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POLISHED ROD PROTECTOR

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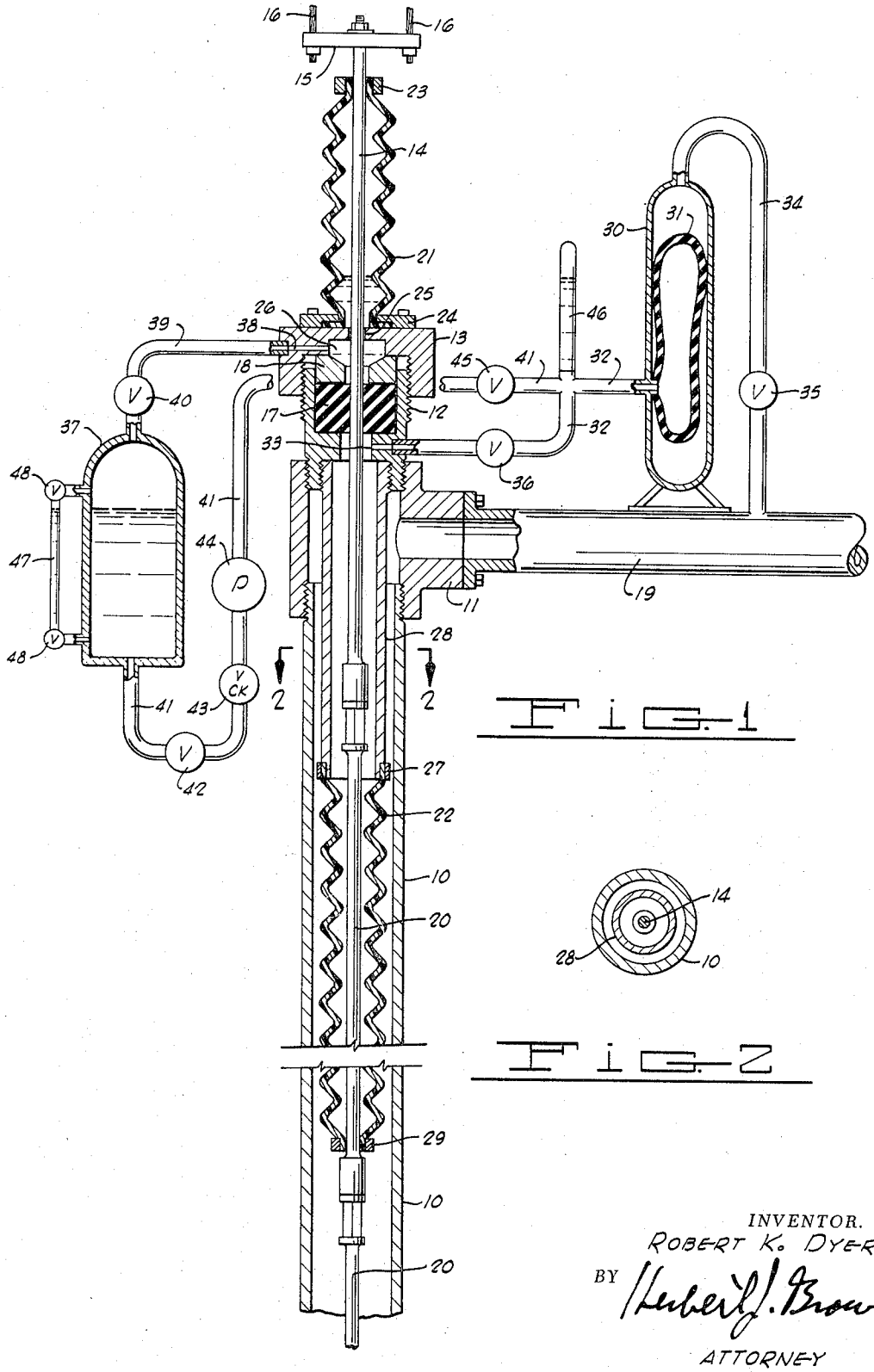


Fig. 1

Fig. 2

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POLISHED ROD PROTECTOR

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ABSTRACT OF THE DISCLOSURE

A polished rod protector for a pumping well having a reciprocating polished rod extending through a stuffing box on a well head, extensible closures above and below the stuffing box, around the polished rod and extensible therewith, and means communicating both said closures with a surge tank.

