

Nov. 27, 1934.

A. G. HEGGEM

1,982,252

OIL SAVER

Filed Feb. 27, 1931

2 Sheets-Sheet 1

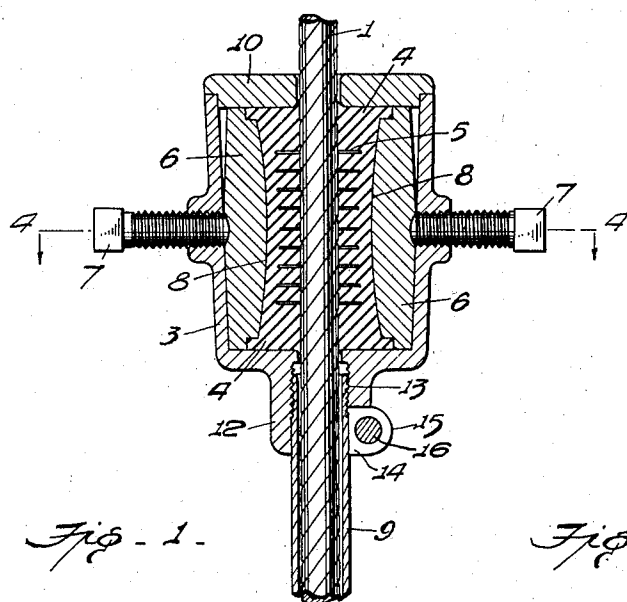


Fig. 1.

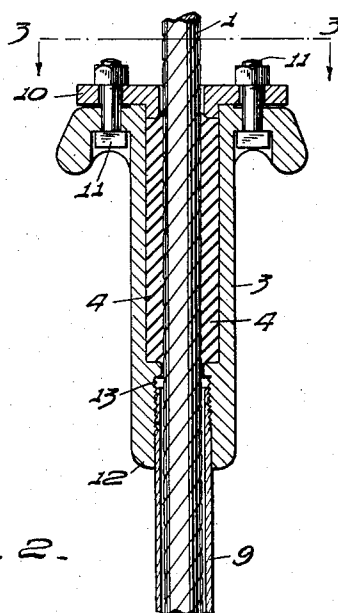
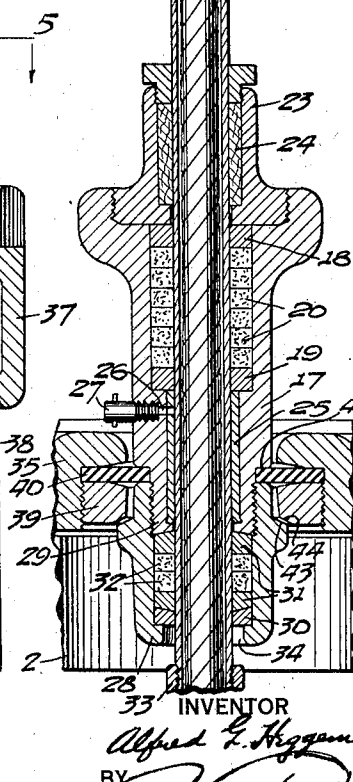
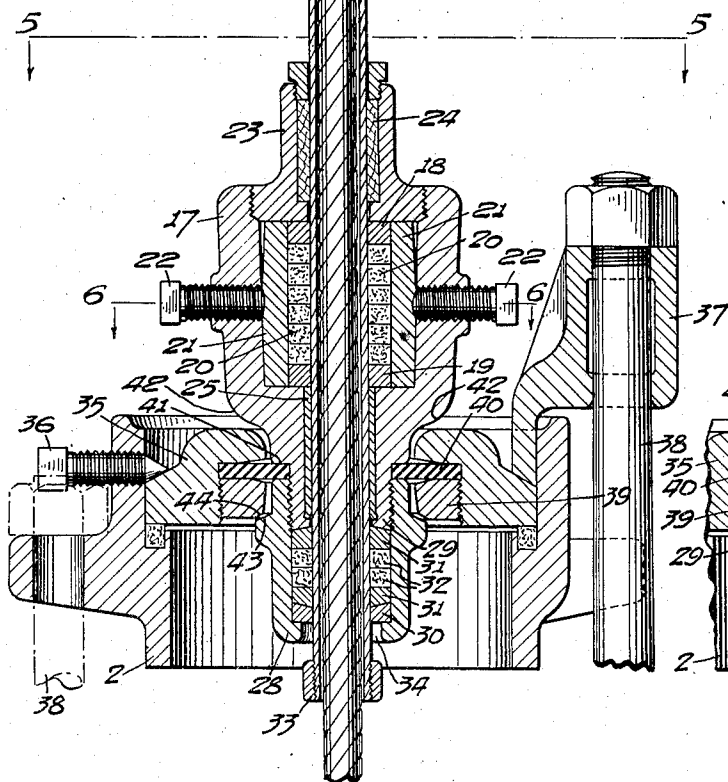


