Dec. 8, 1959 N. G. KITTRELL ET AL 2,915,975

MEANS FOR DETECTING STUFFING BOX LEAKAGE

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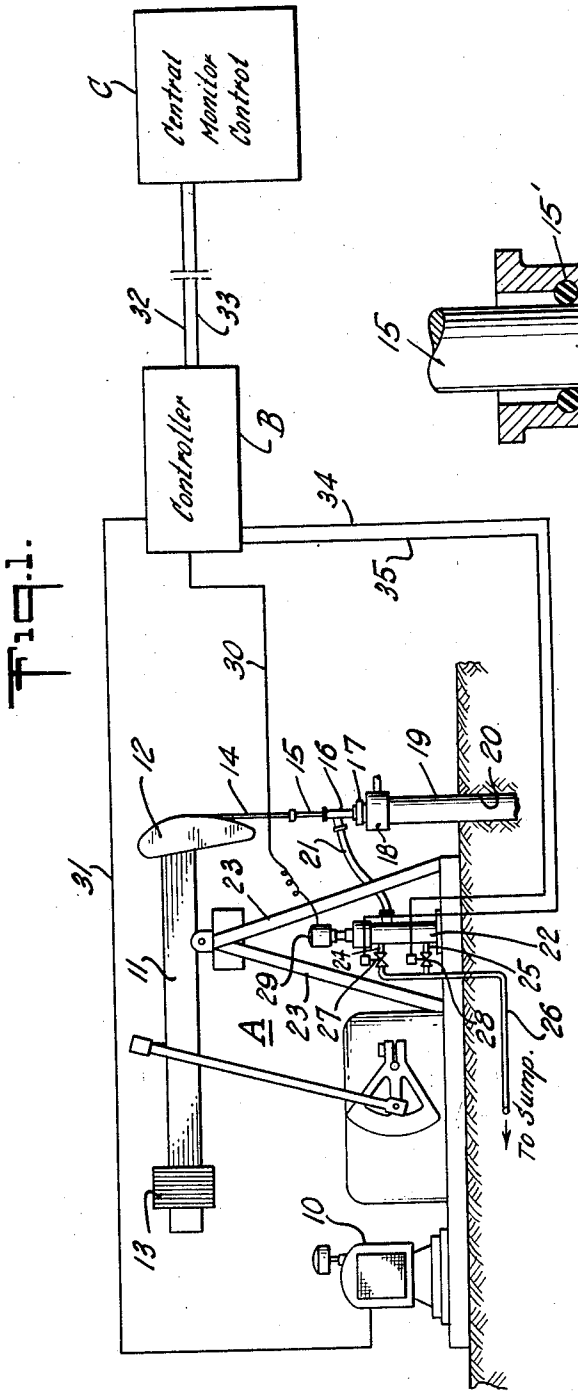


Fig. 1.

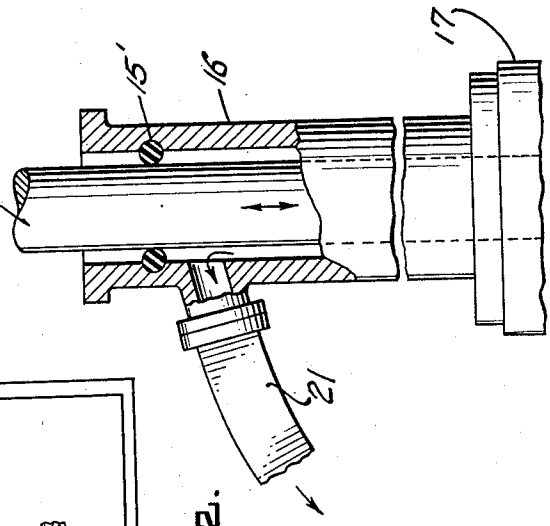


Fig. 2.

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MEANS FOR DETECTING STUFFING BOX LEAKAGE

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2 Claims. (Cl. 103—25)

This invention relates generally to a monitoring system for well production equipment and more specifically to means for detecting stuffing box leakage in such equipment.

One of the common situations encountered in petroleum production is the large dispersion area of the petroleum field where production is underway. Consequently, many field accessories are unattended for lengthy periods of operating time, being inspected only occasionally, due to the distances involved and the problem of manpower requirements for more frequent observation. In many instances, the production of a field may be marginal, due either to the depth of the wells or to the condition of the producing levels, or a combination of both, so that any unwarranted loss of production fluid leading to inefficient operation may result in financial troubles. Among the general sources of losses, in addition to breakage of and leakage in the production lines, is that of leakage at the stuffing box surrounding the polished rod of the pumping unit at the well head.

If such leakage is not curbed promptly, it may reach excessive levels, as the wear by the action of the polished rod increases from continuation of the pumping operation. Since some leakage from the stuffing box is inevitable until it is discovered and the condition corrected, it is highly desirable to collect the leaking fluid in a container for salvage, and when the fluid level in the container reaches a certain calibrated point, to activate some kind of signal to indicate the existing conditions, in order that proper action may be taken to remedy the situation, e.g. stopping of further pumping until the stuffing box is repacked. In this manner, the detection of stuffing box leakage is possible at an early period, and at the same time, salvage of the fluid leakage provides economy of production.

Accordingly, it is an object of the present invention to provide means for detecting stuffing box leakage.

It is another object of the invention to provide means by which stuffing box leakage may be used to control the operation of the pumping unit at the well head.

Still another object of the invention is to provide means by which the leakage from stuffing box may be salvaged to prevent loss of production fluid.

