Sept. 11, 1951

G. G. HEBARD

POLISH ROD STUFFING BOX

Filed Sept. 8, 1947

2 Sheets-Sheet 1

FIG. 1

INVENTOR.
G. G. HEBARD

BY Hudson & Young

ATTORNEYS
FIG. 2

FIG. 3

INVENTOR.
G. G. HEBARD

BY Hudson & Young
ATTORNEYS
UNITED STATES PATENT OFFICE

2,567,479

POLISH ROD STUFFING BOX

Glen G. Hebard, Bartlesville, Okla., assignor to
Phillips Petroleum Company, a corporation of Delaware

Application September 8, 1947, Serial No. 772,789

5 Claims. (Cl. 286—16)

1 This invention relates to polish rod stuffing boxes. In one specific aspect it relates to a stuffing box for a polish rod in an oil well pump sucker rod line. In another specific aspect it relates to a polish rod stuffing box in which lubricant under spring pressure, and/or well pressure is applied to the packing.

In the art of polish rod stuffing boxes, about 33 per cent of the causes of leaking are due to the man in charge of the pumps tightening the main packing of every stuffing box every time he passes the same which soon ruins the stuffing box, about 33 per cent of the cause of leaking is due to misalignment and inability of the stuffing box to adjust itself to the misaligned polish rod and about 33 per cent of the leaks are due to sudden changes of pressure in the well due to the well heading up and starting to flow while being pumped.

It is an object of this invention to provide a stuffing box in which the main packing is maintained at a substantially constant predetermined tightness by spring means which cannot be tightened by the operator.

Another object is to provide a stuffing box which permits the main packing and gland glands to always align itself with the rod during such portions of the pumping stroke when the rod is misaligned.

Another object is to provide a stuffing box in which the pressure above the main packing may be maintained at substantially greater pressure than the pressure in the well during times when the well heads up and starts to flow.

Still further objects are to provide a stuffing box having a V type packing as the main packing with means to provide grease under pressure at all times on the packing, and in which a V type packing ring is reversed and used as a grease wipping ring to prevent excessive use of grease.

Other objects are to provide a stuffing box capable of withstanding high well head pressures, which is not dependent upon well fluid for lubrication, and which is simple and rugged in construction, simple in assembly and adjustment, and generally better in operating characteristics, maintenance, cost of construction and which is foolproof.

Numerous other objects and advantages will be apparent to those skilled in the art upon studying the accompanying specification, claims and drawings.

In the drawings:

Figure 1 is an elevational view with a quarter of the same broken away to show the parts in cross section of a polish rod stuffing box embodying the present invention.

Figure 2 is an elevational view with parts broken away to show details of construction of a well tubing head and flow line provided with a polish rod stuffing box and lubricant supply means for the same embodying the present invention.

Figure 3 is an elevational view of a check valve seating for grease which may be substituted for the similar seating shown in Figure 2 when desired.

In Figure 1 a polish rod stuffing box is shown having a bowl generally designated as 3 provided with a cap generally designated as 4. While bowl 3 can be made in a single piece it is desirable in some instances to make the same in several parts as shown. When made in several parts bowl 3 comprises a bowl base 6 having external threads 1 for attachment to the usual well tubing head. Obviously other attaching means, such as a bolted flange, can be substituted in place of thread 1 if desired. Bowl base 6 is provided with a shoulder 8 for receiving a bushing guide 9.

Secured to bowl base 6, preferably by welding at 14, is a cylindrical bowl body member 15 which is provided at its top with any suitable means for securing cap 4. However, it is preferable to use a flange 13 provided with only two bolt holes 14 and secured to 12 by welds 16 and 17.

Cap 4 can be made in single piece but preferably consists of a grease reservoir member 18 to which cap flange 19 is secured by welding at 21. Obviously flange 19 has holes 22 corresponding to holes 14 so that cap 4 may be secured to bowl 3 by only two bolts 23 and nuts 24. Suitable washers 25 may be provided to aid in assembly and operation.

