

Sept. 25, 1962

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3,055,429

METHOD OF WORKING OVER UNDERWATER WELLS

Filed Oct. 16, 1958

2 Sheets-Sheet 1

FIG. 4.

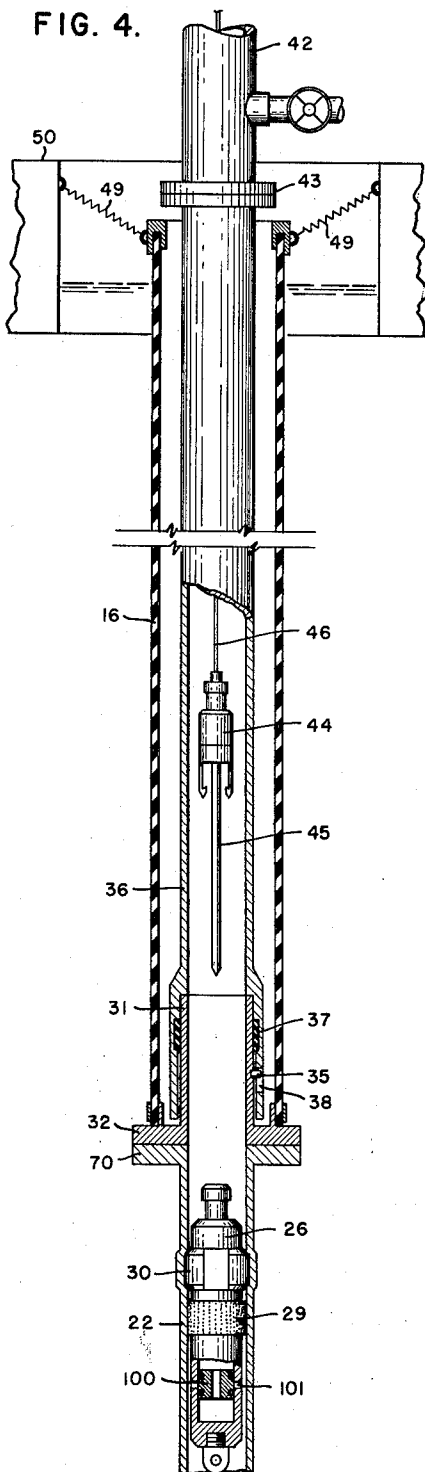


FIG. 1.

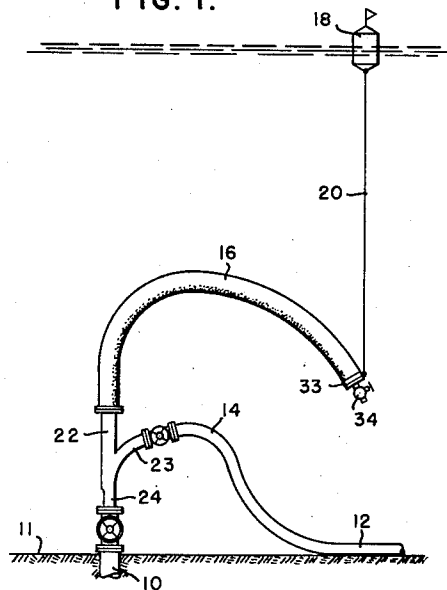
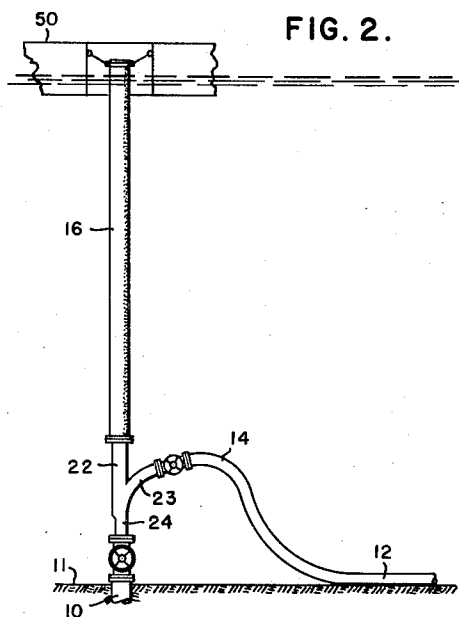


FIG. 2.



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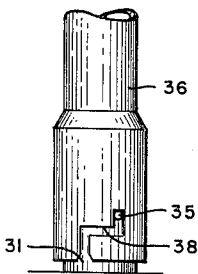


FIG. 5.



