

Nov. 6, 1962

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3,062,287

METHOD AND APPARATUS FOR CLEANING A WELLHEAD GUIDE SYSTEM

Filed Dec. 12, 1960

5 Sheets-Sheet 1

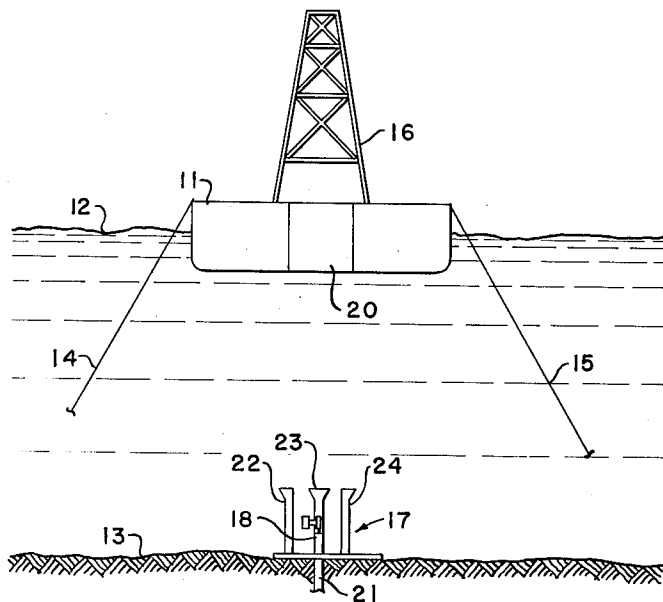


FIG. 1

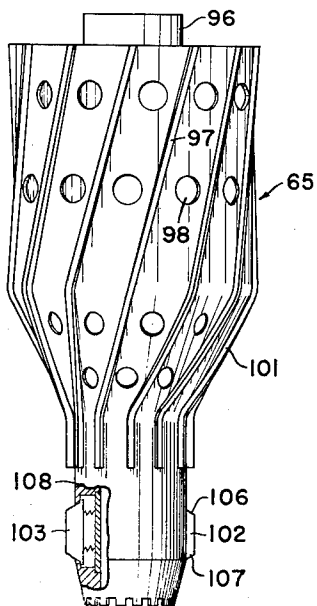


FIG. 5

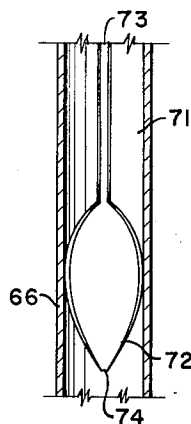


FIG. 6

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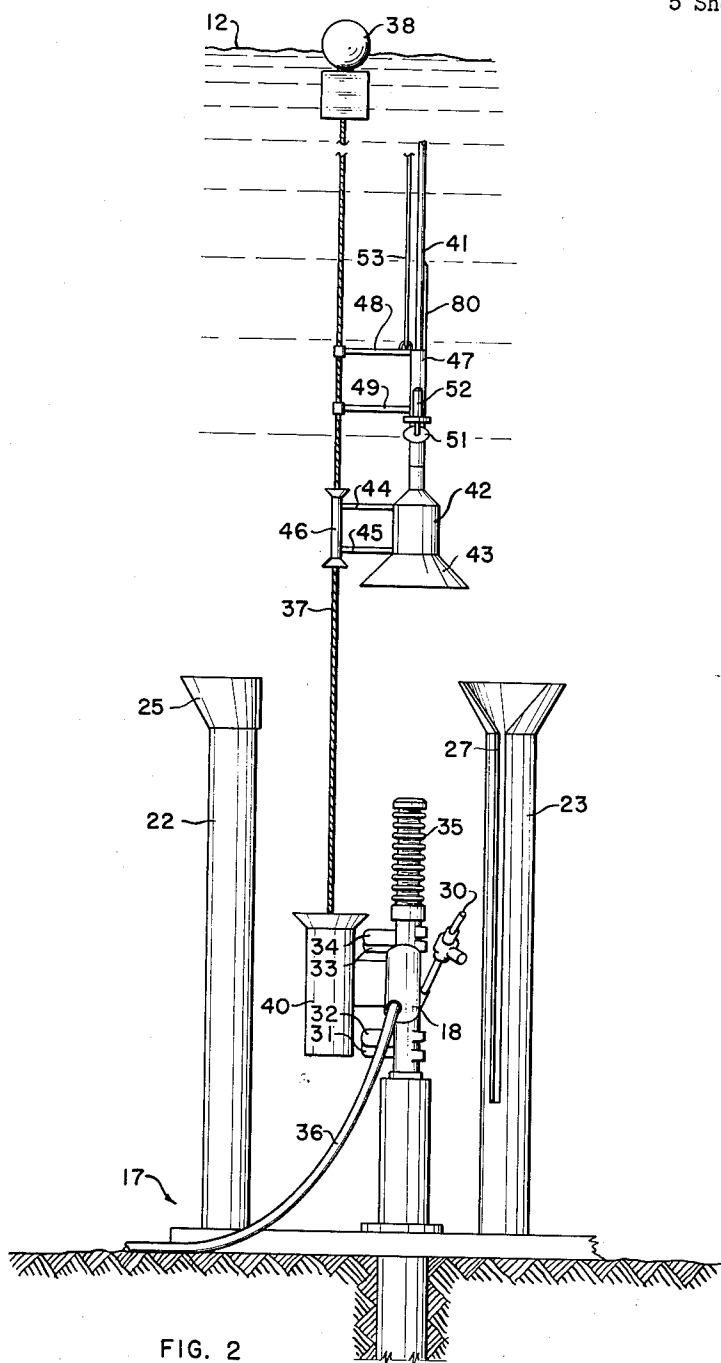
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5 Sheets-Sheet 3