Cap 4 contains a grease reservoir chamber 26 and part 18 is provided with a stuffing box 27 having the usual follower 28 and bolts 29 to adjust the follower. A suitable grease seal ring 31 is provided of suitable packing material for engaging polish rod 32 and preventing loss of grease from chamber 26 up the surface of rod 32.

The main packing gland 33 of the bowl 3 is mounted on a resilient seating ring 34 and its upper end is guided in cylindrical recess 36 of flange 19. Bolts 33 are considerably smaller in diameter than holes 14 and 22 which allows movement of the upper end of gland 33 and flange 19 in a direction normal to the longitudinal axis of rod 32, and this movement is controlled and limited by an upper alignment ring 37 made of resilient material. In order to further align and
3. Cushion the main packing gland 33 and to maintain the space between seating ring 34 and upper alignment ring 37 a number of auxiliary alignment rings 38 are preferably provided. By employing rings 38 spaces 39 are left which are just the right size to provide room for deformation and flow of resilient members 34, 37, and 38, which is an important feature of one preferred form of the present invention.

The main packing comprises one or more inverted V type packing rings 41 which ring or rings 41 are supported against an upper follower ring 42 by means of a loading spring 43 acting through lower following ring 44. It is preferred to also employ a V type packing ring 46 to act as a grease wiping ring to prevent excessive loss of grease. Grease wiping ring 46 is in reversed position to packing rings 41 and is spaced therefrom by spacer ring 47.

While not essential it is preferred to insure that spring 43 is kept out of contact with rod 22 by means of a guide ring 48 which may be provided with a positioning flange 49 preferably located at its lower end. Access to chamber 26 is provided by a suitable grease hole and grease nipple 51 which is shown in Figure 2, and the discussion of the drawing will now proceed with reference to Figure 2.

In Figure 2, oil, grease or other well generally designated as 52 is provided with a tubing 53 through which oil or other liquid is being pumped and/or flows under its own pressure. In order to operate a pump (not shown) located in the lower portion of tubing 53 (not shown) the string of sucker rods 54 which extends in the usual manner through stuffing box 3 and cap 4. Polish rod 52 has a polished metallic surface, or substantially smooth metal surface, in order to reduce to a minimum the friction on packing 41 and any tendency of the rod to tear the packing to pieces.

Tubing 53 is provided with a tubing tee 54 to which stuffing box 3 is attached by threads 1 or other connecting means. Tubing tee 54 has a flow nipple 56 to which the usual flow line 67 may be attached to carry the pumped and/or flowing oils to suitable tanks (not shown).

In order to provide grease for grease reservoir 68 it is often sufficient merely to supply a check valve fitting 66 as shown in Figure 3 which may be substituted in place of connection 51 of Figure 3. In such a case a portable grease gun is attached to bosses 59 of fitting 66 and the grease is forced through center passage 61 forcing the spring seated check valve (not shown) in the usual grease fitting 66 to open and allow the grease to pass into chamber 26. The portable grease gun (not shown) is then removed and the spring sets the check slide preventing grease from leaving chamber 26.

While that construction is sufficient in many instances it is preferred to employ the permanent attached grease gun generally designated as 62 as connected in Figure 2 especially when well 63 is one which heads up and flows intermittently during the pumping operation.

Grease gun 62 consists of a body 63 which can be supported in any manner adjacent cap 4 but which is preferably secured to bowl 9 by strap 46 and bolt and nut 48 or other suitable securing means.

Body 63 contains a load of grease 67 which is being urged upwardly by piston 68 provided with suitable O type packing 69 in packing ring groove 71. Piston 68 is urged upwardly by helical compression spring 72 pressing against cap 73. Cap 73 is secured to body 63 by any suitable means such as threads. Piston 68 is provided with a measuring rod 74 which extends down below cap 73 and indicates the amount of grease 67 remaining above piston 68.

