Oct. 8, 1935. A. J. PENICK ET AL 2,016,454

WELL HEAD

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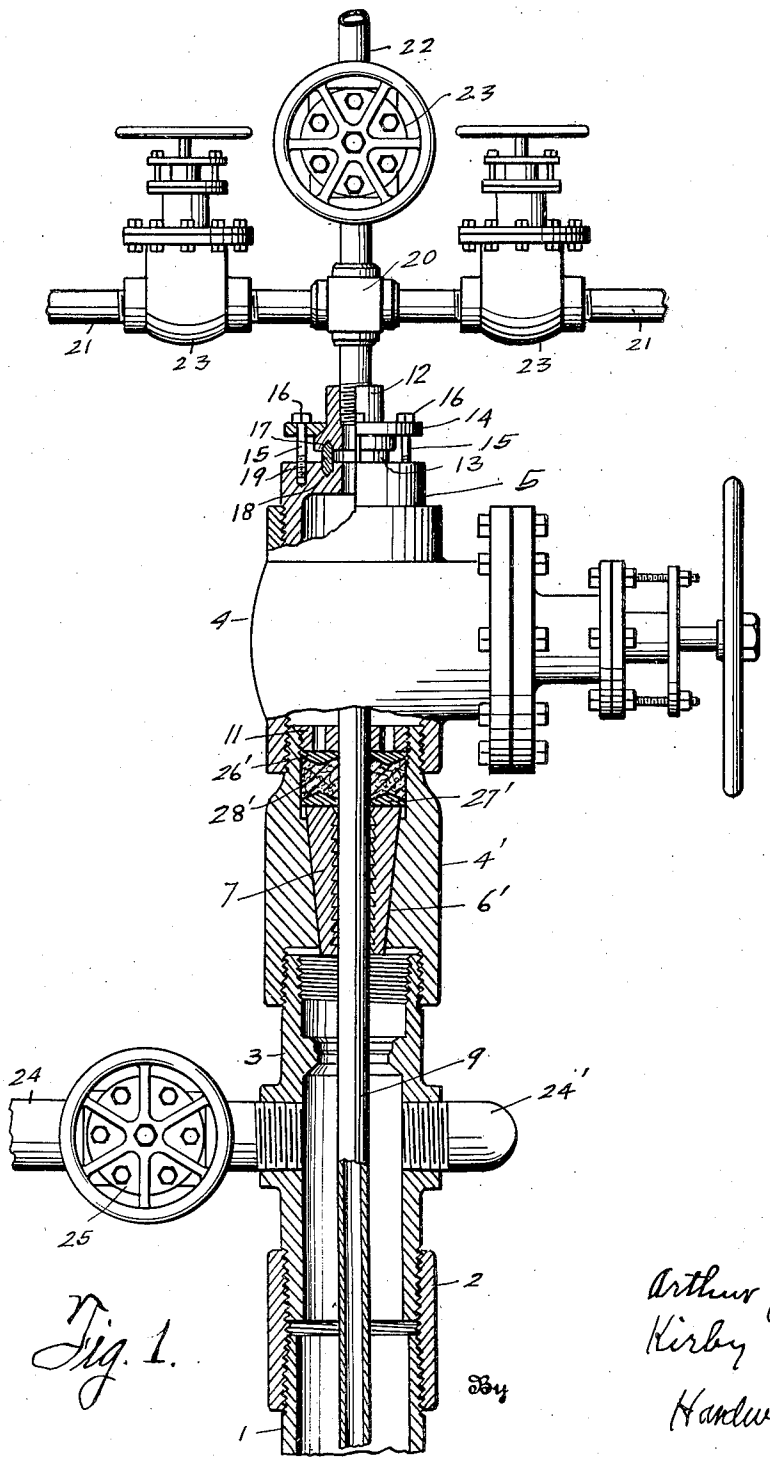

Fig. 1.

