Nov. 7, 1939. H. C. BLOCK 2,178,549

TUBING HANGER

Filed Feb. 20, 1937 3 Sheets-Sheet 1

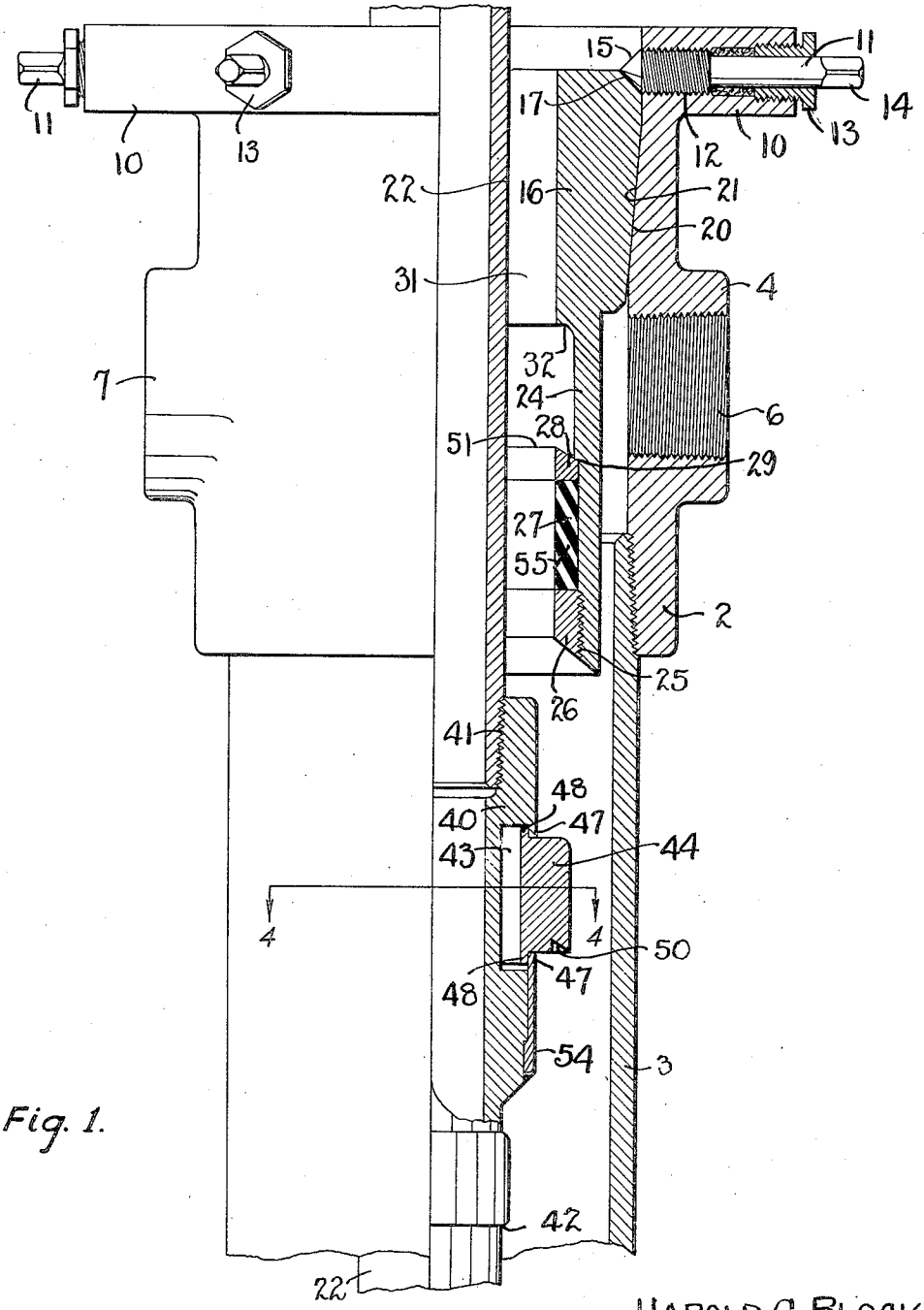


Fig. 1.