Fig. 2.



INVENTOR
Alfred L. Heggem
 BY *Walter A. Fisher*
 ATTORNEYS

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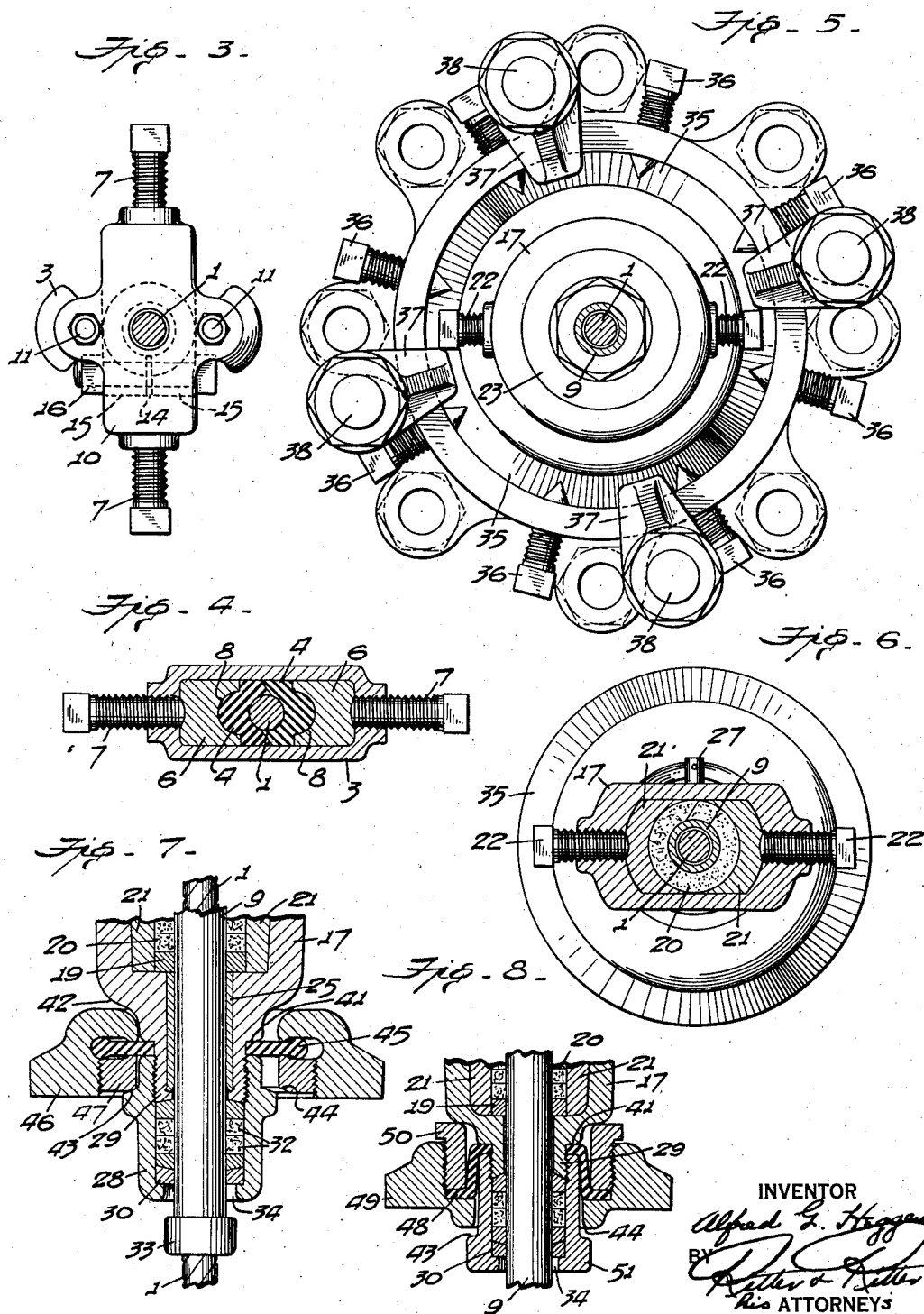
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

1,982,252

OIL SAVER

Alfred G. Heggem, Tulsa, Okla.