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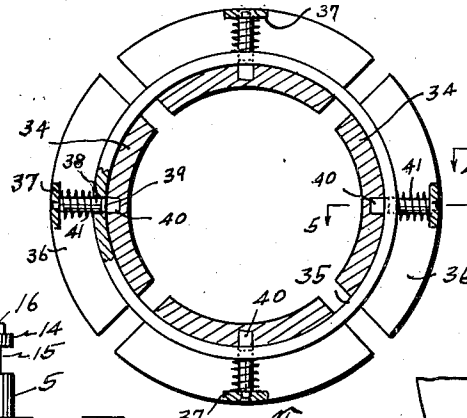

Fig. 4.

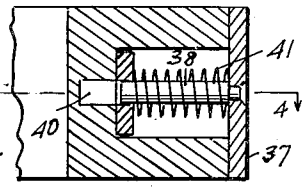

Fig. 5.

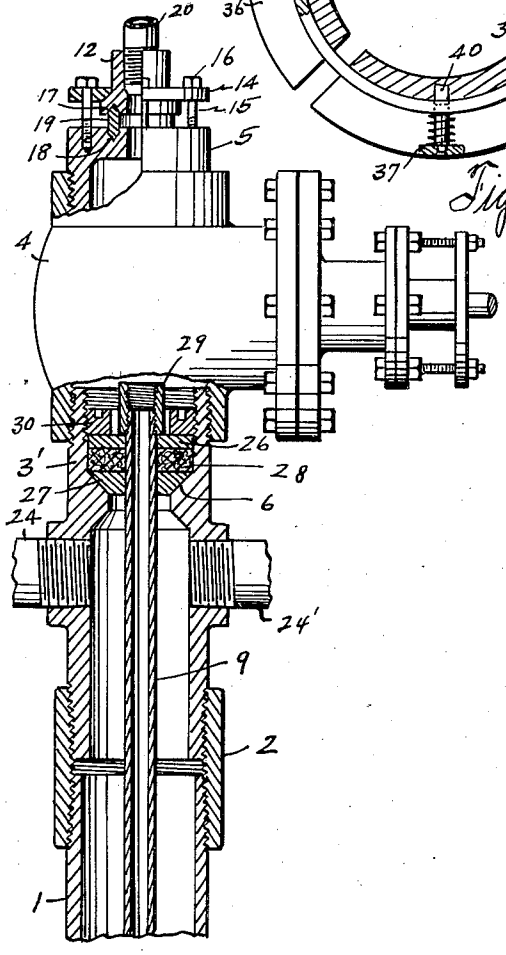

Fig. 2.

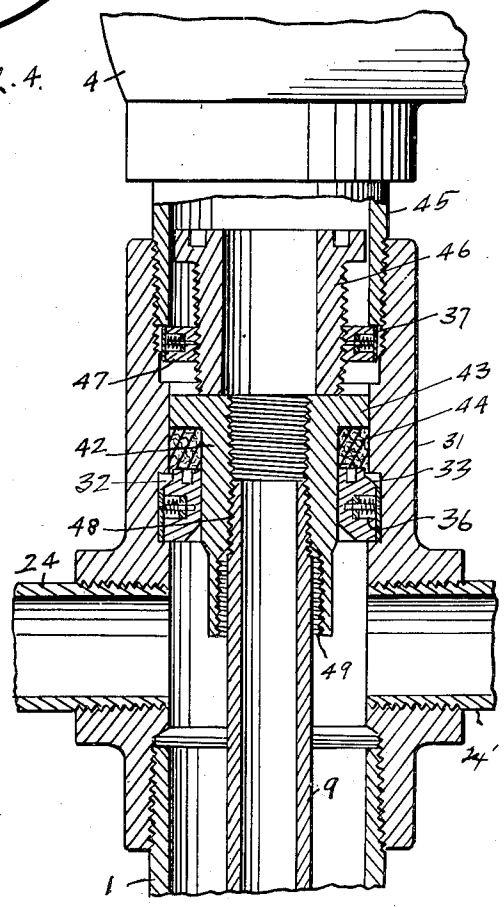

Fig. 3.

