

June 20, 1939.

W. L. CHURCH

2,163,422

TUBING CONTROL HEAD

Filed Dec. 30, 1935

2 Sheets-Sheet 1

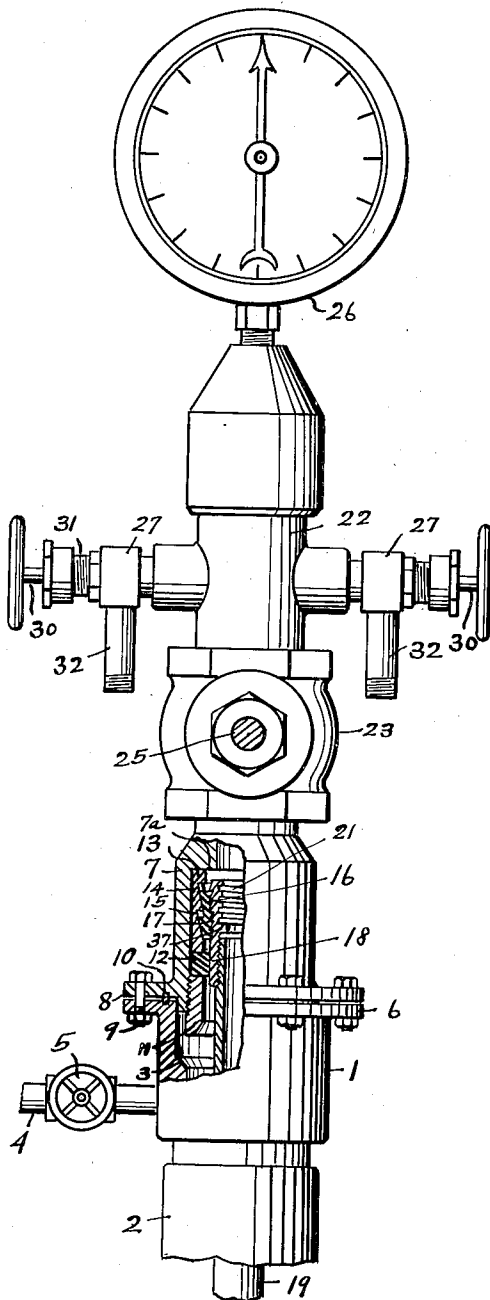


Fig. 1.

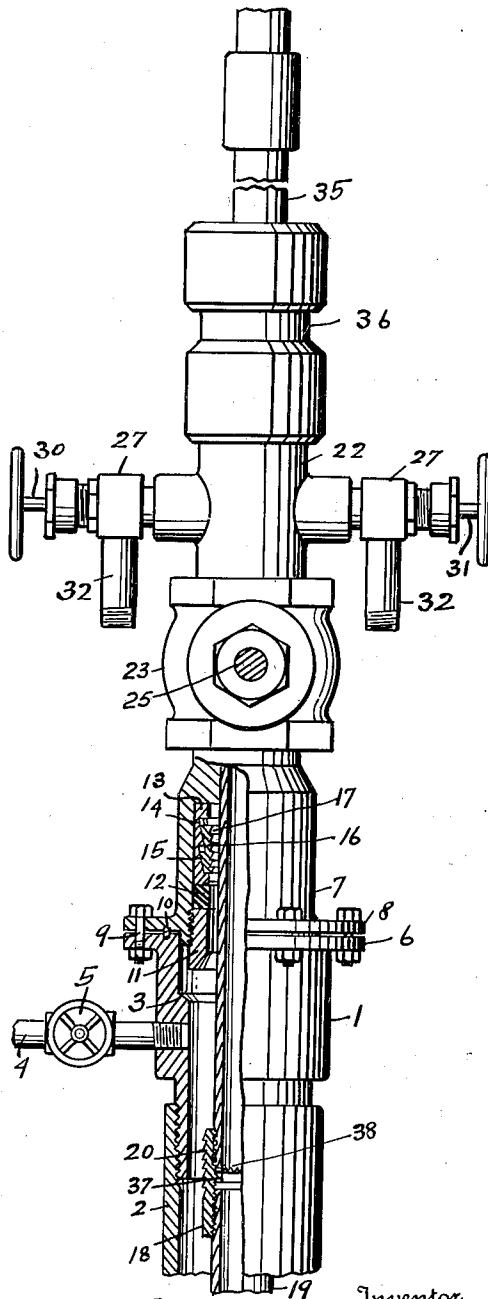


Fig. 2.

