United States Patent

James

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[54] LUBRICATOR ASSEMBLY DEVICE

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[52] **U.S. Cl.** **166/.5**, 166/77

[51] **Int. Cl.** **E21b 33/035**

[58] **Field of Search** 166/.5, 77, 82, 84

[56] **References Cited**

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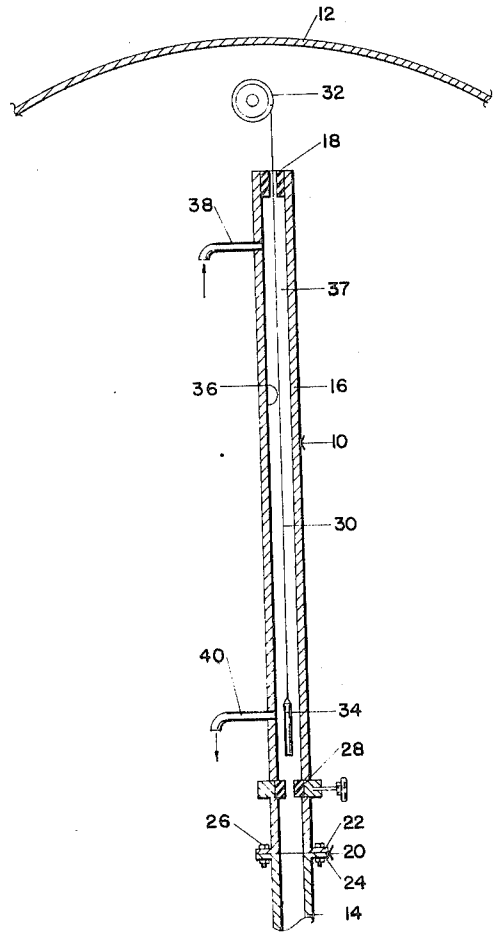
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[57] **ABSTRACT**

The invention provides a well lubricator assembly device which is capable of eliminating or substantially minimizing contamination of the surrounding area in which it is used, from leaking oil and gas. The lubricator device is in the form of an elongated tubular member adapted for mounting on the top of the wellhead of an oil or gas well. A wire line is provided to pass through the lubricator to lower a tool or other workpiece into the well. Seals to pack off around the wire line are provided at the top of the lubricator and near the end which is affixed to the wellhead. A chamber is provided between the two seals for the passage of a circulating fluid. The lubricator is adapted for use on wells located on land as well as those submerged under water such as in the ocean. In the latter case, the device is adapted to be transported by and used in a chamber which may be submersed into mating relation with the well to provide a watertight working area.