Application February 27, 1931, Serial No. 518,803

17 Claims. (Cl. 166—14)

My invention relates to oil savers which are employed in oil well drilling to prevent the escape or waste of oil over the top of the well. Devices of this character are employed in the drilling of oil wells not only because they effect economy by saving oil, but also because they materially reduce the fire hazard and thus minimize the liability of losing a drilling well by burning.

The principal object of the invention is to produce an oil saver of the hollow polished rod or tubular barrel type with effective means for clamping the rod to the drilling line and for packing against the drilling line to prevent waste of oil when withdrawing the drilling tools from the well or when withdrawing oil from the well by swabbing. Another object of the invention is to provide means for supporting the oil saver in such manner that the saver may accommodate itself to the alinement of the drilling line. A further object of the invention is to provide simple and easily operated means for preventing loss of oil when the packing means normally cooperating with the hollow polished rod are required to be removed or renewed. A still further object of the invention is to provide simple and effective means for rigidly connecting the hollow polished rod to means by which it may be firmly connected to the drilling line so as to partake of the movements of the latter.

A principal feature of the invention consists, generally stated, in constructing an oil saver with a stuffing box to which is secured a downwardly extending hollow polished rod, the stuffing box and polished rod being adapted to receive a drilling line, packing means being disposed within the stuffing box for packing the drilling line, means including said packing means being provided for clamping the stuffing box to the line, the polished rod being packed exteriorly by a stuffing box through which it extends and with respect to which it is adapted to reciprocate.

A further feature of the invention consists in combining in an oil saver a stuffing box, a hollow polished rod secured thereto and extending downwardly therefrom, said stuffing box and rod being adapted to receive a drilling line, means for securing the stuffing box to the drilling line so that it may move with said line, a stuffing box through which the polished rod extends and with respect to which it is adapted to reciprocate, and means for supporting the last-named stuffing box to permit it to shift its position laterally to conform to the alinement of the drilling line, the last-named stuffing box being provided with packing means for packing the polished rod.

Other features of the invention residing in advantageous details of construction and particular combinations of parts will hereinafter appear and be pointed out in the claims.

In the drawings illustrating a preferred form of the invention,—

Figure 1 is a longitudinal section of an oil saver embodying the invention, showing its application to the casing head of a well and its relation to a drilling line or cable.

Figure 2 is a longitudinal section of the oil saver and associated devices illustrated in Figure 1, the view being taken at right angles to that of Figure 1.

Figure 3 is a detail sectional view on the line 3—3, Figure 2, showing the upper stuffing box in plan.

Figure 4 is a detail sectional view on the line 4—4, Figure 1.

Figure 5 is a sectional view on the line 5—5, Figure 1.

Figure 6 is a detail horizontal section on the line 6—6, Figure 1.

Figure 7 is a detail vertical sectional view illustrating a modified form of the invention.

Figure 8 is a detail vertical sectional view illustrating another modified form of the invention.

In the drawings, 1 indicates a reciprocating drilling line with which the oil saver is associated, while 2 indicates the casing head of a well upon which the saver is mounted. The drilling line is usually a wire cable and the casing head may be of any suitable form.