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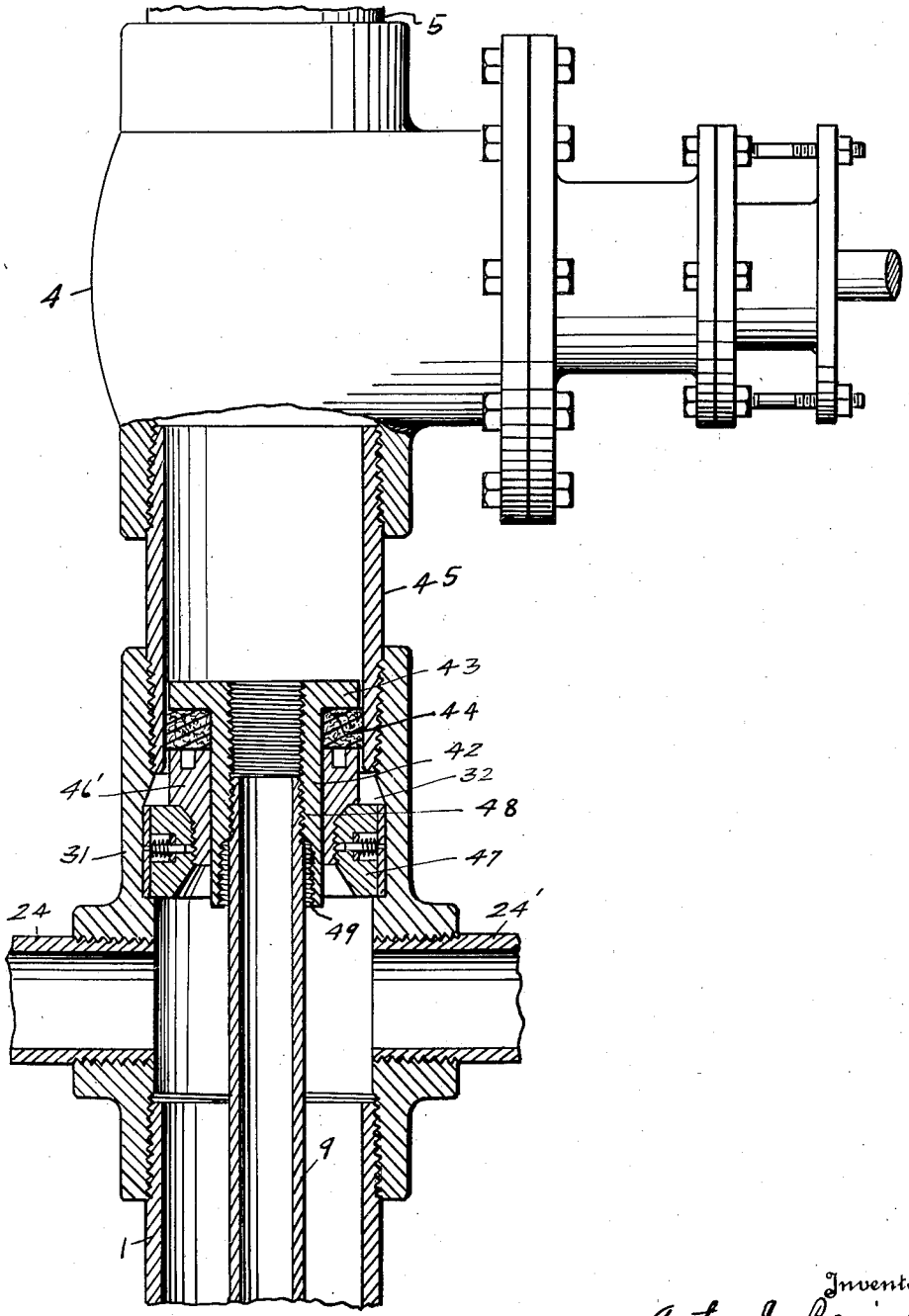

Fig. 6.

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Patented Oct. 8, 1935 2,016,454

UNITED STATES PATENT OFFICE

2,016,454

WELL HEAD

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Application May 25, 1931, Serial No. 539,841

14 Claims. (Cl. 166—14)

This invention relates to a well head.