HAROLD C. BLOCK.
INVENTOR
BY Jesse R. Stone
Lester B. Clark.
ATTORNEYS.

Nov. 7, 1939. H. C. BLOCK 2,178,549

TUBING HANGER

Filed Feb. 20, 1937 3 Sheets-Sheet 2

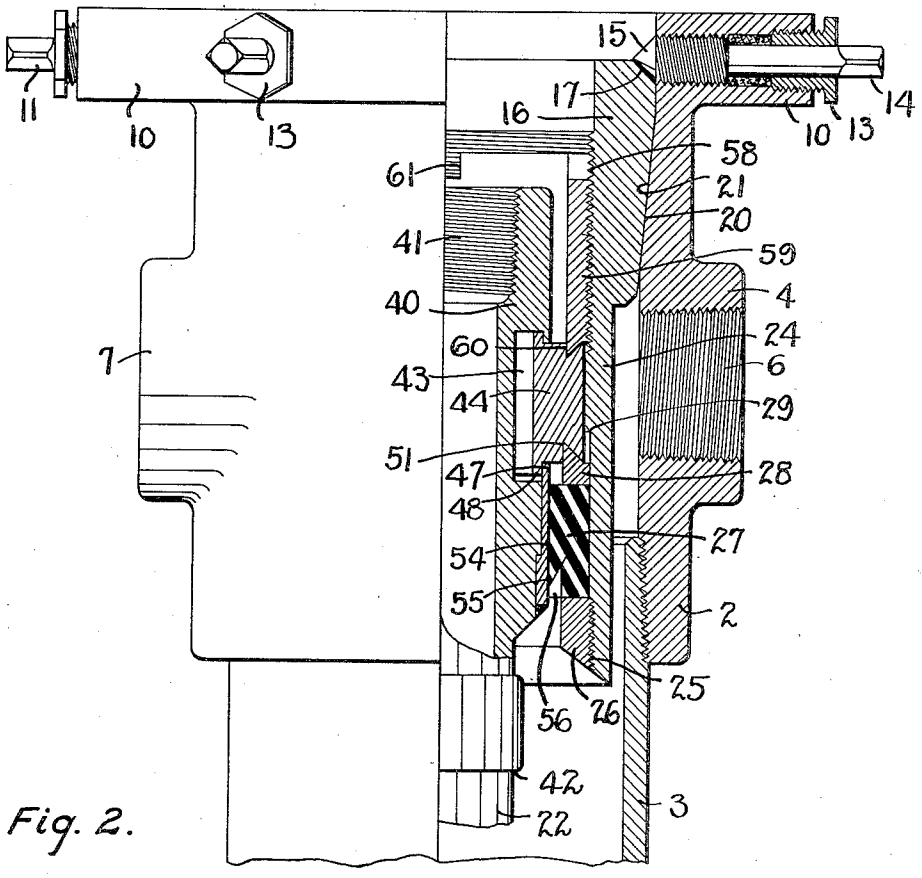


Fig. 2.

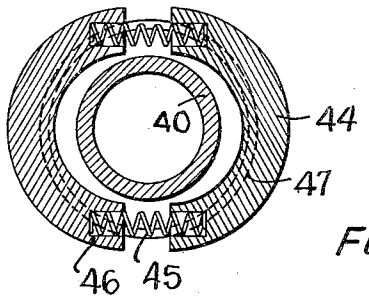


Fig. 4.

HAROLD C. BLOCK.
INVENTOR
BY Jesse R. Stone
Lester B Clark
ATTORNEYS.