FIG. 9

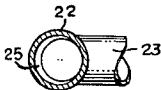


FIG. 6.

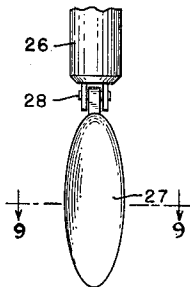


FIG. 7.

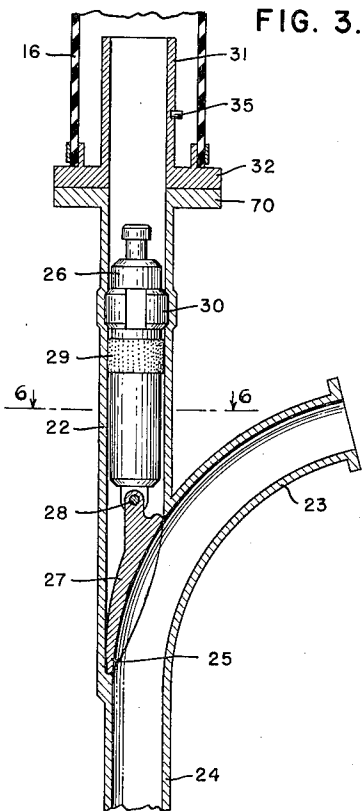


FIG. 3.

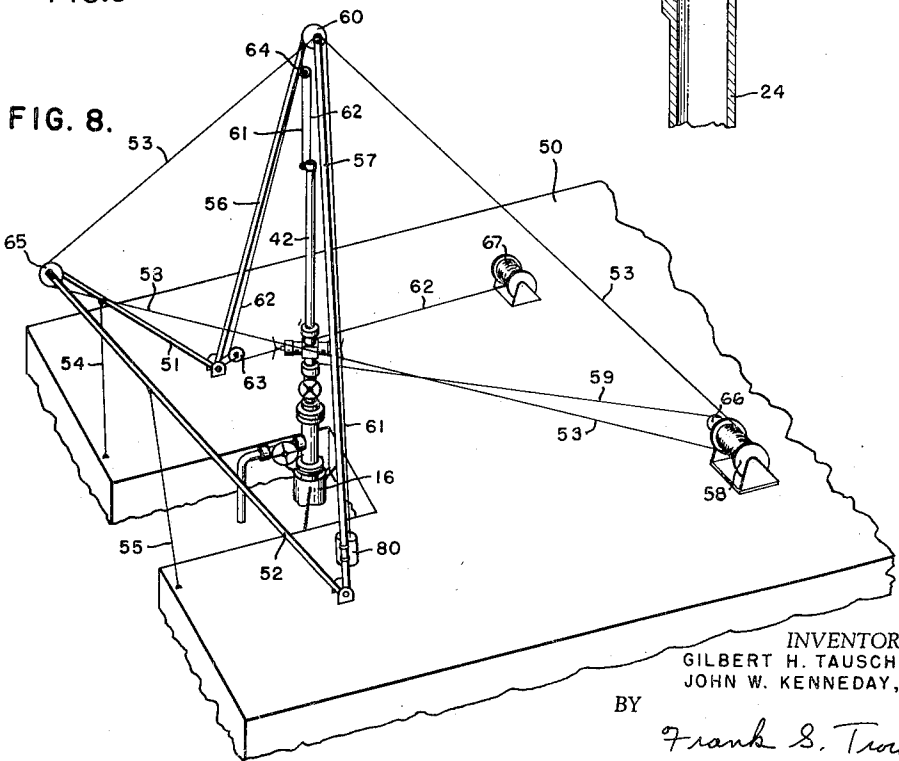


FIG. 8.

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METHOD OF WORKING OVER UNDERWATER WELLS

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Filed Oct. 16, 1958, Ser. No. 767,636

2 Claims. (Cl. 166—66.5)

This invention relates to workover operations performed on oil and gas wells. More particularly, this invention relates to methods of performing workover operations on oil and gas wells located under water.

Often it is necessary to perform workover operations on underwater oil and gas producing wells. Examples of workover operations are sand washing, perforating, and cementing operations.

It is highly desirable that the workover operations be performed from a floating vessel such as a portable barge. This obviates the building of permanent or temporary offshore platforms for carrying out these operations. The saving in time and money is obvious.