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2 Sheets-Sheet 2

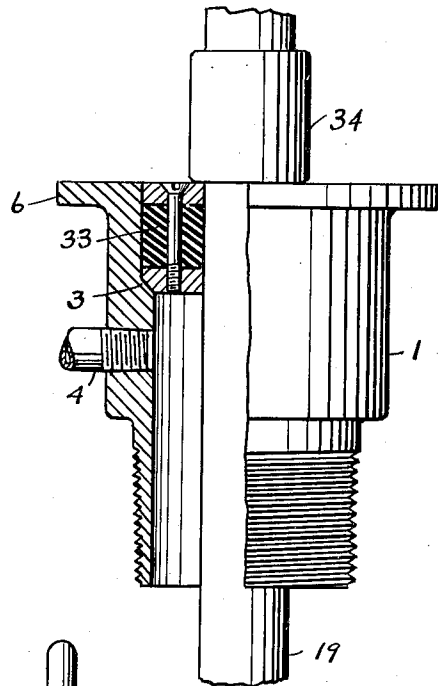
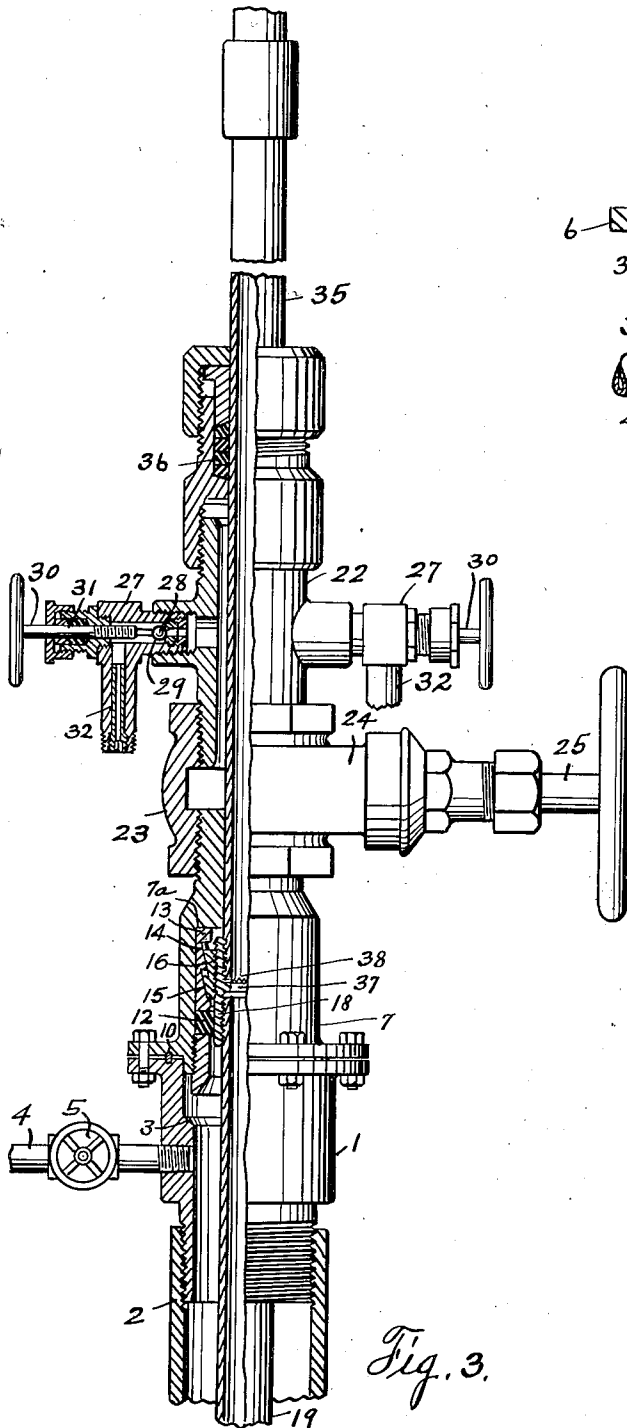