9 Claims, 3 Drawing Figures



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SHEET 1 OF 2

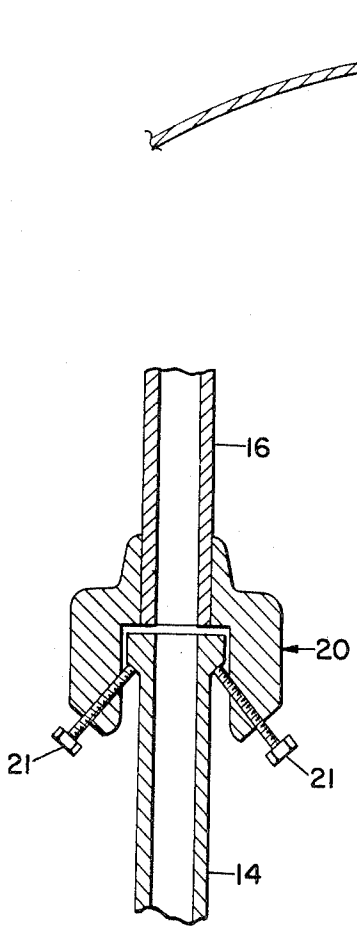


FIG. 3

FIG. 1

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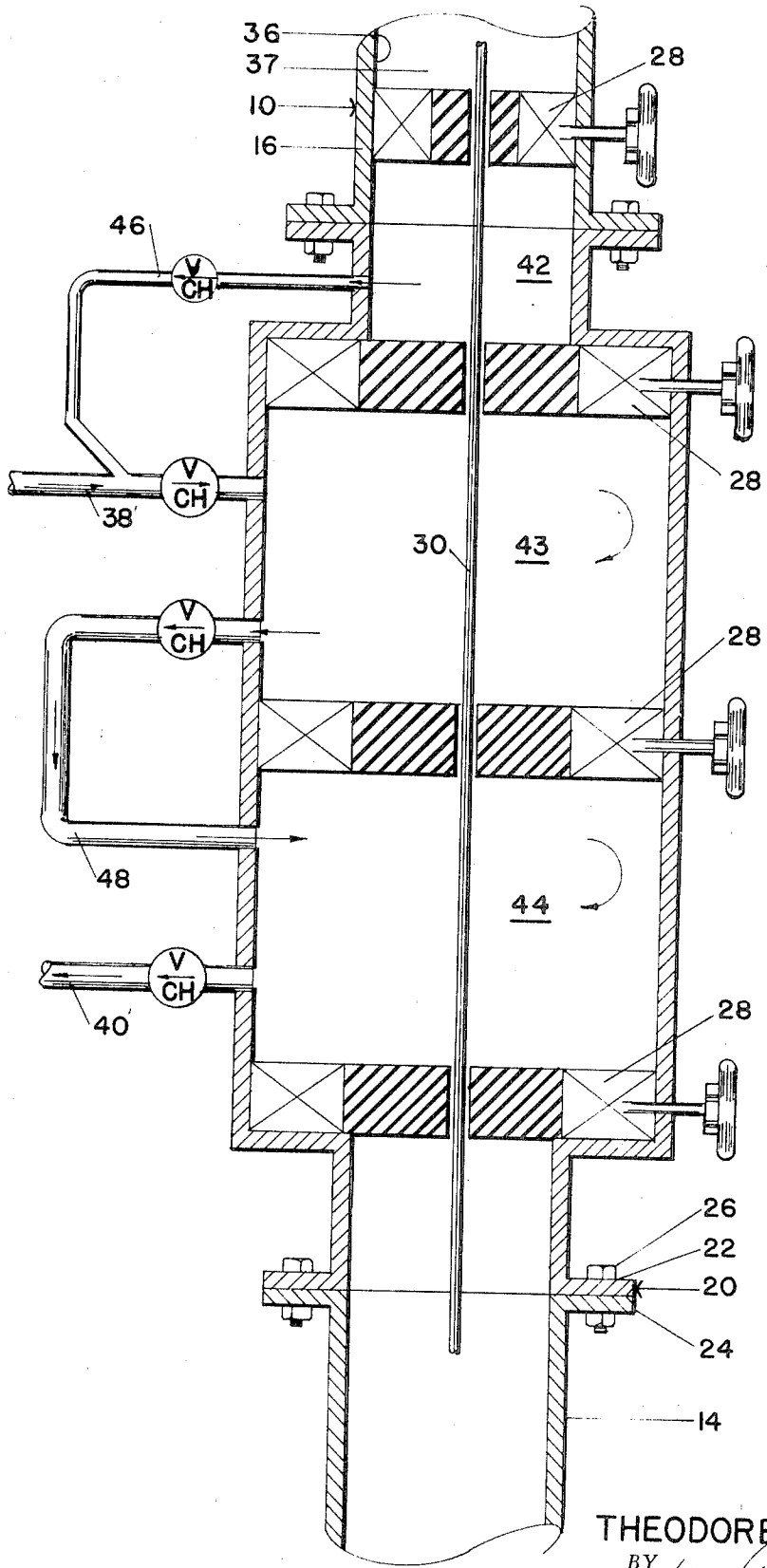


FIG. 2

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LUBRICATOR ASSEMBLY DEVICE

BACKGROUND OF THE INVENTION

In the oil industry, lubricator devices are used for servicing wellheads. In general, such devices are elongated and tubular in structure. The device is affixed to a wellhead and a tool or other workover piece is lowered from it by means of a winch and wire line down into the wall.