An important feature of our invention is the provision of a new wellhead system for underwater wells. The new system is such that workover operations are easily performed from a floating vessel. The new wellhead system includes a curved pipe which branches from a vertically extending pipe. The vertically extending pipe is normally closed. Oil and gas are produced from the well, through the curved pipe, and a flow line attached to the curved pipe. A flexible member such as a hose is connected to the wellhead about the vertically extending pipe. The flexible member is completely submerged, but is of sufficient length to extend above the water when its unconnected end is raised. The flexible member provides a flexible lubricator that will allow movement of the floating vessel.

Another important feature of this invention is a new method for working over underwater wells. In carrying out the new method, a portable barge is floated to the underwater well location. The upper end of the flexible member is lifted until it extends above water. The normally closed vertically extending pipe is then opened. The workover operations are then performed through the vertically extending pipe and flexible member.

The invention, as well as its many advantages, may be further understood by reference to the following detailed description and drawings, in which:

FIG. 1 is a schematic view showing a portion of the new oil well equipment before carrying out workover operations;

FIG. 2 is a schematic view showing a portion of the new oil well equipment ready for use in carrying out workover operations;

FIG. 3 is a sectional view through a portion of FIG. 1;

FIG. 4 is a sectional elevational view showing the equipment used in carrying out operations within the well from the water surface;

FIG. 5 is an elevational view showing the latching arrangement of FIG. 4;

FIG. 6 is a view taken along line 6—6 of FIG. 3, with the plugging member removed;

FIG. 7 is a fragmentary elevational view of the guide member shown in FIG. 3 rotated 90°;

FIG. 8 shows an arrangement for maintaining stationary the equipment which is lowered into the well from the water surface; and

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 7.

Referring particularly to FIG. 1, there is shown a protector casing 10 of an underwater well drilled into

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the ground 11. Flow line 12 is connected to the protector casing 10 through gooseneck or curved pipe connection 14. The flow line 12 leads to the shoreline (not shown) or to a central offshore location (not shown).

A flexible conduit or hose 16 is also connected to the protector casing 10 and supported by buoyant means, such as buoy 18 attached by line 20 to the end of flexible hose 16. Flow line 12 and flexible hose 16 lead into a unitary member, to be subsequently described. If desired, a plurality of flow lines and flexible hoses may be connected to protector casing 10 for use in multiple well completions.

FIG. 2 shows the flexible conduit 16 raised above the water surface and attached to a barge 50 and is now ready for use in carrying out workover operations.

The unitary member as shown in FIG. 3 includes a vertical pipe 22. A curved pipe 23 branches out from the vertical pipe 22. Vertical pipe 22 and curved pipe 23 both lead into a common pipe 24.

A portion of curved pipe 23 is cut away where curved pipe 23 joins vertical pipe 22. The size of the opening in curved pipe 23 is such that an annular shoulder 25 is provided to receive a guide member 27. The opening is large enough to provide a full-opening path for instruments to be lowered and raised through the vertical pipe 22 when the guide member 27 is removed from vertical pipe 22 (see FIG. 6).

In order to close off the vertical pipe 22, a tubing plug 26 may be used (see FIGS. 3 and 4). The guide member 27 is pivotally attached to the bottom of plug 26 by means of pivot 28. Guide member 27 is connected to the bottom of tubing plug 26 in a manner so that the center of gravity of guide member 27 is such that guide member 27 will face downwardly as the tubing plug 26 is lowered into vertical pipe 22 to easily seat upon the guide shoulder 25. A packer 29 is provided about plug 26. Locking dogs 30 lock plug 26 firmly in place within tube 22. There are many well-known structures for expanding the locking dogs into locking engagement. One such structure is shown and described in Patent No. 2,798,559 issued July 9, 1957, to J. V. Fredd. An equalizing valve 100 normally closes ports 101.

The under surface of guide member 27 is concaved, as shown in FIG. 3 and FIG. 9. The concave under surface has the same curvature as the curved pipe 23. The guide member 27 mates with the upper curved portion of guide shoulder 25.

A lubricator anchoring tube 31 is connected to the vertical pipe 22 and forms a continuation thereof. The connection is made through flange 32 bolted to flange 70. The flexible hose 16 is also connected to flange 32 in a manner so as to be coaxial with lubricator anchoring tube 31 at the base. A plug 33 having a bleed valve 34 is placed in the upper extremity of the hose 16 to prevent debris from entering the hose. Latching means, such as latching pin 35, is provided on the outside of the lubricator anchoring tube 31. The hose 16 should be made long enough to extend above the water surface when it is lifted to a vertical position (see FIGS. 2 and 4).