Fig. 4.

Fig. 3.

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TUBING CONTROL HEAD

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9 Claims. (Cl. 166—14)

This invention relates to a tubing control head.

An object of the invention is to provide a tubing head of the character described having a novel type of hanger therein for suspending the tubing from the head.

It is another object of the invention to provide a type of hanger which is of such construction that the hanger coupling connected to the upper end of the tubing may be lowered, with the tubing, to carry the coupling beneath the head to locate the tubing in proper position for washing the well, and to permit the tubing to be manipulated to set the packer at the upper end of the well screen; the said hanger and hanger coupling being of such construction that upon elevation of the tubing, the hanger and coupling will automatically engage to support the tubing in its permanent position in the well.

A further object of the invention is to provide, in combination with the hanger, a suitable packing arranged to support the hanger and to form a fluid-tight joint between the hanger and head.

This invention embodies certain improvements over those disclosed in United States Patents previously issued to me, No. 1,888,550, issued on November 22, 1932, for Control head, and No. 1,944,545, issued on January 23, 1934, for Tubing head.

With the above and other objects in view the invention has particular relation to certain novel features of construction, arrangement of parts, and use, an example of which is given in this specification and illustrated in the accompanying drawings wherein:

Figure 1 shows a vertical sectional view of the complete tubing head, shown partly in section, with the tubing suspended therefrom.

Figure 2 shows a vertical sectional view, partly in section, showing the hanger collar beneath the hanger with the parts in position for washing the well or setting the packer.

Figure 3 shows a vertical, sectional view, shown partly in section, showing the tubing and hanger in position with the lowering string ready to be detached, and

Figure 4 shows an enlarged side view, partly in section, of the casing head and packer employed while lowering the tubing in the well.

Referring now more particularly to the drawings wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates a casing head adapted to be connected to the casing 2, located in a well, and having the inside seat 3. The casing head has an outlet line 4 leading outwardly therefrom be-

neath the seat and which is controlled by the valve 5. The casing head is provided with an annular outwardly extending flange 6 at its upper end.

On the casing head there is a tubing head 7 whose lower-end has an outwardly extended flange 8 adapted to rest on the flange 6, said flanges being secured together by the bolts 9. The lower end of the tubing head fits closely within the upper end of the casing head and between the flanges above referred to there is a leak-proof gasket 10. Screwed within the lower end of the tubing head there is a nipple 11 whose lower end is outwardly flared and whose upper end forms a seat for an annular packing 12 which fits closely within the tubing head.

On the packing 12 there is an adapter 13 having the upper and lower downwardly tapering faces 14 and 15 and mounted in the spider are the slips 16 having external upper and lower downwardly tapering faces to fit against the faces 14, 15, and the inner sides of the slips have the teeth 17 in the form of upwardly pitched, righthand buttress threads. The upper end of the adapter 13 abuts the inside shoulder 7a in the tubing head.

There is a hanger collar 18 adapted to be connected to the upper end of the tubing 19. The upper end of the collar has the right hand downwardly pitched external teeth 20 and the inside coarse right hand threads 21. The adapter 13, slips 16, and coupling 18, form a hanger for the tubing when the teeth 20 are engaged with the teeth 17, as shown in Figure 1. There is a T-connection 22 connected to the upper end of the tubing head by means of a valve casing 23 and in this valve casing there is mounted the conventional gate valve designated generally by the numeral 24 and which may be manipulated by the valve stem 25.

