Dec. 28, 1937. G. B. KITCHEL ET AL 2,103,586

TUBING HEAD

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Fig. 1.

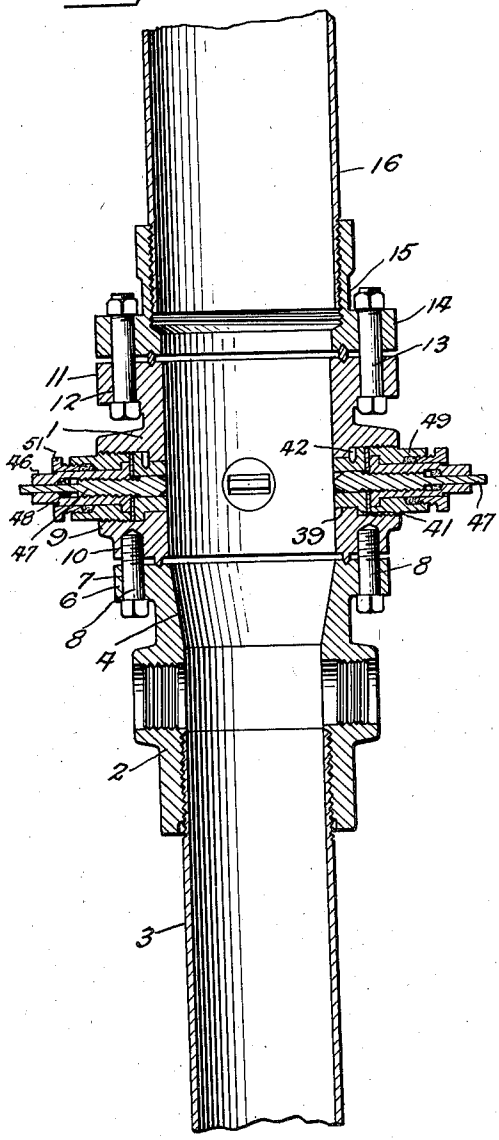
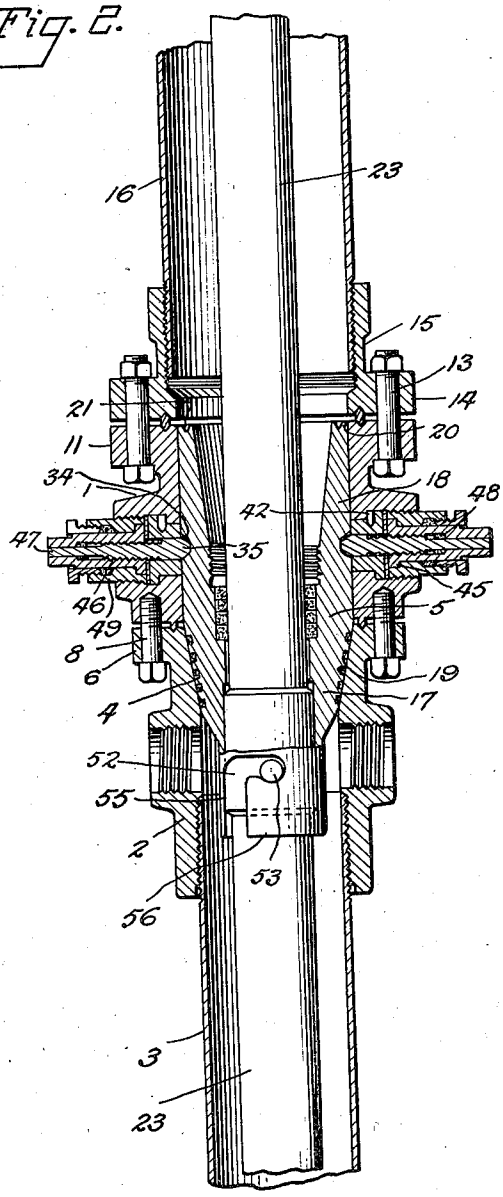


Fig. 2.



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Fig. 3.