One object of the invention is to provide a head of the character described adapted to be connected to the upper end of a pipe or casing in a well bore for the purpose of supporting a pump tubing or other tubing, suspended in the well.

Another object of the invention is to provide a well head equipped with novel means for supporting tubing therein and having a control valve incorporated therein above the upper end of the supported tubing, whereby the well may be closed in case strong internal pressure is encountered or whenever it may be desired to close the well against the outward flow of fluid from the well up through the head, for example for the purpose of making repairs or replacements to the fittings above.

Another object of the invention is to provide a well head of the character described having a Christmas tree or other similar pipe connection mounted to swivel thereon about an approximately vertical axis so that said Christmas tree or other connections may be positioned and secured in any desired position.

A still further feature of the invention resides in the provision, in a well head, of novel means for supporting a tubing in the well, said means forming a fluid tight joint with the tubing and with the head, so that there will be no flow of fluid from within the casing above the tubing suspending means.

A still further object of the invention is to provide a well head of the character described having removable means therein for suspending and anchoring the tubing in the well, said head having an inside diameter substantially equal to the inside diameter of the casing or pipe to which the head is attached to the end that when said tubing suspending means and tubing are removed from the head the head will provide ample room for carrying on operations therethrough in the well.

It is another object of the invention to provide a well head assembly with the tubing connected thereto and with flow lines leading therefrom in such manner that the fluid from the casing and tubing may be taken off separately.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts, examples of which are described in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a side elevation of one form of the head shown partly in section.

Figure 2 shows a fragmentary side view of another form of the head shown partly in section.

Figure 3 shows a fragmentary side view partly in section, of still another type.

Figure 4 shows an enlarged horizontal sectional view of a type of suspending means employed, taken on the line 4—4 of Figure 5.

Figure 5 shows a fragmentary vertical sectional view taken on the line 5—5 of Figure 4, and

Figure 6 shows an enlarged fragmentary vertical sectional view of a slightly modified type of the form shown in Figure 3.

Referring now more particularly to the drawings wherein like numerals of reference designate similar parts in each of the figures, the numeral 1 designates the pipe or casing in a well bore. Attached to the upper end of said pipe preferably by means of a coupling 2 there is the main, tubular, body 3, connected to the upper end of which there is a slip bowl 4' whose upper ends supports a gate valve 4 having the swivel adapter 5 attached to the upper end thereof. The bowl 4' has an internal, downwardly converging seat 6' in which may be located the downwardly tapering slips 7 forming a tubing hanger and the inner faces of these slips may be provided with tubing engaging teeth 8 adapted to engage around the tubing 9 to be supported on the slips 7. There is a gland composed of upper and lower annular plates 26' 27' with a packing ring 28' between them, said gland fitting closely around the tubing. A ring nut 11 may be threaded into the upper end of the bowl 4' against the upper plate 26' to secure the gland and slips in place and to expand the packing ring 28' outwardly against the surrounding walls of the bowl 4' and inwardly around the tubing 9 to form fluid tight joints.

Upon the swivel adapter 5 there is a top outlet union 12 whose lower end is enlarged as at 13 and on said enlarged portion is an annular, loose, flange 14 which is retained in place by the set bolts 15 through said ring and screwed into the swivel adapter 5 and whose ends have the heads 16 which engage the flange 14.

The lower end of the union 12 and the upper end of the adapter 5 have the facing annular grooves 17, 18 in which is seated a suitable sealing ring 19 to form tight joints in said grooves.

A suitable connection such as a Christmas tree 20 having the lateral branches 21, 21 and the upstanding branch 22, may be connected to said union 12, said branches being equipped with suitable control valves 23. Any other type of connection than that shown may be connected

to the union 12. In case it be desired to adjust said Christmas tree or other connection about a vertical axis, the bolts 15 may be loosened and the desired adjustment accomplished and said bolts again tightened. The fluid flowing upwardly from the well may flow up through the tubing 9 and on up through the swivel adapter 5 and through the connection attached to the union 12.

The tubing in the well may be readily removed by detaching the swivel adapter 5 and the appendants thereof and by removing the ring nut 11.