This invention relates to pumping wells and has reference to means for protecting and lubricating polished rods and packing in stuffing boxes. The invention is particularly directed to oil wells which from time to time are dry, gas wells from which excess water must be pumped, and wells containing corrosive fluids such as sour oil. Additionally, the invention is useful in wells where there are abrasive materials in the fluid to be pumped.

An object of the invention is to isolate the polished rod of a pumping well from contact with dust in the air, corrosive fluids in the well and abrasive material in fluid to be pumped.

Another object is to provide means for lubricating the polished rod during its operation and at the same time lubricate the packing of the well stuffing box.

Another object of the invention is to provide means for lubricating the polished rod above and below the stuffing box and to provide means for transferring accumulated excess lubricant from above the stuffing box to the lubricating means therebelow.

Another object of the invention is to provide bellows type protectors for the polished rod of a pumping well including means equalizing or substantially equalling the pressure inside and outside the bellows to prevent the bellows from bursting.

These and other objects of the invention will become apparent from the following description and the accompanying drawing, wherein:

FIGURE 1 is a vertical sectional and partly elevational view of a pumping well and illustrating a preferred embodiment of the invention, and

FIGURE 2 is a transverse sectional view taken on line 2—2 of FIGURE 1.

The well shown in the drawing includes a well tubing **10**, a tubing coupling **11** on the top of the tubing, a stuffing box **12** on the tubing coupling and a cap **13** on the stuffing box, all in the usual manner. Also of conventional construction, there is a polished rod **14** extending through the cap **13** and stuffing box **12**. A hanger **15** and bridle **16** are a part of a pumping unit, not shown, for reciprocating the polished rod **14**. Within the stuffing box **12** there is a packing **17** around the polished rod **14** and there is a packing gland **18** above the packing. In the well shown, the cap **13** is threaded on the stuffing box **12** and bears against the packing gland **18** which, in turn, biases the packing. Other parts of the illustrated well include a flow line **19** connected with the tubing coupling **11** and sucker rods **20** connected with the lower end of the polished rod **14**. The sucker rods **20** extend downwardly in the tubing **10** to a reciprocating pump, not shown.

Primarily, the present invention is directed to longitudinally extensible upper and lower closures **21** and **22**

around the polished rod **14** above and below the stuffing box **12**. Preferably, the closures **21** and **22** are in the form of cylindrical bellows of a suitable resilient material such as neoprene. The upper bellows **21** extends nearly to the polished rod hanger **15** where it is secured to the polished rod **14** by a clamp **23**. The lower end of the upper bellows **21** is secured to the upper surface of the well cap **13** by a recessed plate **24** which is bolted in place. It is to be noted that the orifice **25** in the cap **13** receiving the polished rod **14** is larger than the rod so as to provide communication between the upper bellows **21** and a chamber **26** in the cap and the upper portion of the packing gland **18**.

The upper end of the lower bellows **22** is secured, by a clamp **27**, to the lower end of a sleeve **28**, the upper end of which sleeve is threadedly engaged in the stuffing box **12**. The lower end of the lower bellows is secured to a sucker rod **20** by a clamp **29**. The outside diameter of the sleeve **28** is less than the inside diameter of the tubing **10** so as to provide communication between the tubing and the flow line **19** through the tubing coupling **11**.

Located near the well head there is a surge tank **30** having a resilient bladder **31** of neoprene or the like therein. The bladder **31** is in communication with the interior of the lower bellows **22** by means of a line **32** which is connected with a port **33** in the stuffing box **12** beneath the packing **17**, and which port is thus in communication with the sleeve **28**. A pressure equalizing line **34** connects the top of the surge tank **30** with the flow line **19**, and which equalizing line may include a normally open manually operated valve **35**. Similarly, there is a normally open valve **36** in the line **32** connecting the bladder **31** with the port **33** in the stuffing box **12**. Not shown in the drawing, the lower bellows **22**, the sleeve **28**, the stuffing box **12** beneath the packing **17**, the connecting line **32** and the bladder **31** contain a liquid lubricant during normal operation. A suggested lubricant is SAE 90 oil.