At its upper end the oil saver is provided with a stuffing box 3 through which the drilling line 1 extends. The chamber of this stuffing box receives packing members 4 which are preferably of rubber and are disposed on opposite sides of the drilling line 1 so as to be movable toward each other transversely of the drilling line into packing contact with the latter. To permit them readily to conform to the inequalities of surface of a wire drilling line 1, the packing rubbers 4 are preferably recessed or slotted, as indicated at 5, to provide spaces into which the rubber may yield or expand as may be required to maintain efficient packing contact with the line. The packing rubbers 4, each of which is curved on its inner face for contact with the drilling line, are forced into packing engagement with the line 1 by means of followers 6 disposed within the stuffing box. Adjusting screws 7, which have threaded engagement with the stuffing box 3 and respectively bear at their inner ends against the followers 6, serve to force the packing followers against the packing rubbers 4 and thus press the latter firmly against the drilling line 1. The inner face 8 of each of the followers 6 is preferably of convex form, being curved longitudinally of the stuffing box. By this means the center portions of the packing rubbers 4 are first compressed against the drilling line 1, leaving the ends of the packing members free to move more readily in conformity to movements of the line. This results in an easier and more

5 durable packing. When, however, it is desired to clamp the stuffing box 3 to the drilling line so as to cause the box and the hollow polished rod 9 connected thereto to partake of the reciprocating movements of the line, the follower adjusting screws 7 are advanced further and thereupon the wedging action of the rubber packing members 4, as they seize around the drilling line, is sufficient to lock the stuffing box and the drilling line together. In actual practice it has been found that the convex followers cause the packing members 4 to grip the drilling line with sufficient firmness to support the weight of the entire string of tools carried by the line. The upper end of the stuffing box 3 is formed with a cover or gland 10 through which the drilling line 1 passes. The gland may advantageously be secured to the body of the stuffing box by means of bolts 11.

20 The hollow polished rod or tube 9 through which the drilling line passes is rigidly secured to the stuffing box 3 and extends downwardly therefrom. To securely attach the hollow rod 9 to the stuffing box 3 the latter is provided with a downwardly projecting nipple 12, the upper portion of which is interiorly threaded, as indicated at 13 for engaging the correspondingly threaded upper end of the polished rod. Below the threaded portion the nipple 12 is bored true to the outside diameter of the hollow polished rod and is split or slotted radially, as indicated at 14, to form a clamp having perforated lugs 15 through which a bolt 16 extends. By tightening the clamp bolt 16 the stuffing box 3 may be securely clamped to the hollow polished rod below the threaded connection of the latter with the box. By thus clamping the polished rod to the stuffing box 3 danger of the rod unscrewing and becoming separated from the box is overcome and bending stresses are transferred from the roots of the threads down to a point where the hollow polished rod 9 is of maximum diameter.

Below the upper stuffing box 3 the polished rod 9 extends through a stuffing box 17 which is movably supported by the casing head 2. The stuffing box 17 is provided with means for packing against the exterior of the polished rod. For this purpose it is preferred to employ top and bottom split rubber rings 18 and 19 respectively between which are intermediate rings 20 of plastic metallic packing. The commercial form of plastic metallic packing consisting of fibers of lead or lead composition twisted into a rope, generally impregnated with graphite or wax or hard oil and encased in woven asbestos may be used if desired. The packing in the chamber of the stuffing box 17 is compressed into packing contact with the exterior of the tubular polished rod 9 by means of oppositely disposed followers 21 each of which is adapted to be actuated by a corresponding adjusting screw 22 mounted on and having threaded engagement with the stuffing box 17. The followers 21 are of substantially the same general character as the followers 6 employed in the upper stuffing box 3, except that their inner faces are not bowed or convexly curved in the direction of length of the polished rod. The packing elements 18, 19 and 20 and the followers 21 are inserted through the top opening in the stuffing box 17, said opening being closed by a gland 23 having threaded connection with the body of the box. The opening through the gland 23 for receiving the hollow polished rod 9 is preferably of somewhat greater diameter than the rod, thus permitting an anti-friction sleeve 24 forming a guide for the polished rod to be interposed be-

tween the rod and the gland 23. The sleeve 24 is held in place and may be somewhat compressed by means of an annular bushing which encircles the polished rod and is screwed into the upper end of the gland 23. The anti-friction sleeve 24 may advantageously be made of hard wood impregnated with lubricant. To guide the polished rod and relieve it from undue wear, the opening through the stuffing box 17 below the packing chamber thereof is preferably provided with a bronze liner 25 of tubular form which encircles the hollow rod 9. A radial passage 26 communicating with an alemitte or other suitable fitting 27 serves to permit lubricant to be introduced between the liner 25 and the tubular polished rod 9.