Beneath the seat 6' the body 3 has a flow line 24 through which fluid outside of the tubing 9 may be relieved from the well and the line 24 may be controlled by a suitable valve 25.

In the form shown in Figure 2 the valve 4 is connected directly to the body 3' and said body has an internal seat 6 beneath the valve 4 and which preferably converges downwardly. In this type there is a tubing-hanger seated with the body 3' and resting on said seat, said hanger being in the form of a gland composed of the upper and lower plates 26, 27 with the packing ring 28 between them. In this form the upper end of the tubing 9 extends through said gland and has a coupling 29 thereon which rests on said upper plate 26 to support the tubing 9. The gland is secured in place by means of a ring nut 30 which is screwed in the body 3' against the plate 26. The weight of the tubing 9 on said gland will expand the packing ring 28 both against the inner wall of the body 3' and against the tubing 9 and form fluid tight joints with said body and tubing. In other respects the form shown in Figure 2 is substantially the same as that shown in Figure 1.

In Figure 3 there is shown another type of body and still another form of the means for suspending the tubing 9 from and securing the same to the body, which will now be described:—In this form the body 31 has an internal annular channel 32 above the flow line 24 and beneath the valve 4. In this channel there is seated an expansible, removable, support which will be designated by the numeral 33 in Figure 3. This support is formed of a plurality of sections 34, arcuate in horizontal cross sectional contour. These sections are held in assembled relation by means of a ring 35 seated in an external groove 36 around said sections. Welded or otherwise secured to each section there is a bar 37 across the groove 36 and a guide rod 38 has its outer end anchored to said bar with its inner end working through a bearing 39 in the ring 35 and in alignment with an external socket 40 in said section. A coil spring 41 surrounds each rod 38 and bears at one end against the bottom of the groove 36 and at its other end against the corresponding bar 37. In each form a connection for an additional flow line is provided and shown as being closed by the bull plug 24'.

In assembling when it is desired to seat the support 33 in the channel 32 the sections 34 of said support may be contracted together by any suitable implement provided for the purpose and lowered into the body 31 with the springs 41 compressed and when said support is landed in its proper position, it may be released and the springs 41 will expand said sections of the support outwardly into position in the channel 32. The tubing 9 may then be lowered into the well with the tubular nipple 42 connected to the upper end thereof and forming the hanger therefor. The upper end of this nipple has a flange 43 which seats on an annular packing ring 44 around said nipple and on the support 33 and this packing forms a seal between said nipple 42 and the body 31. In this form of the device the valve 4 is shown connected into the body beneath by means of a tubular nipple 45 which is screwed into said body 31 and there is a tubular gland 46 threaded through a sectional nut 47 and whose lower end abuts the upper end of the nipple 42 to retain the same in place. The nut 47 is constructed in all essential particulars like the support 33 shown in Figure 4 but has the internal threads so that the gland 46 may be threaded therethrough.

In case it be desired to remove the tubing 9 for further operations in the well or for any other purpose the connections above the valve 4 may be removed and the gland 46 unscrewed from the nut 47 and removed and said nut may then be contracted and withdrawn through the nipple 45. The tubing 9 may then be withdrawn from the well in the manner hereinabove indicated and the support 33 contracted and removed. When this is done, operations in the well may then be carried on through the body 31 which has a large inside diameter substantially the same as the inside diameter of the well casing 1. In this form of the apparatus the body 31 may be screwed directly onto the upper end of the well casing 1 if desired, as shown.

The form shown in Figure 6 is a slight modification of the form shown in Figure 3, wherein the nut 47 is seated in the channel 32 of the body 31. In this form the gland 46' is threaded through the nut 47 and its upper end forms a support for the packing ring 44 which in turn supports the flange 43 of the hanger nipple 42 in this form when the tubing 9 and the supporting means therefor are removed from the body operations may be carried on through said body as hereinabove explained.

