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A. J. PENICK ET AL

2,254,752

WELL HEAD ASSEMBLY

Filed Sept. 25, 1937

4 Sheets-Sheet 1

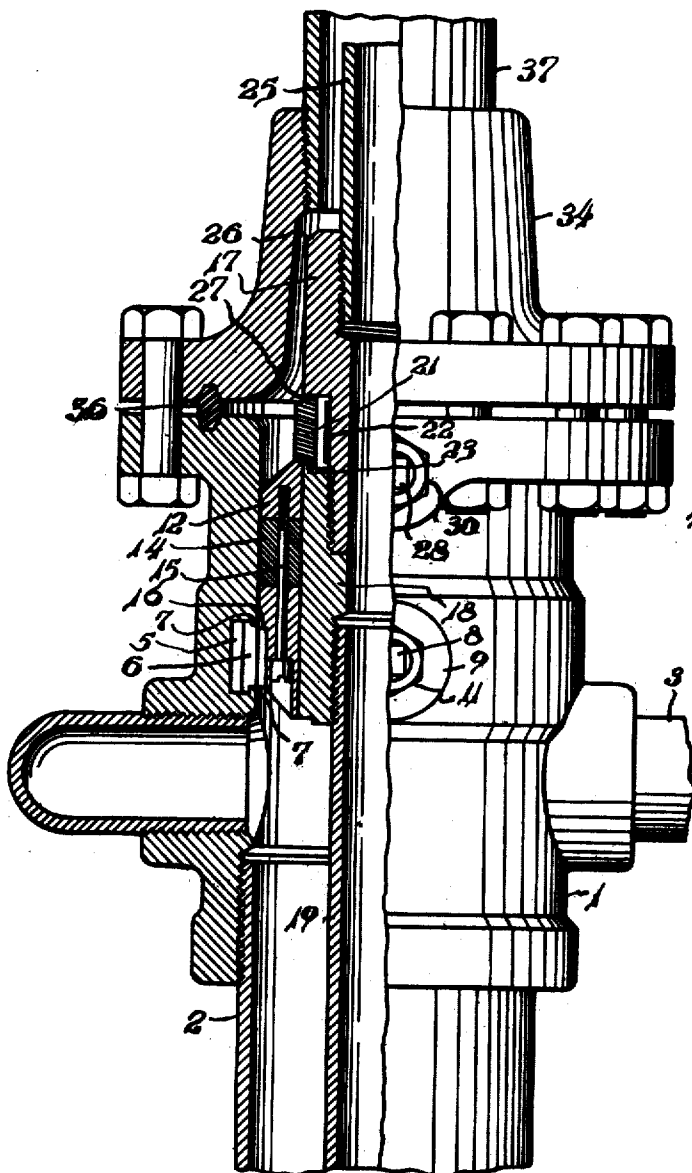


Fig. 1.