Nov. 7, 1939. H. C. BLOCK 2,178,549

TUBING HANGER

Filed Feb. 20, 1937 3 Sheets-Sheet 3

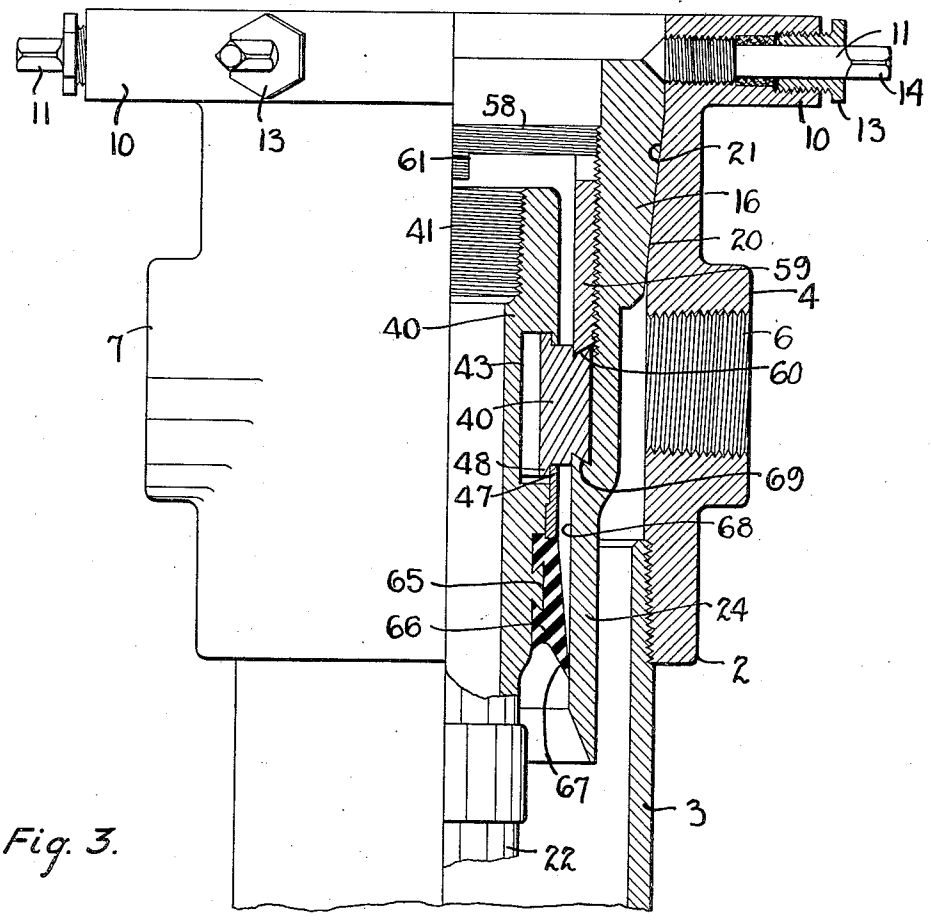


Fig. 3.

HAROLD C. BLOCK
INVENTOR
BY Jesse R. Stone
Lester B Clark
ATTORNEYS.

Patented Nov. 7, 1939 2,178,549

UNITED STATES PATENT OFFICE

2,178,549

TUBING HANGER

Harold C. Block, Houston, Tex., assignor to Leslie A. Layne, Houston, Tex.

Application February 20, 1937, Serial No. 126,801

5 Claims. (Cl. 285—22)

The invention relates to a well head and tubing hanger of a type wherein the tubing may be run into the well, the well prepared for production, and then the tubing hung in position in order to provide a seal thereabout, at a single operation.

Another object of the invention is to provide a tubing hanger wherein a latch and support device on the tubing may be received in the tubing hanger in order to support the tubing.

Another object of the invention is to provide a tubing hanger wherein the tubing has been hung and then locked into position with the weight of the tubing being utilized to maintain a seal about the tubing.

Another object of the invention is to provide a tubing hanger and string of tubing which may be interlocked and sealed together.

Another object of the invention is to provide an expansible latching mechanism on a string of tubing so that it may be automatically received in a tubing hanger when the string of tubing during its movement arrives at the desired elevation where it is to be hung.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings wherein:

Fig. 1 is an elevation of a well head shown partly in section and illustrating the arrangement of the well head, tubing hanger, and tubing just prior to hanging the tubing in position.

Fig. 2 is a side elevation showing the parts in section with a slightly modified form of the construction wherein the tubing has been hung and locked in position.

Fig. 3 is a side elevation showing the parts in section of another form of the invention where the tubing has been suspended and locked in position.