Still another object of the invention is to provide a means by which inefficient operation of a pumping unit may be indicated.

And another object of the invention is to provide means for controlling the operation of a pumping unit which is subject to stuffing box leakage.

These and other objects and advantages of the invention will be apparent from the following specification when read in the light of the drawings in which:

Fig. 1 is a diagrammatic showing of a part of a monitoring system for well production equipment in which the present invention is used; and

Fig. 2 is an enlarged view of part of the equipment used in the salvage of stuffing box leakage.

The objects of the invention are attained by a means

for collecting stuffing box leakage, in which, after the leakage liquid has reached a calibrated point, there is an actuating means brought into play for further control of the pumping unit involved.

Referring to Fig. 1 of the drawing, there is disclosed a pumping unit A, located at the well head in a production field, a controller B, located nearby, and a central monitor control C, located relatively distant from the production field.

The pumping unit at A includes a prime mover or power plant **10**, which may be either a gas engine or an electric motor. This provides the power for imparting a reciprocating motion to the sucker rod string, located in the well, through the horse head walking beam at **11**, having the conventional horse head at **12**, and counterbalance weights at **13**. From the horse head at **12**, there extends the bridle **14**, which is joined to the polished rod **15**. This rod extends through the salvage chamber or oil saver unit **16**, mounted on the stuffing box **17**, which is supported by the casing head **18**. This casing head supports the casing string **19** projecting into the well, indicated at **20**.

Fig. 2 is an enlarged view of the salvage chamber **16**, through which the polished rod **15** extends, with the double headed arrow indicating its reciprocating motion. The chamber for the leakage fluid is defined by the wiper O-ring at **15'**, which, with the packing glands, retains the fluid leaking past them into the chamber atop the stuffing box.

Referring to Fig. 1 again, from the salvage chamber **16**, there is an outlet conduit **21** which leads off the leakage fluid, as indicated by the flow arrows, to a collecting chamber at **22**, shown positioned under the Sampson posts **23** of the pumping unit. There are disclosed an overflow outlet at **24** and a drain outlet at **25**, leading from the collecting chamber **22** and being joined to the drain **26** which leads to a sump (not shown). The operations of these outlets are controlled by solenoid operated valves, indicated at **27** and **28** respectively. The collecting chamber has installed at **29** a control switch, of conventional type used in the industry, and may be either float or pressure operated. When the level of the leakage fluid in the collecting chamber reaches a predetermined or calibrated point and actuates the switch, a signal passes along the conductor line **30** to the controller B.

Depending upon the predetermined situation and outcome desired, an appropriate signal may be delivered by the conductor line **31** to close down the prime mover at **10**, and/or a supervisory signal may be passed along by the conductor line **32** to the central monitor control of an automatic control system at C, where the location and type of malfunctioning is indicated, so that proper repairs may be initiated. Thereafter, a control signal may be returned from the central monitor control by the conductor line **33** to the controller B. This signal may in turn cause another signal to be delivered by the conductor line **31** leading from the controller B to the prime mover **10**, either to close down the unit from further pumping action, if it has not been stopped previously, or to start up the unit to resume pumping. The signal delivered by the conductor line **33** to the controller B also may be of such a nature as to cause the solenoid operated valves at **27** and **28** to be actuated selectively, by means of the conductor lines **34** and **35** respectively, which may result in opening the valves for a partial or complete drain-off from the collecting chamber of the leakage fluid.

Thus, it can be seen that an apparatus in which the signal from the switch at **29** is delivered to the controller B, and in turn, may be passed on to the central monitor control C, has been developed for detecting stuffing box leakage automatically, without necessity of frequent personal inspections, and that such apparatus can be used

for controlling the production in an efficient manner, not only by the salvage of the stuffing box leakage, but by selective operation of the pumping unit until corrective action has been taken.

Obviously, many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore, only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. In a pumping unit of a production well including a polished rod, a prime mover interconnected therewith and providing power thereto, and a stuffing box having packing glands surrounding said polished rod, the combination therewith of means for indicating leakage at said stuffing box comprising a chamber joined thereto and surrounding said rod for receiving production fluid leaking past said packing glands, means for collecting leakage fluid from said chamber connected thereto, means for indicating a predetermined level of collected leakage fluid and thereby leakage of a known amount by transmission of a signal joined to said last mentioned means, means interconnecting such indicating means with said pumping unit for the control of the latter in response to said signal whereby the operation of said prime mover may be governed, said means for collecting leakage fluid having a drain outlet, and means for governing the operation of said drain outlet joined thereto and interconnected with said means for the control of said pumping unit.

2. A monitor set-up for a pumping well for signaling a control station of an automatic control system of the existence of stuffing box leakage at a specific location comprising, in combination, a pumping unit including a prime mover therefor, a polished rod interconnected therewith, and a stuffing box having packing glands surrounding said rod at a well head, means for collecting fluid leakage past said packing glands comprising a salvage chamber mounted in series with said stuffing box and surrounding said rod, means joined to said salvage chamber for receiving fluid leakage therefrom comprising a collecting chamber having a controlled drain outlet, means joined to said collecting chamber responsive to said fluid leakage when a predetermined amount thereof has accumulated therein comprising a control switch whereby a signal is transmitted to indicate the existence of stuffing box leakage for further control of said pumping unit, and control means for receiving said signal and for maintaining a predetermined amount of leakage fluid in said collecting chamber interconnecting said last mentioned means with said controlled drain outlet, and a monitor control means joined to said last mentioned control means.

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