The well, of course, contains fluid such as gas or oil under pressure. If the lubricator is not provided with sealing means, a certain portion of the oil or gas will be forced out the lubricator to contaminate surrounding equipment and perhaps workmen in the area.

Heretofore, it has been the practice to place a seal or hydraulically actuated packing element in the upper end of the lubricator. Generally, this device has been constructed of rubber or other compressible material. To prevent seepage of gas or oil through the packer, it is essential that the seal or packer squeeze inwardly against the wire line as tightly as possible. However, it will be obvious that if the packer is squeezed too tightly against the wire, it soon will be worn away by the wire rubbing against it. On the other hand, when the packing is too loose, there may be relatively large leakage of oil or gas through the device.

Such leaking is a problem as regards both land and underwater wells because of the resulting contamination of the surrounding area. Such contamination is particularly undesirable in the case of underwater oil and gas wells when the servicing is done from inside a watertight underwater chamber provided for workmen. As will be appreciated, the amount of gas buildup may become dangerous within the closed chamber; or if it be an oil well, the mess from leaking oil soon can become intolerable to the workmen within the chamber.

SUMMARY OF THE INVENTION

The present invention provides a lubricator assembly device adapted for mounting on a wellhead. The lubricator device comprises an elongated tubular member having a central bore. The member is closed at one end by an inwardly compressible packer means and is provided with securing means for removably attaching the other end to the wellhead.

Additionally, adjustable sealing means is mounted within the bore of the member near the end provided with said securing means. The packer and sealing means define a zone in the bore of the member through which a fluid is circulated. A wire line passes through the packer, fluid circulating zone, and sealing means to lower a tool or other workover device downwardly into the well. By passing fluid such as water, sea water or the like through the circulating fluid zone, it will be seen that a fluid seal is provided within the packer which will prevent oil, gas or other fluid in the well from escaping from the lubricator and contaminating the atmosphere as well as men and material located within the surrounding area.

It is a feature of the invention that the lubricator can be transported by a chamber adapted to be submersed into mating relationship with an underwater well to provide an environmentally safe watertight compartment for workmen servicing the well.

DESCRIPTION OF THE DRAWINGS

For more complete understanding of the present invention, reference is made to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is an elevational view in cross section with parts broken away illustrating the lubricator assembly device of the present invention mounted upon a wellhead, the whole being enclosed within a watertight, underwater chamber, and

FIG. 2 is an elevational view in cross section with parts broken away illustrating a second embodiment of the lubricator assembly device of this invention,

FIG. 3 is an elevational view in cross section with parts broken away illustrating one form of a quick connect-disconnect coupling.

DESCRIPTION OF PREFERRED EMBODIMENTS

The lubricator assembly device of this invention is adapted for mounting on land wells and on wells which are located underwater. For convenience, the device will be described in conjunction with a submersible chamber as it can be used for servicing underwater wells. It functions in exactly the same manner when used on land wells except, of course, that the chamber then is not required.

Looking first at FIG. 1, the lubricator assembly device of this invention is referred to generally by reference member **10**. The lubricator is shown being carried within a watertight, underwater chamber **12** adapted to be transported by a surface vessel (not shown) to a location above a submerged well provided with a wellhead **14**.

