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STUFFING BOX FOR OIL WELLS WITH BLOW-OUT PREVENTER

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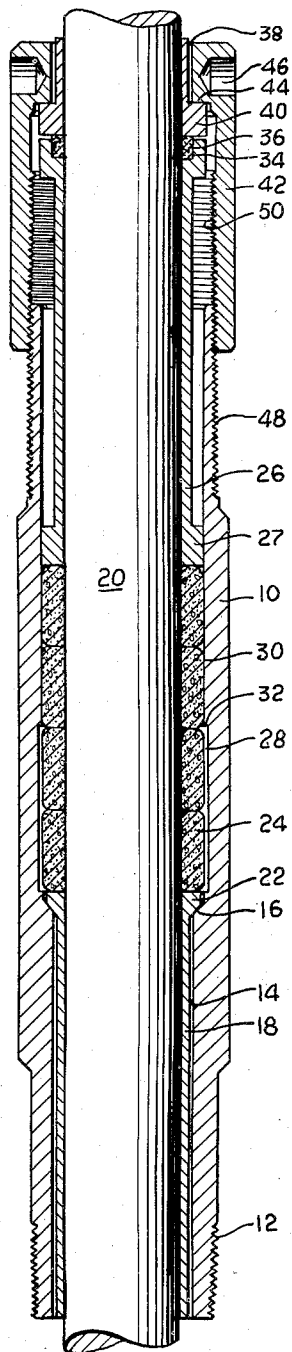


Fig. 1

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**STUFFING BOX FOR OIL WELLS WITH
BLOW-OUT PREVENTER**

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5 Claims. (Cl. 286—34)

This invention relates to fluid seals and more particularly to an arrangement for providing packing around a reciprocating rod.

One of the difficult operations in connection with the production of oil is pumping oil from deep wells where there is insufficient gas pressure to cause it to flow freely. This pumping is usually done with reciprocating pumps operated from the surface. A reciprocating pump is placed in the bottom of the well and a rod extends from the surface to the pump, co-axial with the pipe through which the oil is pumped. The entire rod reciprocates, operating the pump in the bottom of the hole. One difficulty is in providing a packing gland or stuffing box at the point where the reciprocating rod enters the pipe. Often the oil is pumped against pressure and there is considerable pressure differential between inside and outside the pipe. The purpose of the packing gland is to prevent the leakage of oil. Mechanisms used to reciprocate the rod do not always have perfect alignment with the pipe, i. e., in addition to reciprocatory movement of the rod it might also have certain lateral movement.

An object of this invention is to provide a device which will prevent the loss of oil from between a pipe and a moving rod.

Another object of this invention is to provide a device which will have a good seal even when the movement of the rod is not confined to axial reciprocation.

Still further objects are to achieve the above with a device that is sturdy, simple and reliable, yet cheap and easy to manufacture.

The specific nature of the invention as well as other objects, uses and advantages thereof will clearly appear from the following description and from the accompanying drawing which illustrates the device in an axial sectional view.

One embodiment of this invention as seen in the accompanying drawing has a body 10 which has on its lower end a standard screw connection 12 whereby it may be connected to the pipe extending on down to the bottom of the well. This connection 12 can be of any other type standard connection for connecting the body 10 to the pipe such as a flange. The body has a stepped cylindrical bore or opening which is co-axial with the outside of the body. About a third of the way up from the bottom of this internal cavity, of which 14 is the lower portion, is a shoulder 16. The shoulder is a conical section with an apex angle of about 90 degrees.

Telescoped within the lower bore 14 is a tube 18. The outside diameter of the tube 18 is less than the inside diameter of bore 14. The inside diameter of tube 18 is such that it forms a snug fit with rod 20 which reciprocates within the tube 18. The upper end of tube 18 has a flange 22, the lower portion of which is also a conic section mating shoulder 16. The lower face does not have to mate the conic section 16 and may be of other shape. The upper surface of the flange is normal to the axis of the bore 14. The perimeter of flange 22 is less in diameter than the portion of the cavity immediately

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above shoulder 16. The reason for this definite clearance between the tube 18 and the cavity within body 10 is so that when the rod moves laterally, i. e., horizontally, there will be sufficient room to take care of this play.

Immediately above flange 22 and resting thereon is the packing 24. Any expandable packing is suitable for use with the device according to this invention. However, I prefer a metal type of packing which comprises a mixture of pulverized or granular wood, lead, Babbitt metal, graphite, antimony, mica, etc., in an elongated cloth bag. This bag is wrapped around the circumference of rod 20 so that it fills the annular space between rod 20 and housing 10. In practice, four of these bags are used. Each one forming a single annular ring around the rod. The packing is held firmly in place by tubular plunger 26.

The cavity within body 10 is not a single cylindrical opening at the area containing the packing, but two cylindrical bores. The lower 28 has a larger diameter than the upper 30. This lower portion 28 with the larger diameter is a contour blowout preventer. When pressure is applied to the packing through the plunger 26 the packing expands or more exactly rearranges itself to completely fill the larger diameter bore 28. It will retain this changed form sufficiently so that if the plunger 26 is removed the packing will remain in its place because it catches on shoulder 32 which separates bores 28 and 30. I have had good results by making this lower cavity 28 about $\frac{1}{16}$ " greater in diameter than the upper cavity 30, i. e., the shoulder is $\frac{1}{32}$ " deep. Also the shoulder is in a plane normal to the axis of bore 28. However, the invention will also work well when the cavity or groove 28 is deeper, i. e., the shoulder 32 may be more than $\frac{1}{32}$ ". There must be a definite shoulder or ledge to hold the packing in place when and if the plunger 26 is removed.