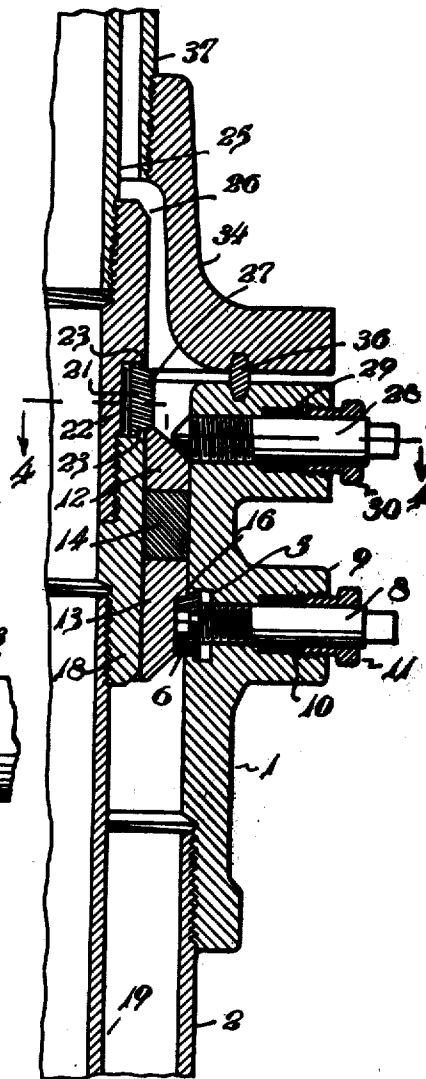


Fig. 2

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4 Sheets-Sheet 2

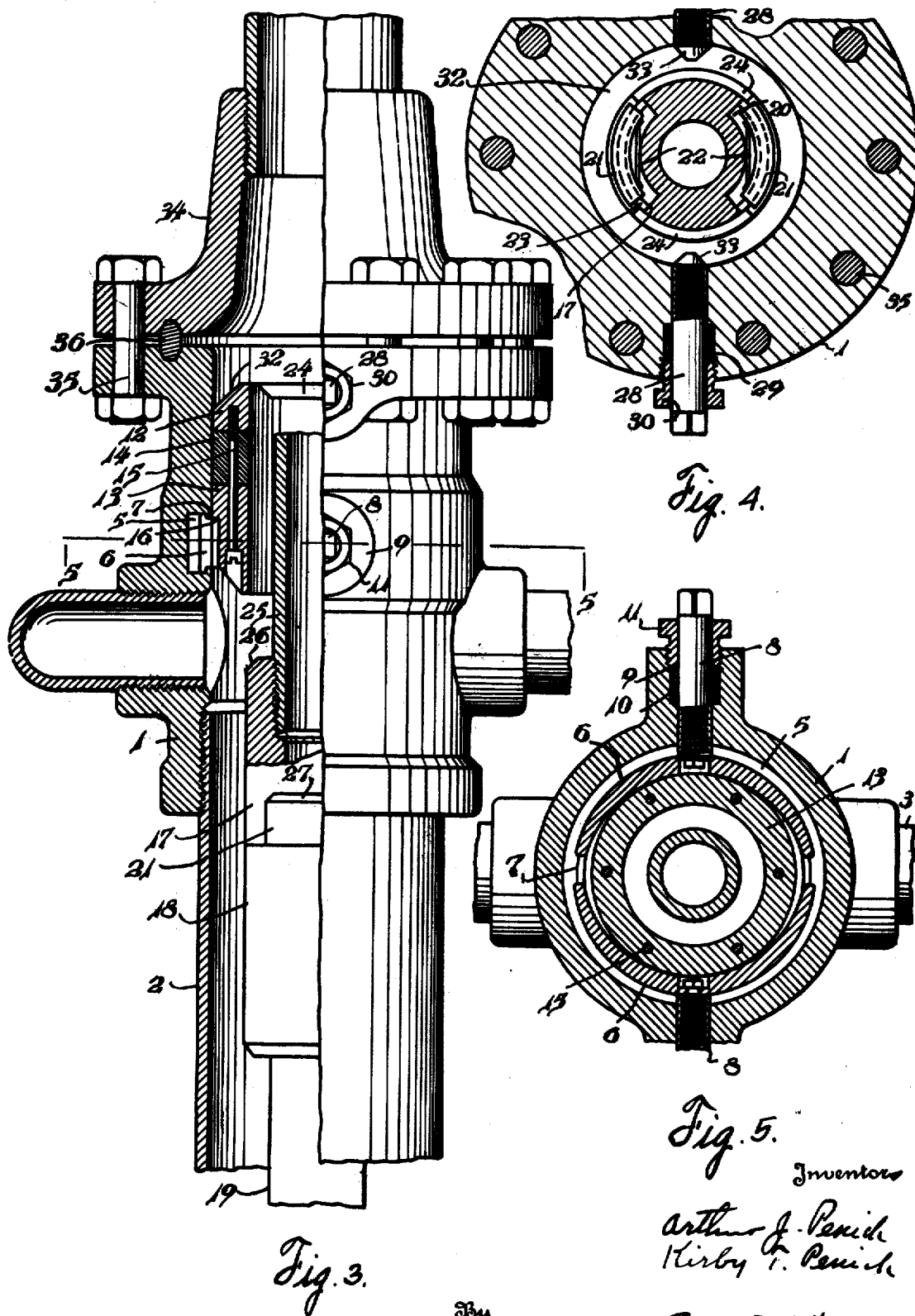


Fig. 4.

Fig. 5.