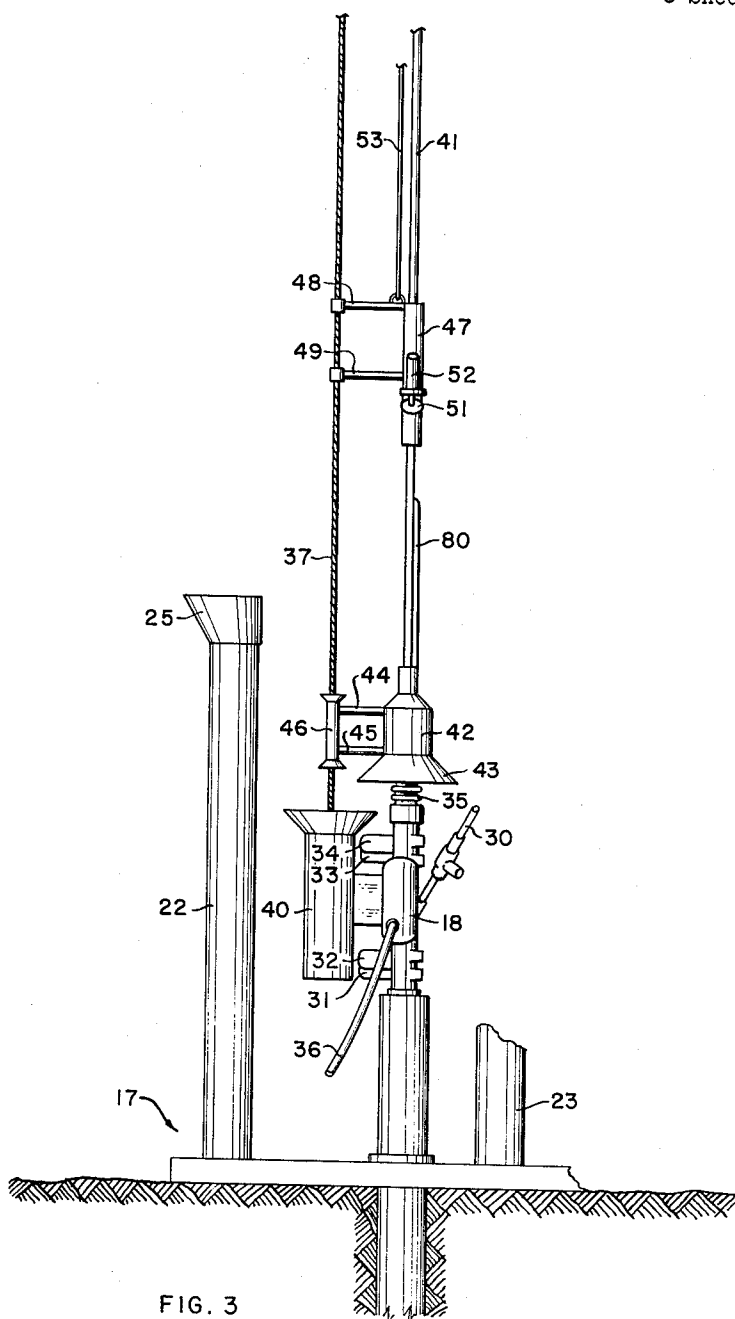


FIG. 3

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METHOD AND APPARATUS FOR CLEANING A WELLHEAD GUIDE SYSTEM

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5 Sheets-Sheet 4

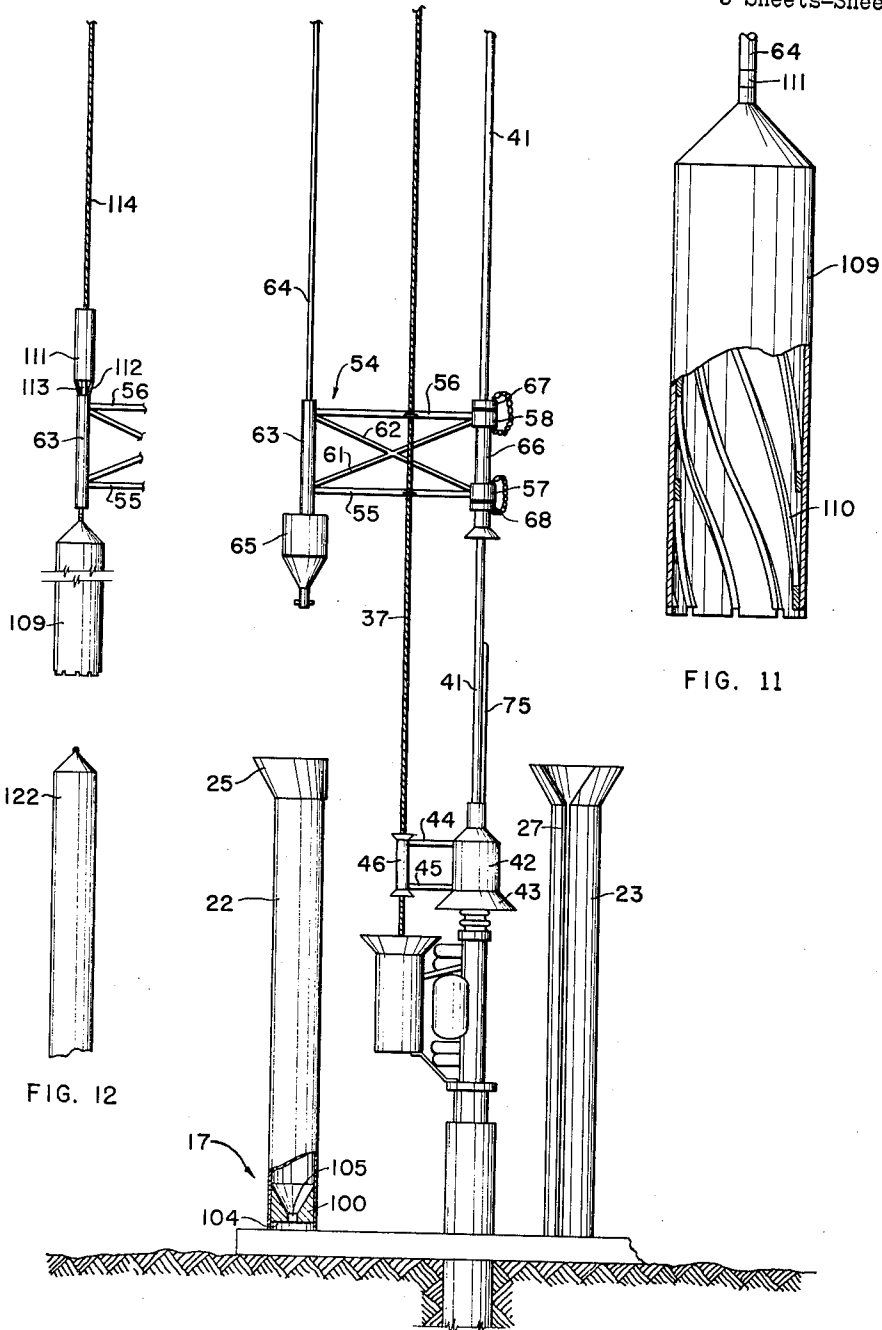


FIG. 4

FIG. 11

FIG. 12

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METHOD AND APPARATUS FOR CLEANING A WELLHEAD GUIDE SYSTEM

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5 Sheets-Sheet 5

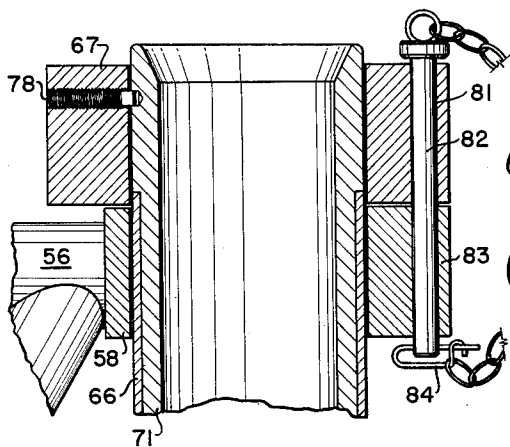


FIG. 7

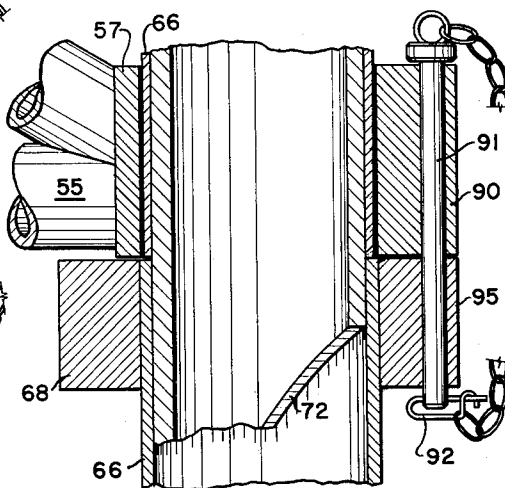


FIG. 9

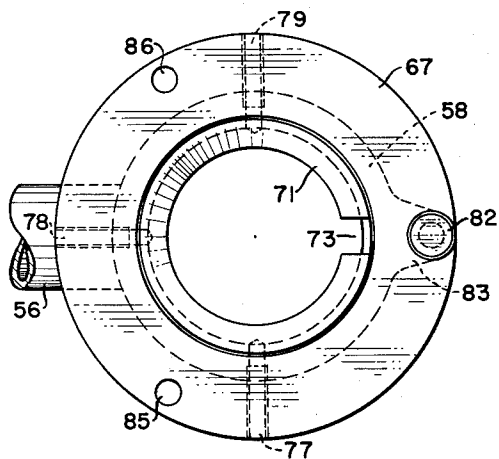


FIG. 8

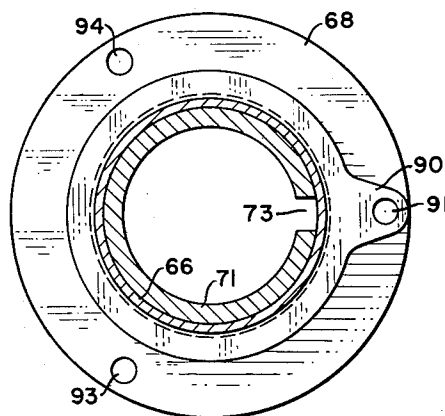


FIG. 10

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METHOD AND APPARATUS FOR CLEANING A WELLHEAD GUIDE SYSTEM

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Filed Dec. 12, 1960, Ser. No. 75,176
8 Claims. (Cl. 166—43)

This invention relates to offshore operations concerned with drilling, producing, servicing, and maintaining underwater oil and gas wells, and pertains more particularly to methods and apparatus for making contact with a guide base of an underwater wellhead assembly positioned on or near the ocean floor and for cleaning the marine growth or other deposits from the guide base, while operating from a remote location such as a vessel on the surface of the water, so that a plurality of guide lines can be lowered into contact with the guide base and connected thereto.