Below the stuffing box 17 and rigidly connected thereto is an auxiliary stuffing box 28 through which the hollow polished rod 9 extends, the upper end of the box being threaded to receive the correspondingly threaded lower end portion 29 of the stuffing box 17. Within the packing chamber of the auxiliary stuffing box 28 is a follower ring 30 between which and the lower end of the stuffing box 17 suitable packing means are interposed, said packing means preferably comprising upper and lower split rubber rings 31 and intermediate packing rings 32 of like character to the intermediate rings 20 within the stuffing box 17. To cooperate with the packing means within the auxiliary stuffing box 28 the hollow polished rod 9 is provided at its lower end with an exterior shoulder preferably in the form of a ferrule 33 which upon upward movement of the rod with respect to the auxiliary stuffing box 28 is adapted to enter the opening 34 in the bottom of the latter and come into engagement with the follower ring 30 upon which the packing members 31 and 32 are superposed. The packing within the auxiliary stuffing box 28 is normally free from pressure and so does not rub or wear against the polished rod 9; but when it is desired to repack the intermediate stuffing box 17 the polished rod may be raised so that the ferrule 33 at the lower end of the rod engages the follower 30 and forces the packing rings 31 and 32 into tight contact with the rod. This permits the packing chamber in the stuffing box 17 to be opened and the packing therein removed or replaced without loss of oil or gas or danger to life or property. The ferrule 33 by cooperating with the follower 30 serves to limit upward movement of the hollow polished rod 9 and upper stuffing box 3 with respect to the intermediate stuffing box 17 and the auxiliary stuffing box 28, thus insuring that the polished rod shall not become accidentally disassembled from the stuffing boxes 17 and 28 upon an extended upward movement of the drilling line 1 in withdrawing the tools from the well or in a swabbing operation.

The stuffing box 17 as well as the auxiliary stuffing box 28, if the latter be employed, is preferably movably mounted on the casing head so as to enable it to accommodate itself to variations in the alinement of the drilling line. This is very advantageous because, due to various causes, the alinement of the drilling line is very rarely concentric with the well casing.

The preferred means for movably supporting the oil saver so that it is permitted to shift laterally and angularly from its normal central vertical position comprises a base member 35 of ring like form which is supported by the casing head 2 and is adapted to be detachably secured to the latter by means of radial set screws 36

and by anchor clamps 37 secured by anchor bolts 38, although either of these securing means may be used alone or other means suitable for the purpose may be employed if desired. Screwed into the under side of the base ring 35 is an annular base bushing 39 between which and the base member 35 a flexible diaphragm 40 is interposed. This diaphragm may advantageously be of rubber, canvas, a combination of rubber and canvas, leather or metal, or a combination of metal and rubber or duck, and it forms a flexible or movable connection between the stuffing box 17 and the supporting base 35 permitting the alignment of the hollow polished rod within the well casing by either lateral or angular movement. The flexible diaphragm 40 is apertured at the center to receive the lower end 29 of the stuffing box 17 which latter is formed with a downwardly facing shoulder 41 which overlies the inner margin of the diaphragm, the diaphragm being clamped to the stuffing box device 17 between the shoulder 41 and the upper end of the auxiliary stuffing box 28. By this means the oil saver is movably mounted upon the base, but escape of oil and gas between the stuffing box and the supporting base 35 is prevented. To prevent the stuffing box 17 from passing through the base 35 in the event the diaphragm 40 should fail for any cause, said stuffing box is provided with shoulders 42 which extend over the upper surface of the base member 35. To prevent the oil saver from passing upwardly through the base or being blown out by pressure in the well in the event of failure of the diaphragm 40, the auxiliary stuffing box 28 is shouldered, as at 43 for cooperating with the base bushing 39 to limit upward movement of the oil saver, the shoulder 43 of the auxiliary stuffing box and the coacting shoulder 44 of the base bushing being of corresponding form so as to cooperate and act like a valve preventing leakage through an impaired diaphragm whenever the internal pressure of the well is great enough to force the seats 43 and 44 into contact.

In the modified form of construction shown in Figure 7 the flexible diaphragm 45 is mounted with capability of sliding laterally between the base member 46 and the base bushing 47. This form of diaphragm is preferably faced with thin sheets of metal and, as shown, may advantageously be thickened somewhat at its periphery. Other features of construction of the modified form of invention shown in Figure 7 being like those heretofore described have been indicated by corresponding reference numerals.

