENTORS.
ROBERT D. JOHNSTONE
DAVID C. KOFHL

BY

Donald W. Canady

ATTORNEY.

Nov. 23, 1965

R. D. JOHNSTONE ETAL

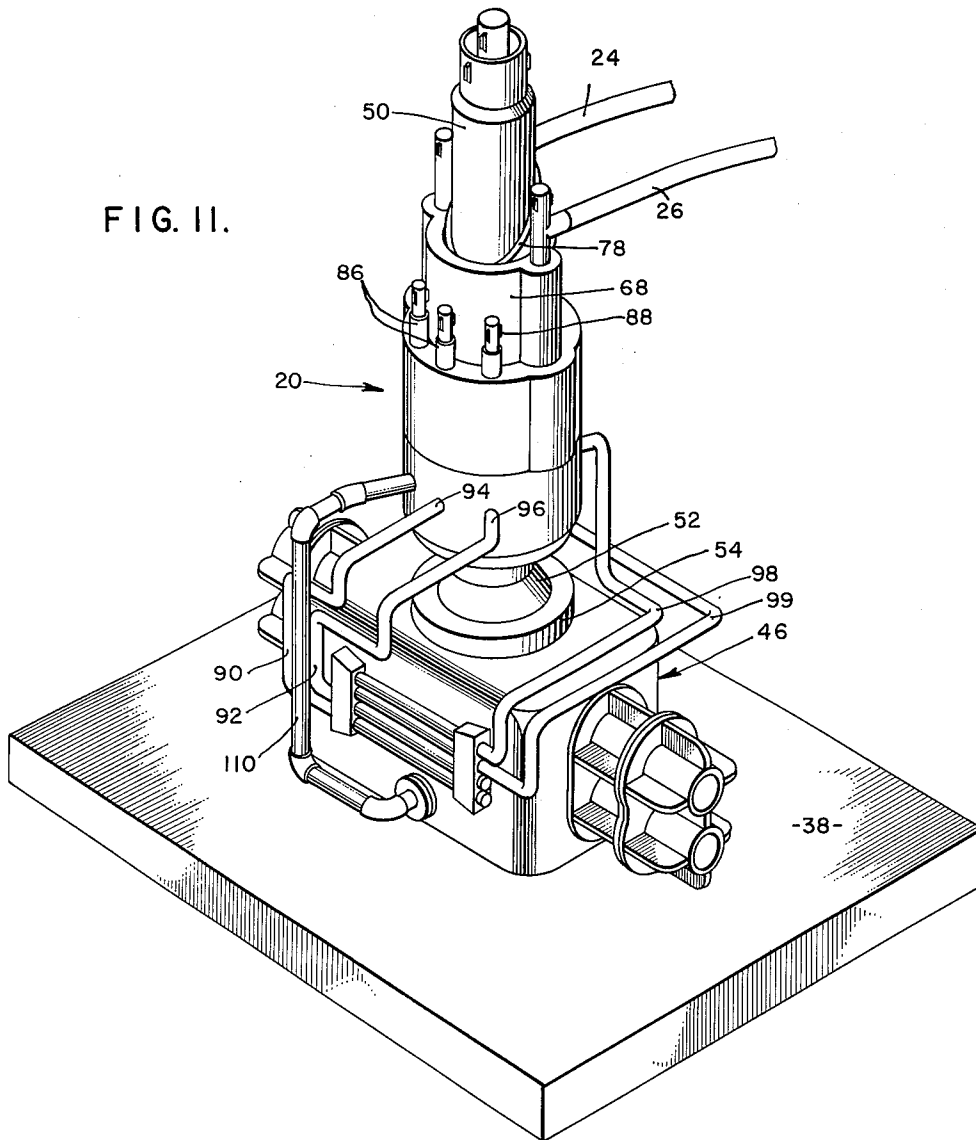
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FIG. II.



INVENTORS.
ROBERT D. JOHNSTONE
DAVID C. KOFAHL

BY

Donald W. Canady

ATTORNEY.

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WELL DRILLING AND PRODUCTION APPARATUS AND METHOD

Robert D. Johnstone and David C. Kofahl, Bakersfield, Calif., assignors to Richfield Oil Corporation, Los Angeles, Calif., a corporation of Delaware

Filed July 10, 1961, Ser. No. 122,919

10 Claims. (Cl. 166-66.5)

The present invention relates to the drilling and production of petroleum from a formation underlying a body of water and more particularly relates to apparatus for drilling and subsequently producing petroleum from a formation underlying a relatively deep body of water and a method for installing such apparatus at the submarine formation without the use of divers.