A method of drilling and completing an underwater well on the ocean floor is described in copending application, Serial No. 830,538, filed July 30, 1959 to Haerber et al. In the described method a wellhead assembly is permanently positioned on the ocean floor and a series of guide lines extend from the wellhead assembly on the ocean floor to a drilling barge or other drilling vessel floating on the surface of the water. Through the use of guide lines various pieces of equipment are raised and lowered between the wellhead assembly on the ocean floor and the vessel on the surface. After well drilling operations have been completed, the guide lines are preferably removed in a manner described in copending application, Serial No. 43,576, filed July 18, 1960 to Hayes, so that they do not become a hazard to navigation of vessels in the area. When it is desired at a later date to re-enter the well, the guide lines are attached to the guide base of the wellhead assembly on the ocean floor by the method described in copending application, Serial No. 43,577, filed July 18, 1960 to Hayes.

In some areas and at some wellhead installations, it may not be necessary to go back and reconnect guide lines to the wellhead assembly on the ocean floor for a number of years. Depending upon the depth of the water and the underwater conditions surrounding a wellhead assembly positioned at or near the ocean floor, marine growth and other deposits including corrosion products may accumulate on the guide base positioned around the wellhead assembly to which the guide lines are to be attached. It is therefore a primary object of the present invention to provide a method and apparatus adapted to be lowered through a body of water to clean any marine growth or other deposits from the guide columns of a guide base.

A further object of the present invention is to provide a method and apparatus adapted to be lowered through a body of water and to be remotely aligned with each of the various guide columns of a guide base positioned on the ocean floor whereby marine growth and/or other deposits may be cleaned from the guide column.

These and other objects of this invention will be understood from the following description taken with reference to the drawing, wherein:

FIGURE 1 is a diagrammatic view illustrating a floatable drilling barge anchored over a wellhead assembly that is positioned on the ocean floor;

FIGURES 2 to 4 are schematic views illustrating the installation of equipment between a drilling barge and a wellhead assembly on the ocean floor for cleaning the guide base thereof;

FIGURE 5 is a longitudinal view showing one form

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of a cleaning tool for cleaning the inside of a tubular guide column;

FIGURE 6 is a longitudinal view of an orienting means carried within the guide frame of FIGURE 4;

FIGURE 7 is a longitudinal view taken in partial cross-section of the upper flange of the guide frame mandrel of FIGURE 4;

FIGURE 8 is a plan view of the upper flange shown in FIGURE 7;

FIGURE 9 is a longitudinal view in partial cross-section of the lower flange carried by the guide frame mandrel of FIGURE 4;

FIGURE 10 is a plan view taken in partial cross-section of the bottom flange of the guide frame mandrel of FIGURE 4;

FIGURE 11 is a longitudinal view taken in partial cross-section of another form of a cleaning tool for cleaning post-type guide columns; and,

FIGURE 12 is a diagrammatic view of the cleaning tool of FIGURE 11 being used to clean a post-type guide column.

Referring to FIGURE 1 of the drawing, a drilling barge 11, of any suitable floatable type is illustrated as floating on the surface of a body of water 12 and substantially fixedly positioned over a preselected drilling location, as by being anchored to the ocean floor by suitable anchors (not shown) at the ends of anchor lines 14 and 15. Equipment of this type may be used when carrying out well drilling operations in water varying from about 100 feet to 1500 feet or more in depth. The drilling barge is equipped with a suitable derrick 16 as well as other auxiliary equipment needed during the drilling, completion or maintenance of a well. The derrick 16 on the drilling barge is positioned over a drilling slot or well 20 which extends vertically through the barge in a conventional manner. When using the equipment of the present invention, the slot 20 in the barge may be either centrally located or extend in from one edge. However, well location and maintenance operations may be carried out over the side of the barge without use of the slot.

An equipment base assembly 17 including a wellhead assembly 18 is shown as being positioned on the ocean floor 13 and being anchored fixedly thereto by a conductor pipe or well casing 21 which extends into the ocean floor 13 and is preferably cemented therein. For ease of operation the slot 20 of the barge 11 is positioned substantially directly over the equipment base 17 on the ocean floor. The equipment base 17 of FIGURE 1 is provided with two or more guide columns 22, 23 and 24, only two of which are shown in FIGURE 2 for ease of illustration. Preferably, each of the guide tubes 22 and 23 has a cone-shaped flange 25 and 26 attached to its upper end which serves to align elements that enter the open upper ends of the guide columns 22 and 23. Each guide column is provided with a longitudinal slot 27 in the wall thereof extending downwardly from the open upper end of the column and is preferably positioned in line with the center line through the wellhead assembly 18. The wellhead assembly may be of any suitable type, the one being illustrated is shown as being provided with a flowline 30, control valves 31, 32, 33 and 34, and a top closure 35 on the wellhead assembly which provides entry into the wellhead assembly by remote operations from the drilling barge, if desired. The various valves and control units of the wellhead assembly 18 are either electrically, pneumatically or hydraulically actuated through a series of individual power transmission lines which are grouped together in one or more bundles 36.

Fixedly secured to the equipment base 17 or to the wellhead assembly 18 is a buoy line 37 of a length suf-

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ficient to extend from the underwater installation to the surface of the water 12 where a buoy 38 is attached thereto. The buoy line 37 may be in its normally extended position as illustrated in FIGURE 2, or a buoy container 40 may be provided in which the buoy line and its buoy 38 may be stored, to be brought to the surface when it is desired to regain contact with the underwater equipment base 17 and wellhead assembly 18. The buoy 38 can be released from its container 40 in any suitable manner, by power supplied through one of the control lines in the transmission bundle 36 or by a signal transmitted through the water to actuate a release mechanism in the container or in the buoy which would release the buoy from the container.