In the construction shown in Figure 8 the diaphragm 48 is formed as a flexible tubular member which is clamped at its lower end between a supporting base member 49 and an annular bushing 50 screwed downwardly into the latter, its upper end being clamped between the stuffing box 17 and the upper end of the auxiliary stuffing box 51. By this means internal well pressures cause the flexible tube 48 to be placed in tension. The tube itself may be of rubber hose reinforced with coil spring wire or of other suitable construction. The other features of construction illustrated in Figure 8 are the same or substantially the same as those heretofore described and corresponding parts have, therefore, been identified by similar reference characters.

I claim:

1. An oil saver involving a stuffing box, a hollow polished rod secured to and extending downwardly from said stuffing box, said stuffing box

and polished rod being adapted to receive a drilling line, flexible packing means within said stuffing box for packing said drilling line, means including said packing means for clamping said stuffing box to said line, and stuffing box means slidably mounted on said polished rod.

2. An oil saver involving a hollow polished rod adapted to receive a drilling line, means for securing said polished rod to the drilling line, a stuffing box through which said polished rod extends and with respect to which it is adapted to reciprocate, yielding packing means within said last-named stuffing box for packing said polished rod, an annular flexible diaphragm for supporting said last-named stuffing box to permit lateral movement thereof from normal position, and means removably mounted on the lower end of said last-named stuffing box for securing said diaphragm to the latter.

3. An oil saver involving a hollow polished rod adapted to receive a drilling line, means for securing said rod to the line to enable it to move with said line, a stuffing box through which said polished rod extends and with respect to which it is adapted to reciprocate, yielding means carried by said stuffing box for packing said polished rod, an annular flexible diaphragm for supporting said stuffing box to permit lateral displacement thereof from normal position, and means for limiting upward movement of said polished rod with respect to said stuffing box.

4. An oil saver involving a hollow polished rod adapted to receive a drilling line, means for securing said rod to the drilling line to enable it to move with the line, a stuffing box through which said polished rod extends, packing means within said stuffing box for packing the polished rod, means for supporting said stuffing box to permit the latter to move in conformity with variations in the alignment of the drilling line, said last-named means comprising a plurality of members including a flexible member secured to said stuffing box adjacent the lower end thereof, and means for limiting upward movement of said polished rod with respect to said stuffing box.

5. An oil saver involving a stuffing box having an opening therethrough permitting the passage of a drilling line, a hollow polished rod secured to and extending downwardly from said stuffing box and adapted to receive the drilling line, yielding means within said stuffing box for engaging said drilling line, follower means movable radially with respect to said stuffing box opening and provided with a convex surface engaging said yielding means, means for causing said follower means to press said yielding means against the drilling line to clamp said stuffing box thereto, and stuffing box means slidably mounted on said polished rod.

6. An oil saver involving a stuffing box having an opening for receiving a drilling line, a hollow polished rod secured to and extending downwardly from said stuffing box and adapted to receive the drilling line, a plurality of yielding packing members arranged within said stuffing box, a plurality of followers within said stuffing box and between which said yielding packing members are interposed, each of said packing followers being formed with a convex inner face for engaging the adjacent packing member, other, and a stuffing box through which said polished rod extends and with respect to which said rod is slidable.

7. An oil saver involving a stuffing box pro-

vided with a slotted clamp portion having an interiorly threaded opening, a hollow polished rod extending into said opening and having threaded connection with the interior threads of said clamp portion, means cooperating with said clamp portion to force the latter to grip the polished rod, a stuffing box through which said polished rod extends, packing means carried by said last-named stuffing box for cooperating with the polished rod, and means for limiting upward movement of said polished rod with respect to said last-named stuffing box.

8. An oil saver involving a hollow polished rod provided with means forming an exterior shoulder on said rod, a stuffing box through which said polished rod extends, packing means carried by said stuffing box for cooperating with said polished rod, an auxiliary stuffing box disposed above said shoulder forming means and through which said polished rod extends, and packing means carried by said auxiliary stuffing box for cooperating with said polished rod, said exterior shoulder being adapted to cooperate with said last-named packing means to force the latter into packing contact with said polished rod.