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4 Sheets-Sheet 3

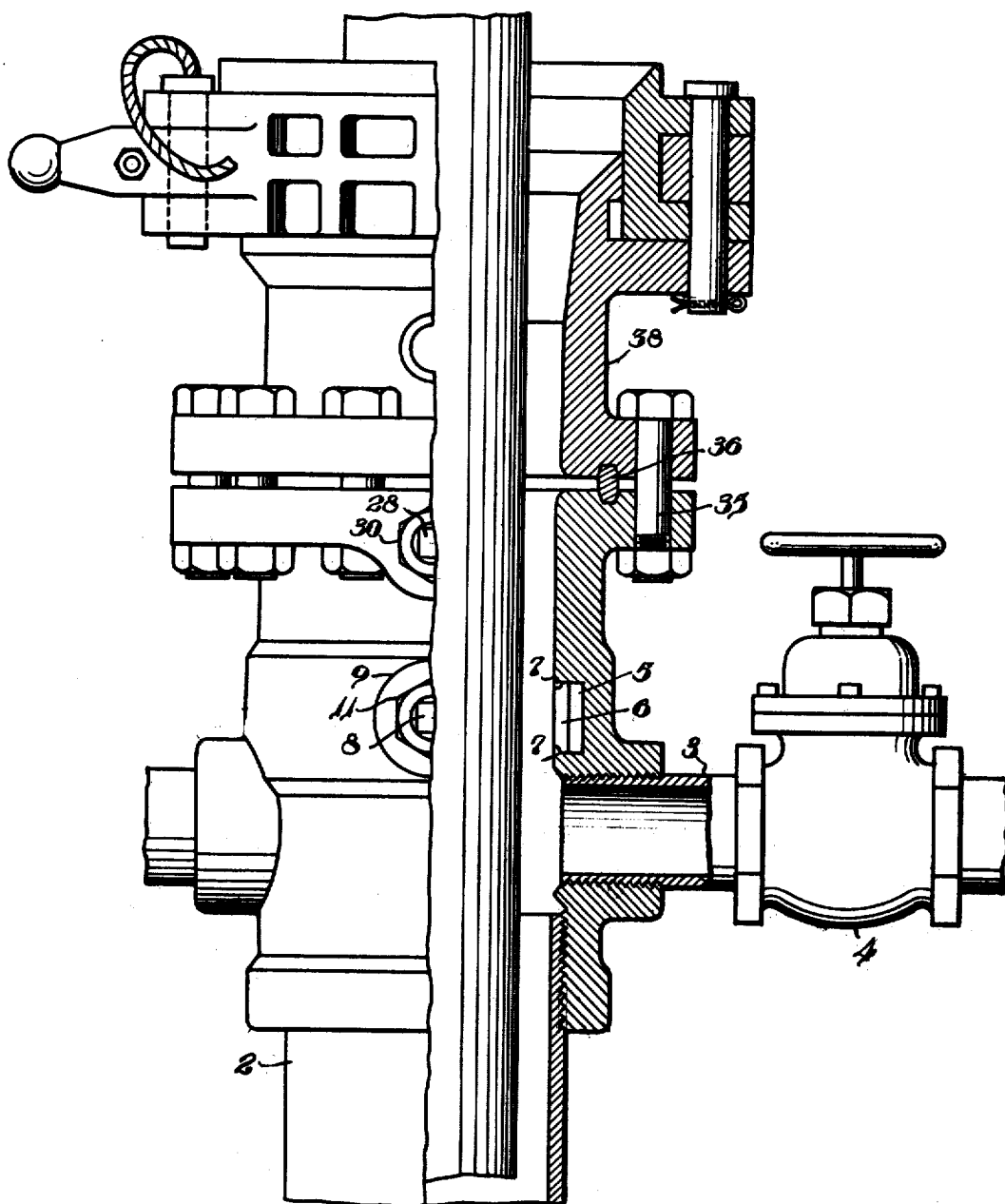


Fig. 6.