In practicing the method of the present invention, the mooring or buoy line 37 (FIGURE 2) serves as a guide line by which a string of tubing 41 or drill pipe is guided down to the wellhead assembly 18. The lower end of the tubing string 41 is provided with a latching tool 42 of any suitable type by which a rigid connection may be made with the top of the wellhead assembly 18. The form of the latching tool 42 illustrated is such that it is adapted to fit over the wellhead closure 35 and be locked thereon in any suitable manner, as by rotating or reciprocating the pipe string 41 or by applying hydraulic pressure therethrough. The lower end of the latching tool 42 is preferably provided with a guide cone 43 to facilitate aligning the latching tool 42 on the top of the wellhead closure 35. The latching tool 42 is attached to a pair of guide arms 44 and 45 which in turn are secured to a guide tube 46 which is slidably mounted on the buoy line 37.

At the start of the operation of regaining contact with the underwater wellhead assembly 18, the buoy 38 and the upper end of its line 37 would be suitably anchored to the barge 11 at the surface in a manner such that the guide tube 46 can be readily slipped over it for movement therealong. Throughout the well contacting operation an attempt is made to maintain the buoy line 37 in a position as close to the vertical as possible. With the guide tube 46 attached to the buoy line, the latching tool 42 and the pipe string 41 are lowered in a conventional manner, as by means of a hoist in the derrick 16 on the barge 11, down through the water until it is within the equipment base 17. The distance down to the wellhead 18 from the surface of the water is normally accurately known from previous work on the well or by means of depth marks which could be contained on the buoy line 37. Thus, since the distance to the top 35 of the wellhead 18 is known, the guide cone 43 of the latching tool 42 would be expected to contact the top 35 of the wellhead 18 when the predetermined length of tubing string 41 had entered the water. If no contact was made at that depth, the tubing string 41 and its latching tool 42 is slowly moved in a circle or in any other desired pattern about line 37 until contact is established between the latching tool 42 and the top of the wellhead assembly. With the latching tool 42 aligned over the top 35 of the wellhead assembly 18, continued lowering of the tubing string seats the latching tool 42 over the top of the wellhead assembly 18 where it can be locked into position.

If desired, in order to facilitate the alignment of the latching tool 42 over the top 35 of the wellhead assembly 18, a light carrier 47 may be employed which could be in the form of a tubular member of a diameter so that it could slide over the tubing string 41 and have a pair of guide arms 48 and 49 that would be slidably mounted on the buoy line 37. One or more lights 51 and one or more television cameras 52 are suitably arranged on the light carriage 47 so as to observe operations at the wellhead. The light carriage 47 is arranged for movement independent of the buoy line 37 or the tubing string 41 and may be raised and lowered by a hoist line 53. In FIGURE 2, the tubing string 41 and its latching tool 42 are shown as being lowered through the water over the wellhead assembly

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18. In FIGURE 3 the latching tool 42 at the lower end of the tubing string 41 is illustrated as being locked into place with the light carriage 47 being raised to the surface again by means of hoist line 53.

With the buoy line 37 and the tubing string 41 extending from the wellhead assembly 18 to the drilling barge 11 (FIGURE 1), a guide frame 54 (FIGURE 4) is lowered down through the water from the barge using the tubing string 41 as a guide. The guide frame 54 comprises any suitable frame or truss member, such for example as a pair of arms 55 and 56 which are fixedly secured at one of their ends to a pair of collars 57 and 58. The arms 55 and 56 may be interconnected by cross-bracing members 61 and 62. Fixedly secured to the other end of the arms 55 and 56 and to the cross-bracing members 61 and 62 is a guide tube 66 which forms a tubular bearing through which a string of pipe 64 extends. The pipe string 64 is rotatable within the guide tube 63 together with a cleanout shoe 65 which is shown in greater detail in FIGURE 5.

When free to do so, the collars 57 and 58 of the guide frame 54 are rotatable in a horizontal plane and on a vertical axis about an orienting guide column 66 having upper and lower flanges 67 and 68 secured thereto. The orienting guide column 66 (FIGURE 4) is provided with tubular guide liner 71 (FIGURE 6) which is fixedly positioned thereto. The lower end of the guide liner 71 is cut in a manner illustrated in FIGURE 6 so as to form a shoulder 72 extending from each side of a longitudinal slot or keyway 73 down to a point 74. The keyway 73 formed in the tubular guide liner 71 is designed to cooperate with a long key 75 which is preferably welded to the outer surface of the tubing string 41 just above the latching tool 42. Thus, it will be seen that as the top of the key 75 on the tubing string 41 contacts any point of the shoulder 72 of the guide liners 71 carried within the orienting guide column 66 of the frame 54, the frame will be caused to rotate until the key 75 slides along the shoulder 72 and enters the keyway 73. While the key 75 on the tubing string 41 is fixedly positioned with regard to the orientation of any of the guide columns 22 and 23, the tubular guide liner 71 and its slot 73 may be positioned at any one of several locations with respect to the frame 54, depending upon which column it is desired to have the cleanout tool 65 enter.

One means for selectively orienting the tubular guide line 71 and its outer guide column 63 with respect to the arm 56 consists of providing the flange 67 (FIGURE 7) with suitable connector means, such for example as set screws 77, 78 and 79 (FIGURE 8) so that the flange 67 can be removed from the top of the tubular guide liner 71 at any time, while the orientation of the flange is always known when the flange 67 is connected to the guide liner 71. One simple means of accomplishing this is to provide the flange 67 with the three set screws 77, 78 and 79 so that the flange 67 can only be attached to the top of the tubular guide liner 71 in one position, that is with a removable pin 82 which passes through the flange 67 oriented in a single position with regard to the slot 73 in the guide liner 71.