When drilling into and producing from a formation containing oil and gas under high pressure, blowout prevention equipment is conventionally used in the drilling operation and a flanged well head assembly with a Christmas tree is normally utilized to control the production of oil and gas from the well during the period of natural flow. The drilling apparatus including the drilling head and the blowout prevention equipment is normally installed on a marine platform located on the surface of the water over the well bore. More recently the drilling head including the blowout prevention equipment has been mounted on the ocean floor in relatively shallow water accessible to divers. The production apparatus including generally a flanged well head assembly and a Christmas tree valve arrangement is normally installed for offshore production on a drilling platform at the surface of the body of water. This assembly includes generally a casing which is normally cemented into the well, a casing spool, a tubing head, a casing head, and the various Christmas tree components which include generally, a master valve, one or more wing valves, and such flow-constricting and gauging devices as may be required in a particular well. This conventional equipment is unsuitable to the production of oil wells in deep water due to the excessive diving operations involved in flanging the various well head and Christmas tree components together. Such equipment would obviously be impossible to install at depths greater than diving operations can be conducted. This marine production equipment so limited to relatively shallow water usage necessarily constitutes an obstacle to navigation and to aesthetic beauty. Because of this distraction from the natural beauty of the off-shore areas and the obstruction of navigation, petroleum drilling and production operations are prohibited in certain areas which are geologically favorable to the production of petroleum.

It is therefore an object of our present invention to provide a novel form of drilling and production head for producing petroleum from wells underlying relatively deep bodies of water and also to provide a method for installing such drilling and production head at the surface without the use of divers.

It is also an object of our present invention to provide a combination drilling and production head which can be installed remotely at an underwater formation from the surface of the body of water.

It is also an object of our present invention to provide a drilling head for drilling a well bore into a formation underlying a body of water whereby the drilling head control lines can be replaced without utilizing a diver. Other objects and a fuller understanding of our invention may be had by reference to the following specification and claims taken in conjunction with the accompanying drawing in which:

FIGURE 1 is an elevational view partially in section of our underwater production and drilling head, posi-

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tion and drilling head, positioned at the submarine formation over the well bore. FIGURE 1a is a section taken on 1a-1a showing the kill line-annulus outlet connector.

FIGURE 2 shows the drilling and production mandrel with the drilling block and production block as utilized in one embodiment of my invention.

FIGURE 3 shows a combination of drilling and production head utilized in the present invention in place of the separate drilling block and production blocks shown in FIGURE 2.

FIGURES 4 through 10 show the several steps involved in installing and using the drilling and production head of the present invention at a well drilled in a formation underlying a body of water.

FIGURE 4 shows an elevational view of the manner in which the drilling base may be lowered to the formation.

FIGURE 5 shows an elevational view of the manner in which the surface hole is drilled.

FIGURE 6 shows an elevational view of the manner in which the surface pipe is run into the well bore with the drilling and production head.

FIGURE 7 shows an elevational view of the method utilized for cementing the surface pipe into the well.

FIGURE 8 shows an elevational view of the manner in which the water string is run and cemented into the hole.

FIGURE 9 shows an elevational view of the manner in which the tubing string is run and hung from the well head.

FIGURE 10 illustrates in cross-sectional elevation, the manner in which the riser pipe and drilling control lines are removed from the well head installation.

FIGURE 11 shows in schematic form, the well head equipment during the production period.

With reference to the drawings, an embodiment of the invention is illustrated in FIGURES 1 and 11 as an assembled well head designated generally as 20 which well head is adapted for remote installation at the floor 22 and the operation thereof controlled from the surface of the body of water during the drilling stage through control lines 74 connected to the drilling head and during the production stage through flow control lines 34 and 36. The well head as shown in FIGURES 6 through 10 is installed by lowering the well head attached to the surface casing to the floor and subsequently running the water string 30 and tubing string 32 into the well bore by remote means from the surface of the body of water. After the well is drilled and completed the well head is plugged off and the casing riser is disconnected from the well head and raised to the surface after which the production of the well through flow lines 24 and 26 is controlled remotely through flow control lines 34 and 36.