Lubricator assembly device **10** includes an elongated tubular member **16** closed at one end by an inwardly compressible packer means **18**. The other end of tubular member **16** is provided with securing means, indicated generally by reference number **20**, for removably attaching the member to wellhead **14**. That means conveniently comprises a quick connect-disconnect coupling. As illustrated in FIG. **3**, the coupling is provided by forming the upper end of wellhead **14** with an outwardly extending shoulder and the end of tubular member **16** with a flared-out portion adapted to fit over the shoulder and to be fixed in place by bolts **21**. It will be understood, of course, that the quick connect-disconnect coupling shown in FIG. **3** is set forth for illustration purposes only and that any commercially available equivalent coupling is suitable for use in accordance with this invention. Alternatively, as shown in FIG. **1** and **2**, the securing means may include a pair of abutting flanges **22** and **24** located respectively on member **16** and wellhead **14**. Flanges **22** and **24** are secured together by suitable means such as bolts **26**.

Adjusting sealing means **28** is located within member **16** near securing means **20**. The adjustable sealing means conveniently comprises a standard blowout preventer type valve. A wire line **30** passes through tubular member **16** and is adapted to be wound around winch **32** and to carry, on its other end, a tool **34** or other workover device. Inwardly compressible packer means **18** is adapted to tightly surround wire line **30** to minimize outward seepage of fluid into chamber **12**.

Tubular member **16** is provided with a hollow central bore **36**. It will be seen that the bore comprises a hollow zone **37** bounded at one end by packer **18** and at the other end by sealing means **28**. The zone **37** is adapted to receive a circulating fluid such as water, sea water or the like. In this connection, inlet means **38** is provided in the wall at one end of tubular member **16** and outlet means **40** is provided at the other end of the tubular member. Fluid such as sea water is introduced into zone **37** in bore **36** through inlet **38** and outwardly to the sea through outlet **40**.

In using the lubricator assembly device of the present invention, it is place din chamber **12** and transported to the region of the well by means of a surface vessel, not shown. Once the vessel is above the well, the chamber is lowered by a cable or other suitable means to the well. The wellhead protrudes a few feet above the mudline and is provided with a platform or other suitable supporting means, not shown, to which the chamber is joined to provide a watertight seal. Before the lubricator assembly is connected to the wellhead, workmen inside chamber **12** attach a work tool **34** to the end of wire line **30**, open seal **28**, and then pull the tool upwardly into the tubular member **16** by operating winch **32**. Seal **28** and outlet **40** may be positioned as shown on the drawing or they can be located in a region closer to the other end of member **16**. In the latter instance, it will be appreciated that there would be sufficient room to pull tool **34** into member **16** without opening seal **28**, and seal **28** could be replaced by a packer **18**.

Member **16** then is secured to the top of the wellhead by securing means **20**. Adjustable sealing means **28** then is opened to provide a passageway wide enough to permit work tool **34** to pass therethrough and down into the upper part of the wellhead. After the work tool **34** has passed adjustable

sealing means **28**, that sealing means is clamped inwardly against wire line **30** to prevent seepage of fluid upwardly into bore **36**. Suitable valves, not shown, mounted on conduits **38** and **40** are opened to permit the circulation of sea water through zone **37** in bore **36** of tubular member **16**. Once the passage of sea water through zone **37** has been established, winch **32** is actuated to lower the wire line **30** and work tool **34** down into the well.

After the well has been serviced, winch **32** is actuated to withdraw wire line **30** and work tool **34** from the well and upwardly back into tubular member **16**. The flow of circulating fluid through zone **37** is stopped and adjustable sealing means **28** is opened to permit the free passage of work tool **34** back up into member **16**.

Packer **18** and sealing means **28** clamp relatively tightly about wire line **30**, there being only enough clearance to permit the wire line to move without causing undue wear on the packer and seal.

The fluid circulating through zone **37** of bore **36** prevents fluids such as oil or gas from the well from escaping into chamber **12** or, in the case of a land well, to the surrounding area.