The collar 58 which is fixedly secured to the arm 56 (FIGURE 7) is provided with a boss 83 (FIGURE 8) through which the pin 82 may extend. The boss 83 has a fixed position with respect to the arm 56. The lower end of the pin 82 may be provided with a suitable holding pin 84 to prevent the pin 82 from becoming dislodged from its position during any operation. As shown in FIGURE 8, the upper flange 67 is provided with a series of holes 85 and 86 and a hole 87, shown in FIGURE 7, which are arranged in a circle around the flange 67 so as to lie in known orientation between the arm 56 (FIGURE 8) and the slot 73 in the tubular guide liner 71 depending on which of the guide columns 22, 23, etc., in the equipment base assembly 17 (FIGURE 4) that it is desired to have the cleanout tool 65 enter. Thus, if the

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three columns 22, 23, and 24 in the equipment base assembly 17 (FIGURE 1) are equally spaced 120° to each other around a circle, the holes 85, 86 and 87 in the orienting flange 67 would also be spaced at 120° around the flange.

While a single orienting flange 67 is all that is needed at the top of the tubular guide liner 71 (FIGURE 7), because of the great weight of the equipment employed, it is preferable to have a second orienting flange 68 positioned near the bottom of the tubular guide liner 71 and its surrounding jacket or guide column 66. Thus, the lower collar 57, which is welded to the arm 55 and is rotatable about the guide column 66, is provided with a boss 90 through which a pin 91 may extend. The pin 91 may be provided with a holding pin 92 at the bottom thereof. The flange 68 is provided with a series of holes 93, 94 and 95 (FIGURE 9) which are coaxial with the holes 85, 86 and 87 in the upper orienting flange 67.

As illustrated in FIGURE 4, the guide frame 54 is lowered down over the tubing string 41 with the tubing string 41 passing up through the orienting guide columns 66 attached to the guide frame 54 by means of the bolts 82 and 91 (FIGURES 7 and 9). Prior to lowering the apparatus through the water the pins 82 and 91 are seated in vertically aligned and selected holes. The guide frame 54 is lowered through the water by means of the pipe string 64 which extends to the vessel at the surface of the water and will later be rotated by equipment carried thereby. If desired, the light carriage (FIGURE 3) with its lights 51 and television camera 52 may follow the guide frame 54 down the tubing string 41 to check the operation of the wellhead. As the guide frame 54 and its orienting guide column 66 approaches the top of the key 75 at the bottom of the tubing string 41, sufficient slack is provided in the buoy line 37 to permit the frame 54 to be rotated about the tubing string 41 to a predetermined position above one of the guide columns 22, 23, etc. (FIGURE 4). With a rigid connection now formed between the guide frame and the wellhead assembly, the pipe string 64 is rotated from the surface by suitable equipment carried on the vessel so as to cause the rotating cleanout shoe 65 to clean out any marine growth or other deposits which may have formed on the inner wall of the guide columns 22, 23, etc.

One type of a cleanout shoe is shown in FIGURE 5 which is provided with a pipe connection 96 at the top thereof for connecting it to the lower end of the pipe string 64 (FIGURE 4). The cleanout shoe is equipped with a series of vertical or helical ribs 21 on the outer wall thereof (FIGURE 5) for scraping the inner wall of a guide column when the tool is rotated. Fluid ports 98 are preferably provided between the ribs 97 and extend through the wall of the tool to allow a circulating fluid pumped down the pipe string 64 (FIGURE 4) to carry away material that is scraped from the wall of the guide column 22. A small circulating port may also be provided out the bottom of the tool. In the event that the bottom of the guide column 22 (FIGURE 4) is provided with a hold-down shoe 100 of the type described in copending patent application, Serial No. 43,577, filed July 18, 1960, the lower portion of the tool 65 (FIGURE 5) is provided with an inwardly sloping face 101 which is contoured to fit the sloping surface of the hold-down shoe 100 (FIGURE 4) so that it will be properly cleaned. Also, spring-loaded dogs 102 and 103 (FIGURE 5) may be provided on the lower portion of the tool 65 so as to be able to clean the under surface 104 of the hold-down shoe 100 (FIGURE 4) adjacent the hole 105 therethrough. Each of the dogs, say 103, is provided with upper and lower sloping faces 106 and 107 so that the radially retractable spring-loaded dog may be forced back into the shank 108 of the tool 65 (FIGURE 5) when the tool is forced down through the opening 105 (FIGURE 4) or pulled up therefrom.

When the column 22 has been cleaned (FIGURE 4), 75

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the frame 54 is raised to the surface again and the pins 82 and 91 (FIGURES 7 and 9) are moved to another set of holes in the flanges 67 and 68 so that when the frame 54 is again lowered down the tubing string 41 in the above-described manner, the cleanout shoe 65 and pipe string 64 will be oriented over another preselected guide column, say guide column 23.