9. An oil saver involving a hollow polished rod, a stuffing box through which said polished rod extends, packing means carried by said stuffing box for cooperating with said polished rod, an auxiliary stuffing box secured to the stuffing box first-named and through which said polished rod extends, packing means carried by said auxiliary stuffing box for cooperating with said polished rod, and means carried by said polished rod for forcing the packing means carried by said auxiliary stuffing box into packing contact with said polished rod.

10. An oil saver involving a polished rod adapted to receive a drilling line, means for securing said polished rod to the drilling line to permit it to move with said line, an auxiliary stuffing box through which said polished rod extends, a stuffing box disposed above the auxiliary stuffing box and through which said polished rod extends, said auxiliary stuffing box being secured to said upper stuffing box, packing means carried by said upper stuffing box for cooperating with said polished rod, means cooperating with said last-named packing means to force the latter into packing contact with said polished rod, packing means carried by said auxiliary stuffing box for cooperating with said polished rod, and means for forcing the packing carried by said auxiliary stuffing box into packing contact with said polished rod.

11. An oil saver involving a hollow polished rod adapted to receive a drilling line, means for securing said polished rod to the drilling line to enable it to move with the line, a stuffing box through which said polished rod extends, packing means within said stuffing box for packing the polished rod, packing followers movable transversely of said rod for forcing said packing means into contact with the rod, a gland connected to said stuffing box and encircling the rod above said packing means, anti-friction means within said gland encircling and engaging said polished rod, and a bushing encircling said polished rod and adjustably connected to said stuffing box for cooperating with said anti-friction means.

12. An oil saver involving a hollow polished rod adapted to receive a drilling line, yielding means for securing said rod to the line to enable it to move with the line, a stuffing box through which

said polished rod extends, yielding means carried by said stuffing box for packing said polished rod, and an annular flexible diaphragm for supporting said stuffing box to permit angular displacement thereof from normal vertical position.

13. An oil saver involving a hollow polished rod adapted to receive a drilling line, a stuffing box device through which said polished rod extends and with respect to which it is adapted to reciprocate, said device including yielding packing means for packing the polished rod, and means for supporting said stuffing box device to enable it to move in conformity with variations in the alignment of the drilling line, said stuffing box device and said supporting means being provided with portions adapted to engage upon an upward movement of the stuffing box device with respect to said supporting means to limit upward movement of said device with respect to the supporting means.

14. An oil saver involving a hollow polished rod adapted to receive a drilling line, a stuffing box device through which said polished rod extends and with respect to which it is adapted to reciprocate, and means for movably supporting said stuffing box device, said stuffing box device and said supporting means being provided with normally separated seats adapted to cooperate with each other upon an upward movement of the stuffing box device to prevent fluid from passing upwardly between said stuffing box device and said supporting means.

15. An oil saver involving a hollow polished rod, a stuffing box through which said polished rod extends, packing means carried by said stuffing box for cooperating with said polished rod, an auxiliary stuffing box into which said polished rod extends, packing means carried by said auxiliary stuffing box for cooperating with said polished rod, and means controlled by movement of the polished rod for forcing the packing means carried by the auxiliary stuffing box into packing contact with the polished rod.

16. An oil saver involving a stuffing box, a hollow polished rod secured to and extending downwardly from said stuffing box, said stuffing box and polished rod being adapted to receive a drilling line, yieldable packing means within said stuffing box, means movable radially of said stuffing box for forcing said packing means against the drilling line, a stuffing box device disposed below the first-named stuffing box and through which said polished rod extends and with respect to which said rod is movable in the direction of its length, and means carried by said polished rod for cooperating with said stuffing box device to limit upward movement with respect thereto of said rod and said first-named stuffing box.

17. An oil saver detachably secured to a casing head and packing around a polished rod comprising in combination a ring secured to the casing head, an annular flexible diaphragm secured to the lumen of said ring, and an annular body secured to the lumen of said diaphragm all said elements being secured in oil tight relationship, means on said body, adapted, upon any considerable displacement of said body, to contact said ring and thereby limit the stress upon and strain of said diaphragm, and packing means in the lumen of said body to pack the polished rod in oil tight sliding relationship to said body.

ALFRED G. HEGGEM.