Referring now more particularly to the drawings, FIGURE 1 shows the well head of our present invention partially assembled at the ocean floor 22 and positioned at the well bore opening with a surface casing 28 extending therein through the landing base 38. A water string landing mandrel 40 extends through the landing base 38 and into the conductor pipe 42 and has a flanged head portion 44 to which conventional blowout prevention equipment 46 having fluid operated control means may be connected, as with bolts 48. A drilling and production mandrel 50 is connected to the blowout preventer 46 by bolting to a flanged drilling and production head spool 52 which, in turn, is bolted to the blowout preventer at the lower flanged spool portion 54. The blowout preventer preferably has threaded bolts 56 and 58 connected to its upper and lower extremities for connecting the well head assemblies. The drilling and production

mandrel is equipped with similar bolts 60 at its lower extremity for securing the same to the well head spool. A central bore 62 extends through the drilling and production mandrel 50, the head spool 52, the blowout preventer equipment 46 and the water string landing mandrel 40, through which bore drilling and production equipment are passed into the well.

The drilling and production mandrel is connected at its upper end to the casing riser pipe 64 with a safety joint 66. Drilling mud is returned to the vessel with a pitcher nipple (not shown) through the casing riser 64, or a rotating drilling head may be used with a hose provided for mud returns, in which case a casing riser is not needed. A drilling block 68 is lowered over the riser pipe 64 as shown in FIGURES 1 and 2 into the position shown in FIGURE 6 to removably connect the blowout preventer control hoses 74 with the mandrel 50. The drilling block 68 has several vertical holes 72 therein, with which control hoses 74 communicate for connection to the blowout preventer 46. The drilling block 68 is lowered over the casing riser 64 and the drilling and production mandrel 50 to rest on the surface 75 of the drilling and production mandrel 50 and is guided into position thereon with an orientation cam 78 which engages an internal lug (not shown) in the drilling block 68. The drilling block is guided down the orientation keyway 80 into fixed position on the drilling and production mandrel 50 so that the sealing plugs 82 of the drilling block fit into the holes 84 (FIGURE 2) of the drilling and production mandrel. The vertical holes 72 of the drilling block are equipped with tubular pipe connectors 86 as best viewed in FIGURE 11. These connectors are secured to the drilling block 68 as by threading therein. The control hoses 74 extend into the connectors 86. The connectors 86 have external locking lugs 88 near the upper ends thereof so that the drilling block may be removed from the drilling and production mandrel by gripping the connectors 86 at the lugs 88 with a barrel-type joint connector, of the type shown at 160 (FIGURE 10) with which the drilling block may be lifted to the surface vessel. Thus the control hoses 74 may be replaced by lifting the drilling block to the drilling vessel and replacing the hoses as required. A spacer plate 89 having holes for the control hoses 74 may be fitted on the riser pipe to equally space the control hoses above drilling block and thus prevent the entanglement of the hoses.

The blowout preventer control lines 90 and 92 connect with openings 94 and 96 (FIGURE 2), respectively, in the drilling and production mandrel which in turn communicate with the receptacles 84 into which the sealing plugs 82 fit, thus completing the connection between the blowout preventer control hoses 74 from the vessel to the blowout preventer through control lines 90 and 92. The sealing plugs 82 may be any type of protuberance, e.g. fingers, etc., however we prefer to use sealing plugs. The blowout preventer control lines 98 and 99 connect to the control hoses 100 and 102 in a similar manner on the opposite side of the drilling and production head assembly through hole 106 (and another hole therein, not shown) in the drilling block. The drilling block is provided with an additional hole 108 which serves the dual function of a kill line channel into the casing annulus during the drilling stage and an annulus channel to the annulus flow line 24 during the production period.

The annulus (between the tubing and water string) communicates with the annulus pipe 110 through the blowout preventer 46 and pipe 110 is connected to the drilling and production mandrel 50 through passageway (FIGURE 2) which has a "Y" therein, as shown in FIGURE 1a, which leads to passageway 119 and the annulus flow line 24 (see FIGURE 11) or through opening 118 to opening 85 and the kill line 14 through hole 108 in the drilling block.