In the modification illustrated in FIG. **2** of the drawing, there is shown a lubricator assembly device including a plurality of additional zones for the circulation of fluid such as sea water. In this embodiment, for illustration purposes, three zones **42**, **43** and **44** are shown positioned below zone **37**. These zones are bounded by adjustable sealing means **28**. As wire line **30** and tool **34** are lowered into the well, it is possible that some of the fluid circulating in zone **37** may seep along the wire line into zone **42**. Any fluid which passes into zone **42** will be withdrawn through conduit **46** by the suction action of fluid passing through inlet **38'**. As shown on the drawing, fluid passes from zone **43** to zone **44** through conduit **48**. As shown on the drawing, the fluid, preferably sea water, circulating through zones **43** and **44** is introduced into those zones through inlet **38'** and is returned through outlet **40'**.

It will be appreciated that it is possible to connect outlet **40** (FIG. **1**) to inlet **38'** (FIG. **2**) whereby to provide an integral fluid circuiting system through the device. Moreover, the device can be constructed whereby zones **42–44** are located above or in place of zone **37**. When these zones are above zone **37**, the seals all can be of the inwardly compressible type **18**. When the zones are in place of zone **37**, at least the upper seal is of the inwardly compressible type. In these latter two modifications, zone **42** may be omitted, if desired.

The fluid circuiting through zone **37** (FIG. **1**) may be at any desired pressure. Thus, it may be at a pressure greater than, equal to, or less than the pressure of the fluid in the well. It is preferable, however, to pass the circuiting fluid through the zone at a pressure greater than that of the fluid in the well. When lower pressures are used, oil or gas contaminants from the well may pass upwardly through seal **28**. This does not result in any severe contamination problem, however, because that fluid will be carried out of zone **37** through outlet conduit **40**. Further, should any fluid seep from zone **37** out through seal **18**, there is no resulting contamination of the surrounding area by anything other than that clean circulating fluid. When the device is constructed to include a plurality of zones (FIG. **2**) the same or different pressures may be employed in such zones.

While the invention has been described with respect to what are considered to be the preferred embodiments thereof, it will be understood, of course, that certain changes, substitutions, modifications and the like may be made therein without departing from its true scope as defined in the appended claims.

What is claimed is:

1. A lubricator assembly device adapted for mounting on a wellhead comprising:

a. an elongated tubular member having a central bore,

b. a wire line extending through the bore and having a work tool on one end thereof,

c. said member being provided at one end with securing means for removably attaching the member to said wellhead and closed at the other end by inwardly compressible packer means operable to tightly surround the wire line and provide a fluid seal,

d. sealing means adjustable to an open position to permit passage therethrough of the wire line and work tool and to a closed position to clamp tightly about the wire line and prevent seepage of fluid into the bore, said sealing means being mounted within the bore of said member near the end provided with said securing means,

e. means for circulating fluid through a zone in the bore of said member located in the region between said inwardly compressible packer means and said sealing means, and

f. means for raising and lowering said wire line.

2. A lubricator assembly device as set forth in claim **1** which is adapted to be carried by a chamber adapted to be submersed into mating relationship with an underwater well.

3. A lubricator assembly device as set forth in claim **1** in which said inwardly compressible packer means comprises a hydraulic packer.

4. A lubricator assembly device as set forth in claim **1** in which the securing means includes a quick connect-disconnect coupling.

5. A lubricator assembly device as set forth in claim **1** in which said securing means includes abutting flanges on the ends of the tubular member and on the wellhead and means for locking the flanges.

6. A lubricator assembly device as set forth in claim **1** in which said means for circulating fluid through the zone in the bore of said member includes fluid inlet means mounted near the packer, fluid outlet means mounted near said adjustable sealing means and means for circulating said fluid at a predetermined pressure.

7. A lubricator assembly device as set forth in claim **1** in which said tubular member is provided with a plurality of additional zones adapted to receive circulating fluid.

8. A lubricator assembly device as set forth in claim **7** in which one of said additional zones is adapted to receive fluid seepage from an adjacent zone.

9. A lubricator assembly device as set forth in claim **7**, in which means is provided for continuously passing fluid through each of said zones.

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