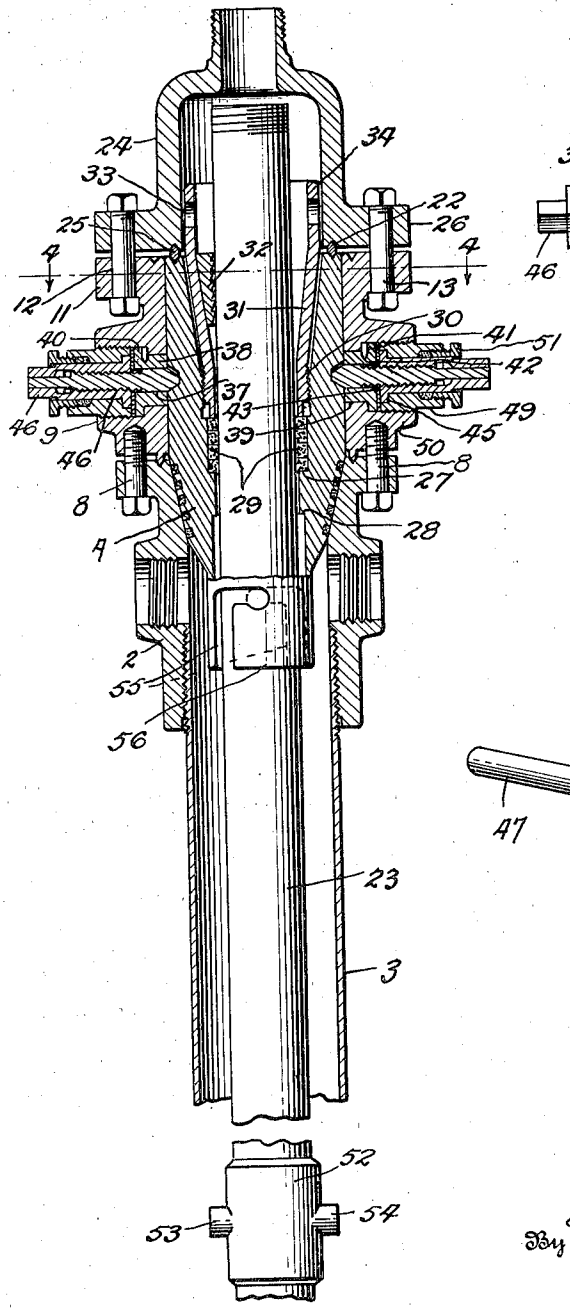


Fig. 4.

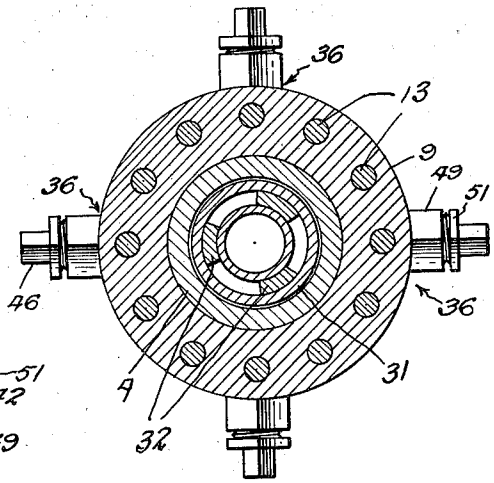
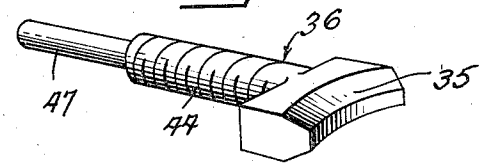


Fig. 5.



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UNITED STATES PATENT OFFICE

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TUBING HEAD

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Application January 24, 1936, Serial No. 60,682

5 Claims. (Cl. 166—14)

This invention relates generally to oil well equipment, and more particularly to a tube support or control head for sustaining tubing in any desired position in wells.

The primary object of the invention is to provide a tubing head which will allow operators of an oil well to support the tubing and seal off the head while the well is under pressure, and to allow adjustment or spacing of the tubing while so sealed off.

Other objects of the invention will appear as the detailed description thereof proceeds.

In the drawings:—

Figure 1 is a central vertical section of the tubing head secured to a surface casing, and with the tubing hanger omitted and hanger locking mechanism in inoperative position.

Figure 2 is a central vertical section through the mechanism illustrated in Fig. 1, but with the hanger and tubing supported thereby, inserted in the head.

Figure 3 is a central vertical section of the mechanism illustrated in Figs. 1 and 2, showing the tubing in final locked position in the hanger.

Figure 4 is a horizontal section taken on the line 4—4 of Fig. 3; and

Figure 5 is a perspective of one of a series of adjustable T-bolts used to lock the tubing hanger in seated position in the tubing head.

As shown in the drawings, the tubing head comprises an upper tubular section 1 and a lower tubular section 2, the latter being internally screwthreaded at its lower end to engage the externally screwthreaded upper end of the surface casing 3. The upper part of the bore in section 2 is shaped to form a frusto-conical seat 4, adapted to receive the correspondingly shaped lower end of a tubular hanger 5, shown in Figs. 2 and 3.