A spring-loaded check valve 121 (shown in FIGURE

1a) is positioned in the passageway 85 in such a position that when the drilling block 68 is placed on the drilling and production mandrel 50 (as shown in FIGURE 11) the lower end plug 122 depresses the check valve 121 to permit flow from the kill line 114 through the annulus. Thus during the drilling stage if it is desired to kill the well, a heavy weighting mud may be pumped down kill line 114 and into the annulus through pipe 110. A second spring-loaded check valve 120 is positioned in passageway 119 so that when the production block 70 is lowered onto mandrel 50 with sealing plug 87 positioned in the shoulder opening 118, the valve 120 is depressed and flow permitted through the annulus flow line 24. Plugs 87 and 122 are designed with tip portions 87a and 122a to actuate valves 120 and 121, respectively. During the production stage, oil may be produced in the annulus through the annulus pipe 110 through the shoulder opening 118 in the drilling and production mandrel 50 by lowering the production block 70 onto the mandrel 50 whereby plug 87 seats in the shoulder opening 115 and depressing the valve 120. A check valve 123 is also positioned in the passageway 117 extending through the shoulder on the opposite side of the production block and through which the tubing 32 communicates with the tubing outlet hose 26. Thus when the production block is not positioned on or is removed from the drilling and production mandrel 50, the check valves 120 and 123 prevent fluid flow through the shoulder openings 118 and 124.

The drilling block 68 and the production block 70 may be secured to the drilling and production mandrel 50 with a conventional tubing insert latch-down spring (not shown) or the blocks may be held down by their own weight. The pipe connectors 86 and 87 are threaded into the passageways 118 and 124 in the production block and have side connections for flow control line hoses. Flow control hose 24 is attached to pipe connector 86 to receive the annulus flow. In a similar manner, connector 87 transmits tubing flow through tubing flow control line 26. The drilling block preferably has fail-safe valves internally thereof with control hoses 34 and 36 connected to such valves for hydraulic control.

Although we have shown the production block and drilling block as two blocks, the function served by each block can be performed by a single production and drilling block as shown in FIGURE 3 by providing six holes 160 in the block 162, four for blowout preventer control hoses, one for the annulus flow line and a sixth hole for the tubing flow line. The hole for the annulus flow line could alternately be used for the kill line, or vice versa. When separate production and drilling blocks are used the drilling block may be employed without the production block, although the drilling may be conducted with the production block in place. Similarly, the well can be produced with or without the drilling block.

The drilling and production head shown in FIGURE 1 can be installed at the submarine formation by remote control from the drilling vessel as shown in FIGURES 4 through 11. The drilling base 38 is lowered to the submarine formation on a pair of cables 126 and 128 with the drill string extending through an aperture in the drilling base which aperture is provided with a conductor pipe 130 so that a bore hole can be started by operating the drill string through the drilling base and conductor pipe before the lower end of the conductor pipe reaches the ocean floor. A conventional pilot bit 132 is provided at the lower extremity of the drill column on a drill collar, and a hole opening device such as a three-blade wall scraper 134 may be used to enlarge the hole for placement of the conductor pipe and the surface pipe. When the well bore has been deepened sufficiently to receive the conductor pipe 42, the drilling base having the conductor pipe affixed thereto is lowered to the formation as shown in FIGURE 5.

The well is then deepened sufficiently to run the surface casing. The surface casing with the drilling and

production head attached thereto as shown in FIGURE 6 is lowered to the formation over the drill pipe with the drill pipe extending into the well bore. The well head, generally designated as 20, connected to the water string landing mandrel 40 which has threaded thereon the surface pipe 28, is lowered from the vessel on the riser pipe 64 which releasably engages the drilling and production mandrel 50 through a safety joint 66.

After the surface pipe and the drilling and production heads are made up at the surface of the body of water and lowered as a unit to the well, the drill pipe is retracted to the surface through the riser pipe 64 and a conventional cement tool 131 attached to the lower end thereof, for example, a cement tool, using a double-down swab, e.g. 133 to prevent cement from entering the annulus between the drill pipe and the surface pipe when the surface pipe is cemented into the formation. Cement is pumped down through the drill pipe and out through a guide shoe 135 located at the bottom of the surface pipe, until the cement returns up through the splined portion of the water string landing mandrel 40 and out onto the floor as indicated by the arrows 136 at FIGURE 7. Cement tool 131 and the double-down swab 133 are then circulated clean and retracted to the surface where they are removed and the water string landing equipment attached to the drill pipe.