Cap 73 is preferably provided with two openings leading from the outside into chamber 76, one of said openings passing through pipe 77 controlled by valve 78 to the atmosphere, and the other of said opening passing through pipe 79 controlled by valve 81 to the interior of flow line 71.

In order to charge body 63 with grease 67 any of the usual type high pressure grease fittings on the market which contain a spring pressed check valve may be employed such as the type shown in Figure 3 which has bosses 59 or the type shown at 83 of Figure 2 which relies on pressure to keep the grease supply device (not shown) in alignment during the grease filling operation. Because of the spring check valve (inside of 83) it is possible to force grease into opening 84 on the top of 83 through a passage into chamber 85 but the grease cannot return because of the check valve. Fittings 82 and 83 are so common and well known in high pressure grease lubrication of automobiles and the like that further illustration is believed unnecessary. Among the trade names for such fittings are "Alemite" and "Zerk."

Fitting 83 is connected to cylinder 63 by a T fitting 88 which has a branch leading to a pipe 87 which extends to space 28 by fitting 81 in the side of cap 4.

In order to unload the grease 67 from the body 63 an emergency unloading valve 88 may be provided. However, valve 88 is unnecessary to the usual operation of the device.

Operation

In the operation of the device rod 32 is reciprocated along its longitudinal axis by a walking beam, rod jack, or other mechanical movement (not shown) which device generally causes misalignment of rod 32 at some portion of the stroke. When such misalignment occurs the main packing 41 does not have to adjust for the misalignment as instead the main packing gland 33 compresses and deforms rings 34, 37 and 38 properly aligned with rod 32.

In such movement spaces 39 allow freely floating movement of cap 4 and gland 33.

If the well heads up and flows liquid under pressure it cannot pass up the surface of rod 32 because of V type packing rings or rings 41. Lubrication of all the packings is provided by grease in chamber 26 which can freely pass as far up as packing 31 and as far down as 41 or 48. Packing 46 prevents excessive loss of grease down the rod.

Spring 63 provides the proper loading pressure on packing 41 and 48 and this pressure cannot be adjusted by the operator, which is important as the operator tends to tighten stuffing boxes too often.

In Figure 2 grease is inserted through opening 84, fitting 83 and T 86 to fill body 63 against the pressure of spring 72. Spring 72 then urges piston 68 to force grease 67 through pipe 68 and 81 into space 26 of cap 4.

Valve 88 is only used when it is desired to remove grease from 83 before disconnecting the device which prevents grease from squirting out of 81 when the same is disconnected.
If valve 81 is closed and valve 78 is open the pressure on grease 61 will be merely that of spring 72 and the atmosphere but if valve 78 is closed and valve 81 is open the pressure on grease 61 will be that of spring 72 plus the pressure in space 82 which is to the well which heads and flows at a varying pressure it is often desirable to have the same pressure applied through pipe 79 to space 76 and transmitted to grease 61 so that the pressure above packing 41 will be substantially balanced with the pressure below the same with an excess pressure above packing 41 caused by spring 72.

At other times such balancing of pressure is unnecessary in which case valve 81 may be closed and valve 78 opened so that spring 72 is the main pressure on grease 61. While not critical it is preferred to have spring 72 provide a pressure of 10 to 30 pounds per square inch when compressed and when substantially completely expanded spring 72 should still provide from 2 to 3 pounds per square inch pressure on grease 61.

In many installations it is unnecessary to have a permanent grease supply 62. In such cases a grease pressure fitting 58, as shown in Figure 3, may be substituted for 51, 87, 62 and related parts of Figure 2 in which case grease is placed in space 26 of cap 4 through fitting 58 under pressure from time to time. As these permanent grease supply 62 of Figure 2 operates automatically over a long period of time it is preferred.

The term "tubing head" in the claims is defined as meaning any upper portion of the tubing, or flow line connected thereto.