The upper end of the lower section 2 is provided with an outwardly extending flange 6, having a series of apertures 7 extending therethrough to receive the shanks of machine screws 8. The base 9 of the upper section 1 is provided with a series of tapped recesses 10 receiving the threaded ends of the screws 8 to secure the two sections firmly to each other. As shown clearly in the drawings, the bore of the upper section 1 has the same diameter as the widest diameter of the tapered seat 4 in the lower section.

The upper end of section 1 has a flange 11 extending outwardly therefrom and provided with a series of apertures 12 to receive the shanks of bolts 13. In the preliminary stages of drilling operation, the bolts 13 are used to clamp the flange 14 of an adapter 15 securely to the flange 11 of the upper section 1. The adapter 15 is shown as internally screwthreaded to receive the screwthreaded end of a connector 16, for blow-out preventer equipment well known in this art and therefore not shown herein. In each case, the opposed faces of adjacent members are provided with annular grooves adapted to receive suitably formed metal gasket or tongues to effect proper sealing of the joints.

The hanger 5 has its lower portion 17 shaped to fit the frusto-conical seat 4; and has its upper portion 18 shaped as a cylinder to fit the bore of the section 1, the two portions intersecting at the joint between the head sections 1 and 2. The lower portion 17 is provided with suitable packing rings 19 to ensure a proper seal. The top edge 20 of the hanger is substantially flush with the top of section 1, when the hanger 5 is fully supported by the seat 4; and is provided with a V-shaped annular groove 21 to receive a sealing ring 22 when the blow-out preventer adapter is removed and inner string 23 is locked in its final position. A bonnet 24, provided in its lower edge with an inverted V-groove 25 to seat on the ring 22, has an outwardly extending flange 26 apertured to receive the bolts 13 when the blow-out preventer adapter is removed.

The bore of the hanger 5 between the shoulders 27 and 28 in the vicinity of the tapered end 17, is slightly larger than the outer diameter of the tube 23 to be supported. Above the shoulder 27, the bore of the hanger is enlarged to receive the tube packing 29; and, above the packing space, is screwthreaded to receive the externally screwthreaded portion 30 of a combined slip bowl and packing sleeve 31.

The slip bowl 31, above the portion 30, is tapered to receive the tapered pipe-supporting segments 32. The top of the slip bowl is extended above the top of the hanger 5 to facilitate rotation of the slip bowl for the purpose of compressing or releasing the packing 29, capstan holes 33 being formed in the extension 34 for this purpose.

In order to force the hanger 5 into sealing engagement with the seat 4, the hanger, between the ends of its cylindrical portion, is provided with a V-shaped groove 34 adapted to receive the V-shaped segmental T-heads 35 of screwthreaded locking bolts 36 mounted for radial adjustment in the upper section 1 of the tubing head. Four of these locking bolts are shown in the drawings, although it is obvious that any desired number may be used. Since all four are alike in construction, only one will be described in detail herein.

The segmental head 35 is slidably mounted in

a transverse slot 37 formed in a bushing 38 which is secured with tight fit in a radial bore 39 formed in the upper section 1. The bore 39 is enlarged to receive the flange 40 of said bushing, and form a shoulder 41 to limit the inward movement of the bushing 38. A key 42 seated in registering recesses in the flange 40 and shoulder 41 prevents rotation of the bushing and positions the T-head 35 for proper movement into and out of the groove 34 in the hanger.

A washer 43 surrounds the screwthreaded shank 44 of the bolt 36 and forms a wear plate between the outer face of the bushing 38 and the flanged head 45 of an adjusting nut 46 screwthreaded on to the shank 44. The outer end of the adjusting nut 46 is squared to receive a wrench or other tool for rotating said nut on its bolt 36.

The bore of nut 46 is reduced at its outer end to receive a rod 47 extending axially from the shank 44, the said rod serving as an indicator to show the position of the T-shaped head 35 with respect to the bore of the upper section 1, or the hanger 5. The reduced bore of nut 46 forms a chamber in which packing 48 is arranged to prevent leakage along the rod 47.

An externally screwthreaded sleeve 49 is threaded into the boss 50 of section 1; and, is counter-bored at its inner end to receive the head 45 of the nut 46, and also to permit the inner end of the sleeve to engage the washer 43 and thereby clamp the bushing 38 in place in section 1. The bore at the outer end of sleeve 49 is also enlarged and internally screwthreaded to form a packing chamber and receive the gland nut 51. The groove 34 in the hanger is so located that the lower bevelled walls of the bolt heads 35 first engage the lower bevelled wall of groove 34, and, by inward adjustment, force and hold the hanger 5 firmly on its seat 4.