A water string hanger 43 such as a conventional Burns fluted hanger or adapter with the water casing hung therefrom, is then lowered into the surface pipe and seated (as shown in FIGURE 8) on a shoulder 41 provided in the water string landing mandrel 40. Cement is then pumped down through the drill pipe to cement the water string within the surface pipe. Preferably a double-down swab 140 is used to prevent cement from returning through the drill pipe-water string annulus. Cement rising in the annulus between the surface pipe and the water string passes through the fluted area in the Burns fluted hanger 43 and up through a by-pass pipe 142 which is temporarily welded to the drill pipe to prevent cement from contacting the blowout prevention equipment and the drilling and production blocks and mandrel. A liner hanger releasing tool 137 is threaded into the fluted hanger 43 to prevent cement from passing down into the annulus 139 between the tubing or drill pipe and the water string. The cement flow is confined to the annulus between the by-pass pipe and the drill pipe by packer cups 144 and 146 provided on the by-pass sub as shown in FIGURE 8. A reverse circulating sub 148 is provided in the drill pipe or tubing 150 so that after the water string is cemented in place the by-pass pipe can be circulated clean and any cement in the by-pass pipe washed out without going to the bottom of the hole. The reversed circulating sub has a hollow bolt through it and a heavy bar is dropped down the pipe 150 to break the bolt off, thus leaving a passageway to the annulus through the bolt holes. After cementing the water string and circulating clean, the cementing tools and double-down swabs, etc. are brought to the vessel and the by-pass pipe 142 removed from the drill pipe.

The production tubing 32 is then run into the well through the water string and hung on an automatic tubing hanger 152, which is supported within the tubing hanger spool 52 on a tapered shoulder section 154 provided therein. The production tubing 32 is lowered into the well on drill pipe with a suitable release tool 156, so that after the tubing is hung the drill pipe 27 can be released from the tubing and returned to the surface.

A mandrel plug 158 is threaded into the upper end of the mandrel 50 and the riser pipe 64 disconnected from the drilling and production mandrel plug 158 by releasing the safety joint 66. The riser pipe and blowout preventer control lines are then removed from the drilling and production mandrel by disconnecting the barrel connectors 160 from the lugged pipe connectors 86 on the drilling block. The flow lines 24 and 26 and the flow line control valve hoses 34 and 36 are then run to a pump-

ing station or to an on-shore pumping installation by running these hoses along the ocean floor. The cables 126 and 128 used to lower the landing base may be used to attach a buoy for marking the locating of the producing well head after the drilling and production tools are removed to the surface of the water.

Although the present invention has been described in its preferred form with a certain degree of particularity, it should be understood that this disclosure has been made only by way of example and that numerous changes in the details of the method and the combination and arrangements of parts may be made without departing from the spirit and scope of the invention as hereinafter claimed.

We claim:

1. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling and production mandrel operably connected with said blowout preventer and having fluid passageways and a bore therein through which drilling tools may be passed into said well,
- a tubing outlet in said mandrel, said tubing outlet being in fluid communication with the bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet,

means for establishing communication between said blowout preventer control means and said mandrel passageways, and a removable block slidably positioned on said drilling and production mandrel, said block having means for connecting said fluid control lines from said vessel to said mandrel passageways to provide control fluid communication between said blowout preventer and said vessel, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel.

2. The apparatus of claim 1 including means for raising said block to said vessel.

3. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling and production mandrel operably connected with said blowout preventer and having fluid passageways and a bore therein through which drilling tools may be passed into said well, the upper end of said passageways forming receptacles,
- a tubing outlet in said mandrel, said tubing outlet being in fluid communication with the bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet,

means for establishing communication between said blowout preventer control means and said mandrel passageways, and

a removable block having passageways therein adapted for connecting with said control lines and being slidably positioned on said drilling and production mandrel, said block having protuberances communicating with said block passageways and extending from said block and adapted to engage said receptacles to thereby connect said fluid control lines from said vessel to said mandrel passageways to provide control fluid communication between said blowout pre-

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venter and said vessel, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel.

4. An underwater drilling head for controlling well pressure and flow of fluid from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling mandrel operably connected with said blowout preventer and having fluid passageways therein, means for communicating said blowout preventer control means with said mandrel passageways,
- a removable drilling block slidable on said drilling mandrel, said block having means for connecting said fluid control lines from said vessel to said mandrel passageways to provide control fluid communication between said blowout preventer and said vessel, and

means for raising said block to said vessel, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel.

5. An underwater production head for controlling the flow of fluids into flow lines from a well drilled from a floating vessel into a formation underlying a body of water, comprising in combination:

- a production mandrel having a bore, a tubing outlet and an annulus outlet, said tubing outlet being in fluid communication with the bore of said mandrel, tubing hanger means below said tubing outlet, well production tubing,
- a removable production block positioned on said production mandrel, said block having means for passing fluids from said outlets to said flow lines, said mandrel having means for aligning said fluid passing means of said block with said outlets of said mandrel, and

means for raising said block to said vessel.

6. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling and production mandrel operably connected with said blowout preventer and having a bore through which drilling tools may be passed into the well and fluid passageways therein including an annulus outlet,
- a tubing outlet, said tubing outlet communicating with the bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet,
- means for establishing communication between said blowout preventer control means and said mandrel passageways,
- a removable drilling block slidably disposed on said drilling and production mandrel, said block having means for connecting said fluid control lines from said vessel to said mandrel passageways to provide control fluid communication between said blowout preventer and said vessel, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel,
- a removable production block slidably disposed on

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said drilling and production mandrel and having tubing and annulus outlets therein,

means for establishing communication between said production block, tubing outlet and said bore of said drilling and production mandrel,

means for establishing communication between said production block annulus outlet and said drilling and production mandrel annulus outlet, and

means for raising said blocks to said vessel.

7. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling and production mandrel operably connected with said blowout preventer and having a bore through which drilling tools may be passed into said well and fluid passageways therein including an annulus outlet,
- a tubing outlet, said tubing outlet communicating with the bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet,
- a spool positioned between said drilling and production mandrel and said blowout preventer, said spool having tubing hanger means therein,
- production tubing hanging from said tubing hanger means into said well,
- means for establishing communication between said blowout preventer control means and said mandrel passageways,
- a removable block slidably disposed on said drilling and production mandrel, said block having means for connecting said fluid control lines to said mandrel passageways to provide control fluid communication between said blowout preventer and said vessel, said block also having a tubing and annulus outlets, said tubing outlet communicating with the bore of said drilling and production mandrel, and said annulus outlet communicating through one of said mandrel passageways with said annulus, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel, and

means for raising said block to said vessel.

8. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

- a blowout preventer having fluid operated means for controlling the pressure in said well,
- a drilling and production mandrel operably connected with said blowout preventer and having a bore through which drilling tools may be passed into the well and a tubing outlet, said tubing outlet communicating with said bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet, said mandrel also having fluid passageways therein including an annulus outlet, check valves in said mandrel tubing and annulus outlets for controlling fluid flow therethrough,
- means for establishing communication between said blowout preventer control means and said mandrel passageways,
- a removable block slidably disposed on said drilling and production mandrel, said block having means for connecting said fluid control lines to said man-

drel passageways to provide fluid communication between said blowout preventer and said vessel, said block also having tubing and annulus outlets, said tubing outlet communicating with the bore of said drilling and production mandrel, and said block annulus outlet communicating through said mandrel annulus outlet with the well annulus, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block and with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel, and means for raising said block to said vessel.

9. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into a formation underlying a body through fluid control lines extending from said vessel to said apparatus, comprising in combination:

a blowout preventer having fluid operated means for controlling the pressure in said well,

a drilling and production mandrel having a tubing outlet, said tubing outlet communicating with the bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlet, said mandrel also having fluid passageways therein including an annulus outlet, check valves in said mandrel tubing and annulus outlets,

a removable block having passageways therein adapted for attachment to said control lines, said block being slidably disposed on said mandrel, and means associated with said block for opening said check valves when said block is lowered onto said drilling and production mandrel whereby fluid communication between said blowout preventer control means and said control lines is established, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel.

10. An underwater drilling and production head apparatus for controlling well pressure and the flow of fluids from a well drilled from a floating vessel into formation underlying a body of water through fluid control lines extending from said vessel to said apparatus, comprising in combination:

a blowout preventer having fluid operated means for controlling the pressure in said well,

a drilling and production mandrel operably connected with said blowout preventer and having a bore through which drilling tools may be passed into said well and a tubing outlet, said tubing outlet communicating with said bore of said drilling and production mandrel whereby fluids produced in the well can flow through said mandrel tubing outlets, said mandrel also having fluid passageways therein including an annulus outlet, the upper end of said passageways forming receptacles,

check valves in said mandrel tubing outlets for controlling fluid flow therethrough,

means for establishing communication between said blowout preventer control means and said mandrel passageways,

a removable block slidably disposed on said drilling and production mandrel, said block having protuberances extending therefrom and adapted to engage said receptacles to thereby connect said fluid control lines to said mandrel passageways to provide fluid communication between said blowout preventer and said vessel, said block also having tubing and annulus outlets, said tubing outlet communicating with the bore of said drilling and production mandrel through said mandrel tubing outlet and said block annulus outlet communicating with the well annulus through said mandrel annulus outlet having a check valve therein, and means for raising said block to said vessel, said mandrel having means associated therewith for aligning said fluid control line connecting means on said block with said mandrel passageways whereby said block is remotely lowerable into place on said mandrel.

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CHARLES E. O'CONNELL, *Primary Examiner.*