Fig. 4 is a section taken on the line 4—4 of Fig. 1 and looking in the direction of the arrows to illustrate the construction of the supporting mechanism.

In Fig. 1 the well head is indicated generally at 2 and embodies the well casing 3 which carries a well head 4 which is sometimes designated as the casing head and sometimes as the tubing head. In either event it is usually a body of the type shown having side outlets 6 and 7 which have been used during the drilling operation for the discharge of fluid from the well and which may be used for flow lines or for the attachment of any desired type of apparatus. This head 4 has been provided with a laterally extending flange 10 adjacent the top thereof and this flange carries a plurality of locking bolts 11 which are threaded at 12 so that they may be moved inwardly or outwardly in order to lock the tubing hanger in position. Stuffing box 18 encloses the outer end of each of these bolts and the bolts are formed with a non-circular portion 14 so that it may be rotated. Any desired number of these bolts may be provided and each has a tapered inner end 15 thereon so that a wedging action may be had against the tubing hanger 16 which is provided with a beveled shoulder 17.

The inside of the head 4 is provided with a tapered bowl 20 which cooperates with a similar tapered surface 21 on the tubing hanger 16. The hanger may of course be of any desired type and is arranged to be deposited in the tapered bowl 20 so that it may support the load of the tubing string 22. In the present instance the hanger 16 is provided with a depending skirt 24 which is threaded internally at 25 adjacent its lower end in order to receive the support ring 26. Deposited upon this support 26 is a sealing ring 27 in the form of a flexible gasket or packing ring. A retainer ring 28 is then deposited on top of the packing and is slidable vertically with respect to the skirt 24 inside of the tubing hanger. A shoulder 29 limits the upward movement of this retainer ring 28 and this entire structure is offset outwardly from the bore 31 of the tubing hanger by the top shoulder 32.

The string of tubing is shown generally at 22 and is provided with a coupling 40 which is threaded at 41 to the tubing at its upper end and at 42 at its lower end. This coupling 40 is of specific construction in that it has an annular recess 43 around its periphery which is arranged to receive the support segments 44 which are best seen in Fig. 4. These segments may each be of substantially semi-circular configuration and are slidable radially relative to each other so that they will be extensible to support the tubing in the hanger 16. As seen in Fig. 4 spring members 45 may be disposed between the segments with the ends of the spring in the recess 46. This normally urges the segments apart, as shown in Figs. 1 and 4, but they are subject to be retracted when a pressure is exerted upon them.

To confine these segments a depending lip 47 is provided on the coupling above and below the recesses 43 and cooperating lip 48 is likewise formed on the segments.

As seen in Fig. 1 the lower face of each segment 44 is provided with an undercut shoulder 50 which is arranged to receive the upwardly inclined beveled face 51 on the retainer ring 28. The periphery of the coupling 40 is provided with a face 54 below the segments against which the packing 27 is adapted to abut in forming a seal between the tubing and the tubing anchor.

In operation the tubing is usually run into the well and is provided with suitable mechanism for setting the strainer, liner, and packing mechanism being equipped with a setting tool on its lower end to form these operations. It is also

usual to circulate water through the tubing in order to wash the mud from the well and during this operation it is usual to reciprocate the tubing up and down so as to insure complete washing of the well. During this washing operation the lower end of the tubing is usually within the strainer and after the washing operation has been completed, and the packer set, the tubing is raised slightly so that its lower end will be in the desired position relative to the strainer and liner. This last operation of raising this tubing slightly brings the coupling 40 upwardly into the tubing hanger 16 so that the wrapped segments 44 will abut against the support ring 46 and be forced inwardly. Additional upward movement of the string of tubing brings the segments 44 to an elevation just above the retainer ring 28.