A suitable gauge 26 is mounted on the upper end of the T-connection 22 when the equipment is installed and completed ready for operation.

Connected into the lateral branches of the T-connection 22 are the flow connections 27, 27, each having an inside valve seat 28 controlled by the outwardly opening valve 29 and these valves may be opened and closed by suitable manipulation of the valve stems 30, 30, which work through suitable stuffing boxes 31 in the outer ends of said flow connections. These flow connections 27 are provided with suitable outlet chokes 32, 32, and which are connected into the conventional outflow lines, not shown.

When it is desired to lower the tubing 19 into the well, preparatory to completing the well, the

tubing head 7 and the appendants thereon are removed from the casing head, or have not yet been connected onto the casing head. While the tubing is being lowered, a conventional packing 33 usually formed of two complementary sections, is seated on the seat 3 and the tubing is lowered through it. Just before the coupling 34, connecting the sections of the tubing, reaches the casing head, the packing 33 is removed to permit the coupling to pass and is then replaced. This packing is provided so that in case a blowout is threatened, the tubing may be lowered and the coupling landed on the packing, as shown in Figure 4, to prevent such blowout, and the valve 5 may then be opened to relieve the internal pressure in the well. The hanger coupling 18 is connected to the top of the tubing.

It is to be understood that a well screen of conventional construction is to be set in the well opposite the oil-bearing strata and is connected to the lower end of the tubing and that at the upper end of the screen there is a conventional packer and setting tool, well known to those familiar with the art of well drilling, which packer is capable of being expanded against the walls of the bore to form a fluid-tight seal at the upper end of the screen or at the upper end of the liner to which the screen is connected.

The tubing 19 is completed to the required length by successively adding sections to the upper end thereof and lowering the tubing into the well, the final sections to be added being cut to the required length so that the overall length of the tubing and the screen will be that required for the depth of the well.

When the tubing is made up to the required length and the hanger coupling 18 is connected to the upper end thereof, the packing 33 may be removed and pipe engaging slips inserted instead thereof to support the tubing suspended in the well with the coupling 18 the required distance above the casing head 1. A lowering string 35 may be then inserted through the T-connection 22 with a stuffing box 36 therearound and connected to the upper end of said T and the lower end of the string 35 may be screwed into the coarse threads 31 and the slips removed and the tubing head 7 then bolted in place on the casing head 1, as shown in Figure 3. While the tubing head 7 is being lowered, the slips 16 will move upwardly and outwardly so as to clear the teeth 20 and when the tubing head finally lands in position, the slip teeth will interlock with said teeth 20. The letting-in string 35 is handled by the traveling block in the derrick in the usual way.

The string 35 may now be turned to the right and the hanger coupling 18 will be screwed out of the slips 13 on account of the righthand pitch of the intermeshing teeth and the tubing 19 may then be lowered into the position shown in Figure 2 and the screen may then be washed by forcing clean washing fluid down through the setting string 35 and tubing 19 until the screen is washed clean and the packer may then be set by suitable manipulation of the tubing 19, and the tubing may then be elevated to carry the hanger coupling 18 up into the position shown in Figure 3 whereupon the teeth 20 will engage with the inside teeth of the slips 16 and the tubing 19 will thereby be supported in the well.

While washing the well, as hereinabove explained, the valve 24 may be closed and the washing fluid returned up around the tubing 19 and out through the outlet line 4.

It is to be noted that the hanger coupling 20

has an inside annular ledge 37 and the lower end of the string 35 has teeth, as 38, adapted to engage said ledge to prevent the threads of the string 35 from screwing up too tightly in the collar 18. When the tubing 19 is finally supported from the hanger, the string 35 may be turned to the left and unscrewed from the coupling 18 and removed and the stuffing box 36 may be detached from the upper end of the T-connection 22 and the gauge 26 screwed in place on said T-connection, as shown in Figure 1, and the installation thus completed.