It is to be noted that in the form shown in Figures 1 and 2 the coupling 29 is internally threaded at its upper end and in the other forms shown the hanger nipple 42 is internally threaded. Provision is thus made for lowering and withdrawing the tubing 9. A joint of pipe or tubing above may be threaded into said coupling 29 or hanger nipple 42 and used in the operations of elevating and lowering the tubing.

The hanger nipple 42, as will be noted, is provided with two sets of threads 48, and 49, which are similar but of different diameter in order to receive tubing of different sizes.

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

What we claim is:

1. A well head having an inside groove, an expansible seat in the groove for supporting a tubing, means on the seat and attached to the tubing for supporting said tubing from said seat, an inside abutment in the head above the seat, and means between the abutment and tubing supporting means, and having a threaded connection with the former for locking the latter in position.

2. A well head having a lower and an upper abutment, a radially expansible, removable support on the lower abutment, means attached to, and supporting, a tubing on said support and vertically adjustable means between the upper abut-

ment and tubing supporting means for locking the latter in position.

3. A well head having internal channels, one above the other, an expansible support seated and locked in one of said channels, an expansible retainer in the other channel, and means on the support beneath said retainer for suspending a tubing.

4. A well head having an inside abutment, an expansible support on said abutment, means on said support for suspending a tubing, an expansible nut anchored in the head above said tubing suspending means and a retainer threaded through said nut and securing the tubing suspending means in place.

5. A tubular well head adapted to be connected to a casing in a well, a valve thereon, a tubing hanger in the head, a removable support and a removable locking device for supporting and locking the hanger in the head beneath said valve, said hanger, support and locking device being insertable and removable through the valve.

6. A tubular well head having an inside annular channel, an expansible support formed of sections and mounted in and removable from said channel, a tubular tubing hanger on the support and an expansible packer around the hanger.

7. The combination with a tubular head, of a valve above the head to open and close the passageway through the head, an inside abutment beneath the valve, said head having an outlet beneath the abutment, a support formed to be contracted to allow it to be passed through the valve and being capable of being expended to cause it to engage and land on said abutment, when so lowered and expanded, a packer on the support, a hanger having an external flange which rests on the packer and from which a tubing may be suspended.

8. The combination with a casing in a well, of a valve above and connected to the casing to open and close the passageway through the casing, the wall of the passageway having an inside abutment beneath the valve, a support formed to be contracted to allow it to be passed through the valve and being capable of being expanded to cause it to engage and land on said abutment, when so lowered and expanded, an annular packer on the support, a hanger having an external flange which rests on the packer and from which a tubing may be suspended.

9. The combination with a tubular member adapted to be set in a well and having an inside groove, of a contractile tubing support insertable, when contracted, into said tubular member, said support being expansible, upon such insertion, to engage in and be retained in position by, said groove and a tubular tubing hanger on said support and having surrounding packing to form a close fitting joint with the tubular member.

10. The combination with a tubular member of approximately uniform inside diameter, of a valve incorporated therein and arranged to open and close the passageway through said member, a supporting seat in said tubular member beneath the valve and of larger diameter than the inside diameter of said tubular member, a contractile support insertable, when contracted, into said member and through said valve, said support being expansible, upon such insertion, to engage and be retained in position by said seat, an annular packing on the support and a tubing hanger having a surrounding flange on the packing.

11. A tubular well head having an inside annular abutment forming a seat, a radially expansible support on said abutment, an annular packing on the support, a tubing hanger extended through the support and having an external annular flange which rests on said packing.

12. A tubular well head having an inside annular abutment forming a seat, a radially expansible support on said abutment, an annular packing on the support, a tubing hanger extended through the support and having an external annular flange which fits closely within the head and rests on the said packing.

13. A tubular well head having an inside annular abutment, an annular radially expansible support on said abutment, an annular packing on the support, fitted closely within the head, a tubular tubing hanger extended through the packing and support and having an external flange which rests on said packing, and means vertically adjustable in the upper end of the head and engaging the upper end of the hanger, securing the same on the said packing.

14. A tubular well head having an inside annular abutment forming a seat, a radial expansible support on said abutment, an annular packing on the support, a tubing hanger extended through the support and having an enlarged, downwardly facing shoulder which rests on said packing.

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