This releases the support segments and the spring 45 causes them to slip outwardly over the top of the retainer ring 28 so that the groove 50 fits over the tapered shoulder 51. The string of tubing can then be lowered slightly so that the weight of the tubing can be taken by the segments 44 and transmitted to the retainer ring 28 which causes this ring to move downwardly. This effects expansion of the packing ring 27 because it is rigidly supported upon the tubing hanger by the support ring 26. This expansion of the packing 27 forces it against the periphery 54 of the coupling 40 in order to provide and insure a complete seal between the tubing and the tubing hanger. This seal is of course constantly maintained due to the fact that the weight of the tubing string is supported upon the movable packing. If it is desired to remove the tubing it is only necessary to raise it slightly and the segments 44 will be caused to move inwardly by contact with the shoulder 32 and the tubing can then be removed from the well and if desired the bolts 11 may be retracted so that the hanger and the tubing can be removed as a unit.

It seems obvious that a simple and economical tubing hanger assembly has been provided in which the tubing is automatically latched when it is raised to the present elevation and wherein the seal is maintained automatically due to the weight of the tubing string without the manipulation of any parts at the time the tubing is being set.

Fig. 2 shows a slightly modified form of the invention where the parts are the same as previously described except that a large type packing 27 has been provided which has an outwardly flaring lip 55 which provides a recess 56 and to which the pressure from the well may enter in order to effect a seal with the tubing.

The inside of the hanger construction is slightly modified by having formed therein a suitable threaded area 58 which is arranged to receive a locking ring 59. This ring may be adjusted into position as desired in order to securely lock the support segments 44 in position and to insure proper compression of the packing 27.

During the washing operation this ring 59 may or may not be present but if it is present it will be screwed down only part way so as to leave sufficient space for the segments 44 to enter the recess above the shoulder 51 on retainer ring 28. After the tubing has been suspended and the packing compressed this locking ring 59 may be turned so as to move it downwardly against the segments 44 to clamp them in position. If desired an interfitting flange and groove construction as at 60 may be provided to insure that the supporting segments cannot be withdrawn from their supporting position. The upper end of the ring 59 may be an irregular edge at 61 in order to receive a spanner wrench by which it may be rotated. The remaining parts in Fig. 2 are similar to those shown in Fig. 1.

Fig. 3 shows another form of the invention wherein the parts are the same as described in connection with the preceding figures insofar as the latching and locking of the hanger are concerned. The packing, however, has been transferred from the hanger to the tubing and as seen in Fig. 3 the coupling 40 is provided with a projecting annular rib 65 which is dove-tailed in cross section and may have the packing ring 66 vulcanized or otherwise securely fixed thereto. This packing has a downwardly and outwardly projecting lip 67 which is arranged to engage the inner periphery 68 of the tubing hanger 16.

This form is particularly adaptable for deep wells where the weight of the tubing would be too great to suspend it upon a resilient packing and with this in mind the support shoulder 69 is formed integral with the tubing hanger 16. The lock ring and the other parts are the same as previously described in the invention.

What is claimed is:

1. A combination tubing and tubing hanger assembly for wells comprising a well head, a tubing hanger to be disposed in said head, a skirt on said hanger, spaced shoulders inside of said skirt, a sealing member between said shoulders, a bearing member on said sealing member, a tubing, an expansible support member thereon which is adapted to seat on said bearing member, and means on the tubing to be engaged by said seal member when the tubing is supported on said bearing member by said expansible support member.

2. A combination tubing and tubing hanger including interfitting parts on said tubing movable through said hanger to latch said tubing to said hanger, cooperating seal and sealing seat portions on said tubing and hanger so as to form a seal when said parts are engaged, said interfitting parts transmitting the weight of the tubing to expand said seal against said seat, a casing head to support said hanger, and means on said head to lock said hanger to said head.

3. A tubing hanger including a body to support said hanger in the well head, a recess in said hanger, a packing in said recess, and means movable through said hanger to support a tubing in said recess upon said packing to form a seal between said hanger and tubing.

4. A tubing hanger including a body, a recess therein, a tubing, latch means on the tubing to be received in said recess, sealing means to be engaged between the hanger and tubing, and additional means to lock said latch means in said hanger.

5. A well head, a tubing hanger therein, means to lock said hanger, a tubing in said hanger, means movable to latch and support said tubing in said hanger, and seal means between said tubing and hanger, including a lip type member to be forced against said tubing.

HAROLD C. BLOCK.