The upper bellows **21** contains at least some liquid lubricant during normal operation, but by reason of the described well head construction there is some migration of lubricant upwardly from below the packing **17**. To compensate for an excess of fluid in the upper bellows **21** there is an accumulator tank **37** to one side of and below the well head cap **13**. The top of the accumulator tank **37** is connected with the chamber **26** in the cap **13** by a port **38** in the latter and a line **39**. The line **39** has a normally open valve **40**, the purpose of which will become apparent.

The bottom of the accumulator tank **37** is connected by a return line **41** with the first described connecting line **32** at a location between the surge tank **30** and the stuffing box **12**. In the return line **41** between the tank **37** and its connection with the first line **32**, there are, in the order named, a normally closed manual valve **42**, a check valve **43**, a pump **44** and a normally closed manual valve **45**. The check valve **43** is arranged to prevent back flow to the accumulator tank **37**.

At the connection of the return line **41** with the first described connecting line **32** there is an upstanding sight gage **46**, and on the accumulator tank **37** there is another sight gage **47** having valves **48** at its upper and lower ends.

In operation, on the up stroke of the polished rod **14**, there is a surge of lubricant to the bladder **31** which expands to accommodate a portion of the fluid. As the polished rod **14** moves upwardly, the lower bellows **22** is contracted and the pressure therein is increased, as is the pressure in the bladder **31**. However, these pressures are somewhat equalized with the pressure in the tubing **10** by way of the equalizer line **34**. When the polished rod **14** moves downwardly, the lower bellows **22** is ex-

tended but the pressure therein is not materially decreased, also by reason of equalizer line 34.

No material action of the lubricant takes place in the upper bellows 21. However, because the pressures in the tubing 10, the lower bellows 22 and connected parts are greater than the pressure in the upper bellows, there is a minute accumulative migration of lubricant upwardly past the packing 17. To correct this condition, the valve 40 above the accumulator tank 37 and the valves 42 and 36 in the return line are opened, and by means of the pump 44 lubricant from the tank 37 is transferred back to the lower system.

The invention is not limited to the exemplary construction herein shown and described, but may be made in various ways within the scope of the appended claims.

What is claimed is:

1. In combination with a well including a string of well tubing, a stuffing box connected therewith and a polished rod extending through said stuffing box, an extensible closure around said polished rod below said stuffing box, the upper end of said closure being rigidly secured relative to said stuffing box and the lower end of said closure being secured to move relative to the movement of said polished rod, a surge tank, means communicating the interior of said surge tank with the interior of said closure, means connecting the interior of said tubing with said surge tank above the last said means, a fluid lubricant within said closure, and wherein said means connecting the interior of said closure with the interior of said surge tank includes a bladder in the latter.

2. In combination with a well including a string of well tubing, a stuffing box connected therewith and a polished rod extending through said stuffing box, a first extensible closure around said polished rod below said stuffing box, the upper end of said first closure being rigidly secured relative to said stuffing box and the lower end of said first closure being secured to move relative to the movement of said polished rod, a surge tank, a lubricant in said first closure, means communicating the interior of said surge tank with the interior of said closure, means connecting the interior of said tubing with said surge tank above the last said means, a second extensible closure around said polished rod above said stuffing box, means connecting the upper end of said second closure with the upper portion of said polished rod, means connecting the lower end of said second closure with said surge tank, a lubricant within said second closure and means selectively transferring at least a portion of said lubricant to the first said means.

3. The combination defined in claim 2, and wherein said means selectively transferring at least a portion of said lubricant is comprised of an accumulator tank connected with said second closure and a line connecting said accumulating tank with the first said means.

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