The well is thus under control while the well is being washed and the packer set, and in case of a threatened blow-out the collar 18 may be raised and engaged in the slips 16, the string 35 detached and elevated, and the well controlled by the valves 5 and 24. Thereafter the flow of liquid from the well, either through the tubing 19 or the casing 2, may be controlled by a suitable manipulation of the valves 5, 24, and 29.

The drawings and description disclose what is now considered to be preferred forms of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. A control head comprising a tubular casing head, a tubing head thereon having an inside seat, an annular packing on the seat, a slip assembly on the packing, a hanger coupling adapted to be connected to a tubing, said coupling and slip assembly having interlocking means releasable upon rotation of the coupling, and engageable upon longitudinal upward movement of the coupling relative to said assembly.

2. A control head comprising a tubular casing head adapted to be connected to a casing in a well, a tubing head on the casing head, a tubing hanger in the tubing head, said hanger including interlocking parts arranged to be released upon rotation of one of said parts to permit the tubing to descend, said interlocking parts being arranged to reengage upon the subsequent elevation of the tubing.

3. A control head comprising a tubular casing head adapted to be connected to a casing in a well, a tubing head on the casing head, a tubing hanger in the tubing head, said hanger including interlocking parts arranged to be released upon rotation of one of said parts to permit the tubing to descend, said interlocking parts being arranged to re-engage upon the subsequent elevation of the tubing, and packing arranged to support the hanger and to close the space between the hanger and tubing head.

4. In combination, a casing head, a tubing head on, and detachably secured to, the casing head, an annular seat in the tubing head, an annular packing on the seat, a slip adapter on the packing, a slip in the adapter, a hanger coupling engaged by the slip and adapted to support a tubing.

5. In combination, a casing head, a tubing head on, and detachably secured to, the casing head, an inside seat in the tubing head, an annular packing on the seat, a slip adapter on the packing, a slip in the adapter, a hanger coupling engaged by the slip and adapted to support a tubing, said slips and coupling having interengaging parts which are releasable upon rotation and downward movement of the coupling relative to the slip to permit the coupling and tubing to descend.

6. In combination, a casing head, a tubing head on, and detachably secured to, the casing head,

an annular seat in the tubing head, an annular packing on the seat, a slip adapter on the packing, a slip in the adapter, a hanger coupling engaged by the slip and adapted to support a tubing, said slip and coupling having interengaging parts which are releasable upon rotation of the coupling relative to the slip to permit the coupling and tubing to descend, said interengaging parts being shaped to reengage upon subsequent elevation of the coupling.

7. In combination a casing head, a tubing head on, and detachably secured to, the casing head, an annular seat in the tubing head, an annular packing on the seat, a slip adapter on the packing having upper and lower, downwardly tapering faces, slips having external, upper and lower, downwardly tapering faces to fit against the adapter faces, a hanger coupling engaged by the slips and adapted to support a tubing.

8. In combination a casing head, a tubing head on, and detachably secured to, the casing head, an annular seat in the tubing head, an annular packing on the seat, a slip adapter on the packing having upper and lower, downwardly taper-

ing faces, a slip having external, upper and lower, downwardly tapering faces to fit against the adapter faces, a hanger coupling engaged by the slip and adapted to support a tubing, said slip and coupling having interengaging parts which are releasable upon rotation and downward movement of the coupling relative to the slip to permit the coupling and tubing to descend.

9. In combination a casing head, a tubing head on, and detachably secured to, the casing head, an annular seat in the tubing head, an annular packing on the seat, a slip adapter on the packing having upper and lower, downwardly tapering faces, slips having external, upper and lower, downwardly tapering faces to fit against the adapter faces, a hanger coupling engaged by the slips and adapted to support a tubing, said slips and coupling having interengaging parts which are releasable upon rotation and downward movement of the coupling relative to the slips to permit the coupling and tubing to descend, said interengaging parts being shaped to reengage upon subsequent elevation of the coupling.

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