In the event that the guide columns 22 and 23 have their guide cones 25 removed and their upper ends closed so as to form a guide post as described in copending application, Serial No. 43,577, filed July 18, 1960, instead of a guide column, a different type of a cleanout tool would have to be employed as the problem would then be to clean the outer surface of the guide post rather than the inner surface of a column. For cleaning guide posts a wash-over pipe similar to that shown in FIGURE 11 may be employed. The wash-over pipe of FIGURE 11 comprises a large diameter length of pipe 109 being provided with a series of ribs 110 on the inner surface thereof with the diameter between diametrically-positioned ribs being slightly greater than the outside diameter of the guide post to be cleaned. The wash-over pipe would be provided with suitable coupling means 111 for connecting it to the lower end of the pipe string 64, through which a fluid could be pumped during cleaning operations. While the present invention has been described with employing a frame 54 (FIGURE 4) having a single guide tube 63 carried thereby to be aligned over one of the guide columns 22 in the base assembly 17 on the ocean floor, it is realized that the guide frame 54 could be of the type described in copending application, Serial No. 43,577, filed July 18, 1960, which had a series of guide tubes 63, so that one would be in register with each of the guide columns 22, 23, etc., of the base assembly 17. Thus, with the guide frame 54 having multiple guide tubes 63 carried thereby, the orienting flanges 67 and 68 could be eliminated. In operating with a frame of this type, after one of the guide columns, say 22, was cleaned out, the frame would be pulled to the surface again and the pipe string 64 and its cleanout tool 65 would be moved to another of the guide tubes 63, so that in being lowered again on the tubing string 41, the guide tube 63 aligned with the guide column, say 23, would be in register so that the cleanout shoe 65 could be rotated down through a second column. Other guide columns in the base assembly would be cleaned by repeating the operation and moving the cleanout tool to a different guide tube each time. However, the weight of a frame of this type is so great that it is preferred to employ the smaller type frame of the type described with regard to FIGURE 4 which is adapted to be oriented by means of orienting flanges 67 and 68 so that one guide column at a time can be cleaned out.

Instead of employing a pipe string 64 (FIGURE 4) to rotate the cleanout shoe 65 or the wash-over shoe 109 (FIGURE 11) other suitable prime movers, such for example as electric motors or hydraulic turbines, which can be connected to the cleaning tools 65 and 109 and, if desired, mounted directly on the guide frame 54 (FIGURE 4) with the guide tube 63 forming the tubular bearing between the prime mover means and the cleanout tool. As shown in FIGURE 12 of the drawing, an electric motor 111 is connected in any suitable manner, as by brackets 112 to the top of the guide tube 63 of the guide frame 54. The shaft 113 of the electric motor 112 extends through the guide tube 63 and is connected to the cleanout tool or wash-over shoe 109. In this case the length of the wash-over shoe 109 would be at least equal to the length of the outer surface of a guide column 122 (FIGURE 12) that it was desired to clean. Power could be supplied to the electric motor 111 through a power transmitting cable 114 which is preferably combined with a cable of the weight-lifting type so that the motor and frame and cleanout tool could be lifted to the surface. In the event that the cleanout tool of the

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type shown in FIGURE 4 (element 65) were employed to clean out the guide column 22 when driven by the electric motor 111 of FIGURE 12, it is quite apparent that the length of the tool 65 (FIGURE 4) must be as long as the height of the guide column 22 which is to be cleaned. Otherwise, in the event that a short clean-out shoe 65 (FIGURE 4) is employed, the electric motor 111 (FIGURE 12) would not be supported on or attached to brackets 112 but would be suspended from the end of the cable 114. In this case, the shaft 113 of the motor 111 would be a length sufficient to enable the cleanout shoe 65 (FIGURE 4) to be run down through the guide column that it was cleaning out. In the event that the electric motor 111 was freely carried above the frame 54 with its shaft 113 slidably positioned within the guide tube 63, any suitable type of anti-rotation device well known to the art may be employed between the electric motor 11 and the guide tube 63, such for example as a key similar to key 75 (FIGURE 4) and its associated keyway. Likewise, the electric motor 111 of FIGURE 12 could be replaced by a hydraulic turbine in which event the power transmitting cable 114 would be in the form of a hydraulic power transmitting pipe string through which pressure fluid could be pumped to drive the turbine which in turn would rotate the clean-out tools.

Throughout the description of the apparatus of the present invention, it is assumed that in using the apparatus the guide columns 22 and 23 (FIGURE 4) and any other guide columns that are attached to the base assembly are all equi-distant from the center of the well and the tubing string 41 attached thereto which serves as the pivot for the guide frame 54. In the event that some of the guide columns on the wellhead base assembly or any other type of assembly on the ocean floor are not equi-distant from the tubing string 41, the arms 55 and 56 of the guide frame 54, which are preferably made adjustable, would have to be adjusted to their length to place a cleanout tool in register with the top of the guide column to be cleaned.

I claim as my invention:

1. A method of remotely cleaning guide columns of an equipment base positioned below the surface of a body of water, said method being carried out from an operational base positioned above the surface of the water, said method comprising the sequential steps of positioning said operational base substantially directly above said equipment base, establishing a connection between said bases by lowering a pipe string through the water to said equipment base, orienting the lower end of said pipe string in register with the top of said wellhead on said equipment base, seating the lower end of said pipe string on at least a portion of the wellhead, lowering through the water from said operational base and guiding along said pipe string a frame carrying cleaning tool means, orienting said frame to a predetermined position above and in contact with at least one guide column on said equipment base, and cleaning the surface of said guide column.

2. A method of remotely cleaning guide columns of an equipment base positioned below the surface of a body of water, said method being carried out from an operational base positioned above the surface of the water, said method comprising the sequential steps of positioning said operational base substantially directly above said equipment base, establishing a flexible connection between said bases by means of an elongated element, lowering a pipe string through the water along said elongated element to said equipment base, orienting the lower end of said pipe string in register with the top of said wellhead on said equipment base, seating the lower end of said pipe string on the upper end of the wellhead, lowering through the water from said operational base and guiding along said pipe string a frame carrying cleaning tool means, orienting said frame to a predetermined position above and in contact with at least one guide column on said equipment

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base, cleaning the surface of said guide column with a fluid during the cleaning operation, and subsequently raising the frame to remove the tool means from contact with said guide column.