It is a further object of this invention to provide a workman with the adjustment of or tighten the main packing 41, which is therefore always in constant to to stop any flow of well fluid, either gas or liquid. The workman can tighten stuffing box 28, 29, but this is a simple single solid ring packing which merely a rubber or which do not distribute the adjustment as 41 is. Improper tightening of 28, 29 does little, if any, damage, but tightening 41 would be likely to result in great loss if the well starts flowing and packer 41 fails through excessive tightening and result worse.

Various materials of construction may be employed, however, it is preferred to make all the parts of metal except rings 31, 34, 37, 38, 41 and 46. Of these rings 34, 37, and 38 are preferably made of rubber (either natural or synthetic) or some less resilient material. Rings 31, 41 and 46 are preferably made of some suitable packing material such as fiber, rubber (either natural or synthetic) felt or the like. While various metals may be employed parts 3 and 4 are preferably made of welded steel parts as shown or of cast steel or cast iron. While ferrous metals can be employed parts 28, 42, 47, 44, 46 and 9 are preferably made of bronze and while spring 43 may be made of any resilient material such as steel it is preferred to use Phosphor bronze because of its corrosion resistance.

While I have shown in the drawings, several particular illustrative forms of my invention, various modifications may be made in the same and in the various features of construction, without materially changing the invention therein, and formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

Having described my invention I claim:

1. A polish rod stuffing box comprising in combi-

2. A polish rod stuffing box comprising, in combination, a housing adapted to be secured to an oil well tubing T, upper and lower resilient rings inside said housing, a stuffing box of smaller diameter than said housing supported coaxially inside said housing by said resilient rings, packing inside said stuffing box comprising, in combination, a spacer ring, at least one ring of the upright V-type packing below and at least one ring of the inverted V-type packing above said spacer ring, an upper follower ring above said packing, a lower follower ring below said packing, a hemoval 72, at the same time as valve 81 is closed and valve 78 is open the pressure on grease 61 will be that of spring 72 plus the pressure in space 82 which is to the well which heads and flows at a varying pressure it is often desirable to have the same pressure applied through pipe 79 to space 76 and transmitted to grease 61 so that the pressure above packing 41 will be substantially balanced with the pressure below the same with an excess pressure above packing 41 caused by spring 72.

At other times such balancing of pressure is unnecessary in which case valve 81 may be closed and valve 78 opened so that spring 72 is the main pressure on grease 61. While not critical it is preferred to have spring 72 provide a pressure of 10 to 30 pounds per square inch when compressed and when substantially completely expanded spring 72 should still provide from 2 to 3 pounds per square inch pressure on grease 61.

In many installations it is unnecessary to have a permanent grease supply 62. In such cases a grease pressure fitting 58, as shown in Figure 3, may be substituted for 51, 87, 62 and related parts of Figure 2 in which case grease is placed in space 26 of cap 4 through fitting 58 under pressure from time to time. As these permanent grease supply 62 of Figure 2 operates automatically over a long period of time it is preferred.

The term "tubing head" in the claims is defined as meaning any upper portion of the tubing, or flow line connected thereto.

It is a further object of this invention to provide a workman with the adjustment of or tighten the main packing 41, which is therefore always in constant to to stop any flow of well fluid, either gas or liquid. The workman can tighten stuffing box 28, 29, but this is a simple single solid ring packing which merely a rubber or which do not distribute the adjustment as 41 is. Improper tightening of 28, 29 does little, if any, damage, but tightening 41 would be likely to result in great loss if the well starts flowing and packer 41 fails through excessive tightening and result worse.

Various materials of construction may be employed, however, it is preferred to make all the parts of metal except rings 31, 34, 37, 38, 41 and 46. Of these rings 34, 37, and 38 are preferably made of rubber (either natural or synthetic) or some less resilient material. Rings 31, 41 and 46 are preferably made of some suitable packing material such as fiber, rubber (either natural or synthetic) felt or the like. While various metals may be employed parts 3 and 4 are preferably made of welded steel parts as shown or of cast steel or cast iron. While ferrous metals can be employed parts 28, 42, 47, 44, 46 and 9 are preferably made of bronze and while spring 43 may be made of any resilient material such as steel it is preferred to use Phosphor bronze because of its corrosion resistance.