The outside diameter of the plunger 26 is less than the diameter of upper cylindrical bore 30, therefore it too can accommodate a certain amount of lateral play, the same as tube 18. Annular flange 27 extends outward on the bottom of plunger 26 and has a snug fit (.005" clearance) with bore 30. Therefore, the plunger and shoulder 16 work together to form an "universal joint." That is, regardless of any misalignment of the rod 20, it will be aligned with the packing 24 although the rod might wobble some above or below the packing. The upper extreme of the bore of plunger 26 has a notch 34 which contains an annular felt ring 36. The purpose of this felt ring 36 is to clean extraneous dirt, dust, and grit from the rod to prevent scratching the rod when inside the principal packing 24.

Tubular bushing 38 telescopes around rod 20 immediately above the felt packing 36 and on the top of plunger 26. The inside bore of the bushing 38 forms a snug fit with rod 20 the same as tube 18. The outside of bushing 38 has a definite clearance between itself and nut 42 for the same reason as the clearances described above. Along the lower end of bushing 38 is an outward extending flange 40 which presses against the upper end of plunger 26 and transmits the force from nut 42 to the plunger and the packing. This flange cooperates with inward turned flange 44 on the nut. The nut has a series of radial bores 46 along its perimeter for the engagement of a wrench so that the nut may be tightened, thereby applying pressure to the packing 24. The upper end of body 10 is threaded at 48 to cooperate with threads 50 on the nut.

The first time the stuffing box is assembled, the body 10 is attached to the top of the pipe telescoped around the polished rod 20. Then the tube 18 is placed within body 10 around the rod 20. Then a ring of cloth covered packing 24 is wrapped around the rod and

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pushed into place by plunger 26. A second ring of packing is wrapped around the rod 20. The joint of the ring on top must not correspond to the same position as the gap of the first ring, else there is a gap along the rings for the oil to leak out. Then this second ring is tamped in by plunger 26. The third and fourth rings are put into place in the same manner, care being taken that the joints are not in alignment and there is not a continuous gap for the leakage of the oil. Then the felt is placed within notch 34, then bushing 38 is placed on top of the plunger. Nut 42 is placed around the rod and screwed down onto the body 10 with sufficient pressure to seat the packing 24 and the assembly is now ready for operating.

When it becomes necessary through normal use for the packing to be serviced, the nut 42 is tightened sufficiently to stop any leakage that might occur. After the nut has been run down on threads 48 so that there is room for another ring of packing 24, the device is serviced by merely removing the nut 42, bushing 38, and plunger 28. Then another ring of packing 24 is added.

It is emphasized that the packing is never removed from the packing gland or stuffing box, but always additional packing added. Also it is emphasized that this process of adding packing can be done while pressure is being exerted within the body 10. The reason this operation can be carried out under pressure is because of the contour blowout preventer 28.

It will be apparent that the embodiment shown is only exemplary and that various modifications can be made in construction, materials, and arrangement within the scope of the invention as defined in the appended claims.

I claim as my invention:

1. A stuffing box comprising: a vertically disposed tubular body; said body having a first bore of a first diameter at its lower end; the upper end of the said first bore terminating with a shoulder which is a conic section, the apex of said section pointing downward; a second bore of a second diameter above the first bore, the second diameter being greater than the first diameter; an elongated tube telescoped within the first bore; the tube having an outward extending flange at top, said flange resting on said conic shoulder; there being positive radial clearance between the tube and the first bore; annular packing within the second bore; a tubular plunger within the second bore above said packing, there being positive radial clearance between the upper portion of the plunger and the second bore; a bushing above the plunger; an outward extending flange on the lower end

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of the bushing in contact with the plunger; a nut at the top of the body, there being positive radial clearance between the nut and the bushing; means for forcing the nut down on the body; an inward flange on the nut in contact with the upper side of the flange on the bushing so that when the nut is forced down, pressure is transmitted axially to the packing; and a rod snugly telescoped within the bushing, plunger, packing, and tube.

2. The invention as defined in claim 1 with the addition of a third bore between the first and second bores, the diameter of said third bore being greater than said second diameter.

3. The invention as defined in claim 1 wherein the packing is an expandable metal packing.

4. The invention as defined in claim 1 with the addition of annular packing at the upper extreme of the plunger in contact with the rod.

5. In a stuffing box having a vertically disposed generally cylindrical body, a rod coaxial with the body, packing between the rod and the bore of said body, a flange within said bore at the lower end of the packing, means at the lower end of the body for attaching said tubular body to a pipe, a plunger at the upper end of the packing, and means for forcing the plunger against the packing; the improvement comprising: an annular groove in the bore of body adjacent the flange, the upper extreme of said groove having a shoulder normal to the axis of the body, said shoulder being substantially below said plunger, and the bore between said shoulder and said plunger being smooth surfaced and cylindrical so that the packing may slide down easily.

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