The manner in which the tubing plug 26 may be removed for carrying out operations through the vertical pipe 22 is shown in FIG. 4. The flexible hose 16 has been raised to extend above the water level and attached to a barge 50 by means of springs 49. An insert lubricator 36 guided by flexible hose 16 is inserted over the lubricator anchoring tube 31. A pack-off packer 37 provides a seal tight engagement of the insert lubricator 36 about lubricator anchoring tube 31. The insert lubricator 36 is releasably connected to the latching pin 35 of the lubricator anchoring tube 31 by means of latching slot 38 as shown in FIG. 5. Other means for connecting the insert lubricator 36 to the anchoring tube 31 may be sub-

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stituted for the latching means described above. For example, screw threads could be placed on both members to provide a screw threaded connection. The insert lubricator extends above the hose 16 and is connected to a conventional lubricator 42 by means of coupling 43.

A fishing tool 44 having an equalizing prong 45 is lowered by wireline 46 to remove the tubing plug 26. Equalizing prong 45 is long enough to move the equalizing valve 100 to open the ports 101 within tubing plug 26. This equalizes the pressure across the tubing plug 26 to permit the easy removal of the plug.

FIG. 8 shows a barge 50 on which is mounted one type of arrangement for inserting instruments into the insert lubricator, lubricator anchoring tube, and vertical pipe. As shown in FIG. 8, one end of a cable 53 is attached to the upper end of boom leg 57 and extends over a sheave 65, mounted between boom legs 51 and 52, to a cable drum 58. Cable 53 wraps around drum 58 and the other end of cable 53 is attached to boom leg 57. As can be seen by rotating drum 58 clockwise, boom legs 56 and 57 along with boom legs 51 and 52 will be raised to the limit of tension cables 54 and 55 attached to boom legs 51 and 52, respectively. A control cable 59 is provided with one end attached to lubricator 42, the other end of which is wrapped around a hydraulic control 66 adapted to actuate cable drum 58 counterclockwise or clockwise to maintain boom legs 56 and 57 above the lubricator. A cable 61 has one end attached to lubricator 42 and the other end to hydraulic hoist 80. Cable 61 passes over a sheave 60 connected to boom legs 56 and 57. Cable 61 provides a means for raising or lowering conventional lubricator 42. An operating wireline 62 passes from reel 67 over a sheave 63 attached at the base of boom leg 56 and over a sheave 64 attached adjacent the upper end of boom leg 56, into the lubricator 42. By attaching wireline 62 in this manner, relative motion between the well and the barge 50 is essentially compensated for without affecting the operation of the wireline.

In operation, if workover operations are to be performed on a particular underwater well, a floating vessel or portable barge is floated to the location of the underwater well. The flexible hose 16 is lifted until its upper end extends above water. The plug 33 is then removed from the hose

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16. The insert lubricator 36 is then lowered down the hose 16 and attached to the lubricator anchoring tube 31. Prong 44 is then lowered through the lubricator 36, anchoring tube 31, and pipe 22. Prong 44 engages plug member 26. Plug member 26 is then removed.

Workover operations are then performed by means of wire line operated tools lowered and raised through the vertically extending pipe 22 and the attached lubricator 36. After the workover operations have been completed, the plug 26 is replaced in the vertically extending pipe 22. The upper end of the flexible hose 16 is replugged. The hose is then allowed to submerge.

Various modifications in the method and apparatus may be made without departing from the scope of the appended claims. Broadly, the invention described is a means for reworking an underwater well, without the aid of either temporary or permanent platforms, utilizing a flexible lubricator, and wireline equipment.

We claim:

1. A wellhead system for underwater wells including: at least one unitary member including a pipe adapted to extend vertically and a curved flowline branching from the vertical pipe; means for closing off the vertically extending pipe at a point in the unitary member to maintain a full-opening path through the curved flowline; and a flexible member connected to the vertically extending pipe, said flexible member being submerged but of sufficient length to extend above the water when its unconnected end is raised.

2. A wellhead system in accordance with claim 1 wherein the means for closing off the vertically extending pipe is a plug member with a guide member having a curved undersurface pivotally connected to the lower extremity of the plug member.

References Cited in the file of this patent

UNITED STATES PATENTS

399,747	Edwards	Mar. 19, 1889
2,676,787	Johnson	Apr. 27, 1954
2,783,027	Gilbert	Feb. 26, 1957
2,808,229	Bauer et al.	Oct. 1, 1957
2,854,215	Cox et al.	Sept. 30, 1958