While I have shown in the drawings, several particular illustrative forms of my invention, various modifications may be made in the same and in the various features of construction, without materially changing the invention therein, and formal changes may be made in the specific embodiment of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

Having described my invention I claim:

1. A polish rod stuffing box comprising in combi-

2. A polish rod stuffing box comprising, in combination, a housing adapted to be secured to an oil well tubing T, upper and lower resilient rings inside said housing, a stuffing box of smaller diameter than said housing supported coaxially inside said housing by said resilient rings, packing inside said stuffing box comprising, in combination, a spacer ring, at least one ring of the upright V-type packing below and at least one ring of the inverted V-type packing above said spacer ring, an upper follower ring above said packing, a lower follower ring below said packing, a helical spring against one follower ring, pack-

3. A polish rod packing assembly comprising in combination a housing adapted at one end to be secured to a well pipe, said housing having a bore, the bore adjacent the opposite end from
said well pipe being enlarged to form a shoulder and a chamber adjacent said shoulder, a first resilient ring in said chamber adjacent said shoulder, a stuffing box concentrically disposed in said chamber and contacting said first ring, a plurality of additional rings surrounding said box in said chamber and contacting said box and the wall of said chamber, at least one of said additional rings being circular in cross section whereby space is provided in said bore for deformation of said rings, packing in said stuffing box disposed to engage in packing contact against said polish rod, a single cover for both said chamber and said stuffing box, said cover being disposed to cover and compress both said packing and the outermost of said rings, and means loosely securing said cover to said housing and biasing the cover to compress the outermost of said rings and said packing, but allowing tilting and radial movement of said box in said housing.

4. The combination of claim 3 in which a wipping ring is mounted on said cover and disposed to engage said polish rod, said cover being recessed to form a chamber between said wipping ring and a portion of said cover contacting said packing, and means to add lubricant to said chamber in said cover.

5. A polish rod packing assembly comprising in combination a housing adapted at one end to be secured to a well pipe, said housing having a bore, the bore adjacent the opposite end from said well pipe being enlarged to form a shoulder and a chamber adjacent said shoulder, a first resilient ring in said chamber adjacent said shoulder, a stuffing box concentrically disposed in said chamber and contacting said first ring, a plurality of additional rings surrounding said box in said chamber and contacting said box and the wall of said chamber, at least one of said additional rings being circular in cross section whereby space is provided in said bore for deformation of said rings, packing in said stuffing box disposed to engage in packing contact against said polish rod, a single cover for both said chamber and said stuffing box, said cover being disposed to cover and compress both said packing and the outermost of said rings, and means loosely securing said cover to said housing and biasing the cover to compress the outermost of said rings, but allowing tilting and radial movement of said box in said housing.

GLEN G. HEBARD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>354,538</td>
<td>Rohn</td>
<td>Dec. 28, 1888</td>
</tr>
<tr>
<td>1,859,639</td>
<td>Joyce</td>
<td>May 17, 1932</td>
</tr>
<tr>
<td>1,973,323</td>
<td>Adams</td>
<td>Sept. 11, 1934</td>
</tr>
<tr>
<td>2,069,443</td>
<td>Hill</td>
<td>Feb. 3, 1937</td>
</tr>
<tr>
<td>2,126,007</td>
<td>Guberson et al.</td>
<td>Aug. 9, 1938</td>
</tr>
<tr>
<td>2,150,539</td>
<td>Tremolada</td>
<td>Mar. 14, 1939</td>
</tr>
<tr>
<td>2,243,598</td>
<td>Flemming et al.</td>
<td>May 27, 1941</td>
</tr>
<tr>
<td>2,480,055</td>
<td>Seaton</td>
<td>Aug. 22, 1949</td>
</tr>
</tbody>
</table>