The bore of the hanger 5 below the shoulder 28 is enlarged to receive a tube supporting fitting 52, having pins 53 and 54 projecting radially therefrom. These pins 53 and 54 are designed to be received in bayonet joint slots 55 formed in a supporting device 56 detachably connected to the lower end of the hanger 5. The connection between the lower end of the hanger and this supporting device may be effected by the well known J-tool, or they may be screwthreaded to each other, with the threads broken for a part of the circumference to permit release of the device from the hanger.

In the operation of this tubing head, the lower section 2 is screwed onto the surface casing 3 after the latter shall have been set in proper position. Valves or other suitable conducting means are connected to the side outlets to control the flow of liquid therefrom. An adapter for blow-out prevention equipment is bolted to the top flange of the upper section 1, a tapered metal ring being inserted between the said top flange and the adapter. Suitable blow-out preventer equipment is then connected to the adapter flange. Any drilling operation that is desired can then be effected. When the tubing has been run to the desired depth, the hanger assembly consisting of the hanger, slip bowl, packing, inner tubing and supporting means, is put on the last joint of tubing, and lowered until the hanger rests in the tapered seat of the body. The weight of the tubing is then supported by the supporting means in the lower part of the hanger. The packing in the hanger packs off the area around the inner tubing to prevent flow of gas or oil and the packing in the hanger rests against the tapered bowl in the body.

The adjusting nut 46 on each of the segmental bolts is rotated to move each of the bolts into the groove 34 of the hanger, and thereby force the hanger firmly down upon the tapered seat 4 in the lower section of the tube body. This means that the hanger is packed off and held down. The blow-out equipment is then removed from the upper flange of the upper section 1.

The tubing is then rotated until the lower supporting means is released and the tubing lowered to the desired position. When the tubing is in the desired position the slip supporting means are put in place. Any portion of the inner tubing that may extend too high is cut off and the bonnet is put in place and bolted down to the body with a metal ring placed between the bonnet and the hanger.

What we claim is:—

1. A tubing head having the lower end secured to a casing and having an upwardly and outwardly flaring seat, a tubular hanger slidable in said head and having its lower end flared to fit said seat, means at the lower end of the hanger for detachably supporting an inner string of tubing in the hanger, and means in the upper part of the hanger for locking the said inner string in any desired position in the hanger.

2. A tubing head having the lower end secured to a casing and having an upwardly and outwardly flaring seat, a tubular hanger slidable in said head and having its lower end flared to fit said seat, said hanger being counter-bored to receive packing for the inner string and having its inner surface upwardly and outwardly flared above the packing counter-bore, a correspondingly flared slip bowl adjustable in said hanger to compress said packing, and segmental wedges in said slip bowl to lock the inner string in adjusted position in the hanger.

3. A tubing head having the lower end secured to a casing and having an upwardly and outwardly flaring seat, a tubular hanger slidable in said head and having its lower end flared to fit said seat, said hanger being counter-bored to receive packing for the inner string and having its inner surface upwardly and outwardly flared above the packing counter-bore, a correspondingly flared slip bowl adjustable in said hanger to compress said packing, segmental wedges in said slip bowl to lock the inner string in adjusted position in the hanger, and a bonnet clamped to the upper ends of said tubing head and hanger.

4. A tubing head having the lower end secured to a casing and having an upwardly and outwardly flaring seat, a tubular hanger slidable in said head and having its lower end flared to fit said seat, said hanger being counter-bored to receive packing for the inner string and having its inner surface upwarly and outwardly flared above the packing counter-bore, a correspondingly flared slip bowl adjustable in said hanger to compress said packing, segmental wedges in said slip bowl to lock the inner string in adjusted position in the hanger, a bonnet clamped to the upper end of said tubing head, said bonnet projecting inwardly over the top edge of said hanger, and sealing means clamped between the bonnet and the top edge of the hanger.

5. A tubing head having the lower end secured to a casing and having an upwardly and outwardly flaring seat, a tubular hanger slidable in said head and having its lower end flared to fit

said seat, said hanger being counter-bored to receive packing for the inner string and having its inner surface upwardly and outwardly flared above the packing counter-bore, a correspondingly flared slip bowl adjustable in said hanger to compress said packing, segmental wedges in said slip bowl to lock the inner string in adjusted position in the hanger, a bonnet clamped to the upper end of said tubing head, said bonnet projecting inwardly over the top edge of said hanger, the projecting portion of said bonnet and the upper edge of said hanger being provided with annular grooves, and a sealing ring clamped in said grooves between the bonnet and hanger.

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