3. A method of remotely cleaning guide columns of an equipment base positioned around a wellhead below the surface of a body of water, said method being carried out from an operational base positioned above the surface of the water on a floating vessel, said method comprising the sequential steps of positioning said operational base substantially directly above said equipment base, establishing a flexible connection between said bases, lowering a pipe string through the water to said equipment base, orienting the lower end of said pipe string in register with the top of said wellhead on said equipment base, seating the lower end of said pipe string on the upper end of the wellhead, lowering through the water from said operational base and guiding along said pipe string a frame carrying cleaning tool means, orienting said frame to a predetermined position above and in contact with a guide column on said equipment base, abrasively cleaning the surface of said guide column, raising the frame to remove the tool means from contact with said guide column, aligning the frame and tool means successively with each of the other guide columns, lowering the frame into position above each of the other guide columns, and repeating the cleaning operation on each guide column.

4. A method of remotely cleaning guide columns of an equipment base positioned around a wellhead below the surface of a body of water on the floor thereof, said method being carried out from an operational base positioned above the surface of the water on a floating vessel, said method comprising the sequential steps of positioning in an anchored manner said operational base substantially directly above said equipment base, establishing a flexible connection between said bases by a buoy line, lowering a pipe string through the water and guiding it along said buoy line to said equipment base, orienting the lower end of said pipe string in register with the top of said wellhead on said equipment base, seating the lower end of said pipe string on the upper end of the wellhead, lowering through the water from said operational base and guiding along said pipe string a frame carrying cleaning tool means, orienting said frame to a predetermined position above and in contact with a guide column on said equipment base, abrasively cleaning the surface of said guide column, flushing the surface of said guide column with a fluid during the cleaning operation, raising the frame to remove the tool means from contact with said guide column, aligning the frame and tool means successively with each of the other guide column, lowering the frame into position above each of the other guide columns, and repeating the cleaning operation on each guide column.

5. Apparatus for remotely cleaning guide columns of a subsurface structure from a remotely-located base above the surface of a body of water, said apparatus comprising an operational base positioned above the surface of a body of water, an equipment base assembly fixedly positioned beneath the surface of a body of water, a plurality of guide columns extending upwardly from said equipment base assembly, a pipe string lowerable through said water to said base assembly, connector means carried by the lower end of said pipe string connectible to said wellhead assembly of said base assembly, a carrier frame slidable along said pipe string to said equipment base assembly, said frame including tool support means disposed in a manner to register with the upper ends of the guide columns of said equipment base assembly, aligning means carried by said frame for selectively aligning the tool support means of the frame over at least one of the guide columns of said base assembly, and tool means carried by the tool support means for cleaning the columns.

6. Apparatus for remotely cleaning guide columns of a subsurface structure from a remotely-located base above the surface of a body of water, said apparatus compris-

ing an operational base positioned above the surface of a body of water, an equipment base assembly fixedly positioned adjacent the floor of a body of water, a plurality of guide columns extending upwardly from said equipment base assembly, a pipe string lowerable through said water to said base assembly, connector means carried by the lower end of said pipe string connectible to said wellhead assembly of said base assembly, a carrier frame slidable along said pipe string to said equipment base assembly, said frame including a vertically-positioned bearing means disposed in a manner to register with the upper ends of the guide columns of said equipment base assembly, aligning means carried by said frame for selectively aligning the bearing means of the frame over at least one of the guide columns of said base assembly, tool means carried beneath the bearing member in axial alignment therewith, shaft means secured to said tool means and extending through said bearing member, and prime mover means carried above said frame for actuating said tool means.

7. Apparatus for remotely cleaning guide columns of a subsurface structure from a remotely located floating vessel on the surface of a body of water, said apparatus comprising a vessel having an operational base positioned above the surface of a body of water, an equipment base assembly including an underwater wellhead assembly fixedly positioned adjacent the floor of a body of water, a plurality of guide columns extending upwardly from said equipment base assembly, anchor means extending from said base assembly into said floor to anchor said base assembly thereto, a buoy line extending between said base assembly and said operational base, a pipe string lowerable through said water to said base assembly, connector means carried by the lower end of said pipe string connectible to said wellhead assembly of said base assembly, a guide frame affixed to the lower end of said pipe string and slidable along said buoy line, a carrier frame slidable along said pipe string to said equipment base assembly, said frame including a vertically-positioned tubular bearing member disposed in a manner to register with the upper ends of the guide columns of said equipment base assembly, aligning means carried by said frame for selectively aligning the bearing member of the frame over one of the guide columns of said base assembly,

rotatable tool means carried beneath the bearing member in axial alignment therewith, shaft means secured to said tool means and extending through said bearing member, and prime mover means carried above said frame for actuating said tool means.

8. Apparatus for remotely cleaning guide columns of a subsurface wellhead assembly of an oil well drilled in the ocean floor and completed underwater from a remotely located floating vessel on the surface of a body of water, said apparatus comprising a vessel having an operational base positioned above the surface of a body of water, an equipment base assembly fixedly positioned including an underwater wellhead assembly on the floor of a body of water, a plurality of guide columns extending upwardly from said equipment base assembly, a string of pipe extending from said base assembly into said floor to anchor said base assembly thereto, a releasable buoy attached in a submerged manner to said base assembly and adapted to float to the surface when released, a buoy line extendible between said base assembly and said buoy when surfaced, a pipe string lowerable through said water to said base assembly, connector means carried by the lower end of said pipe string connectible to said wellhead assembly of said base assembly, a guide frame affixed to the lower end of said pipe string and slidable along said buoy line, a carrier frame slideable along said pipe string to said equipment base assembly, said frame including a vertically-positioned tubular bearing member disposed in a manner to register with the upper ends of the guide columns of said equipment base assembly, aligning means carried by said frame for selectively aligning the bearing member of the frame over one of the guide columns of said base assembly, rotatable tool means carried beneath the bearing member in axial alignment therewith, shaft means secured to said tool means and extending through said bearing member, and prime mover means carried above said frame for actuating said tool means.

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