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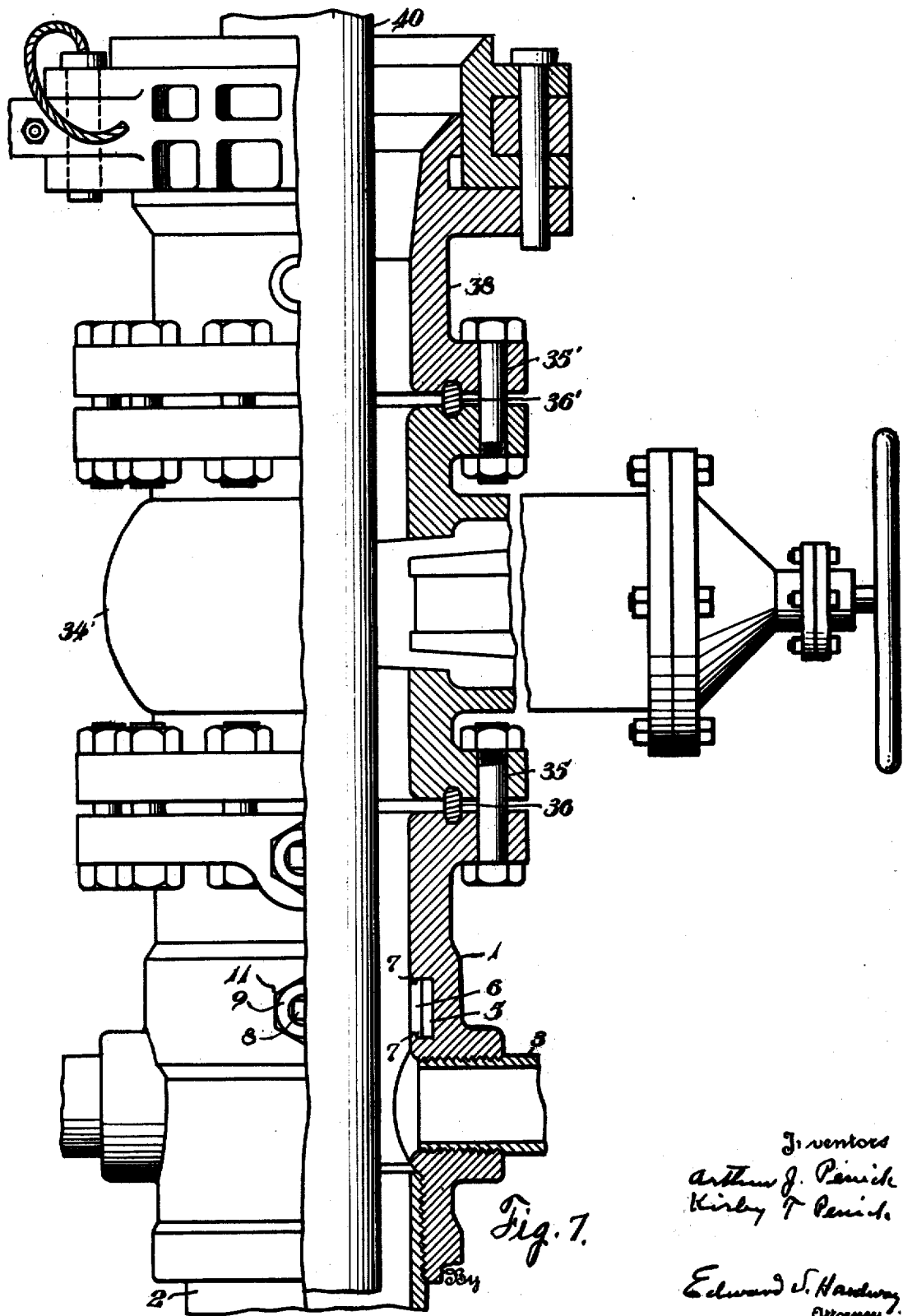
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4 Sheets-Sheet 4



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WELL HEAD ASSEMBLY

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Application September 25, 1937, Serial No. 165,639

6 Claims. (Cl. 166-14)

This invention relates to a well head assembly.

An object of the invention is to provide, in a well head assembly, a novel type of tubing hanger for supporting a tubing in the well casing.

Another object is to provide in a well head assembly a novel type of support for the tubing hanger of such formation as to permit the hanger to pass therethrough, when it is desired to lower the tubing into the well to wash the well, said support and hanger being also formed to be interengaged when it is desired to suspend the tubing from the support.

A still further object of the invention is to provide a novel type of locking means whereby the support may be securely anchored against upward or downward movement in the casing head.

It is another object of the invention to provide, in a well head assembly, a casing head having an inside diameter not less than that of the casing beneath with retractable segments therein for sustaining the hanger support, and which may be retracted upon removal of the hanger and hanger support from the casing head to the end that the casing head will admit drilling apparatus into the well, or other apparatus for working in the well, without restricting the casing.

A still further object is to provide, in a well head assembly, the combination with a novel type of casing head, of a blowout preventer thereon, either with or without an intervening control valve, said casing head, and blowout preventer, and valve, if the latter is used, having an inside diameter not less than that of the casing beneath.

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

Figure 1 shows a side elevation, partly in section, showing the tubing in suspended position in the well.

Figure 2 shows a fragmentary vertical sectional view taken at right angles to the view shown in Figure 1.

Figure 3 shows a side view, partly in section, showing the tubing hanger lowered through the hanger support.

Figure 4 shows a transverse sectional view taken on the line 4-4 of Figure 3.

Figure 5 shows a transverse sectional view taken on the line 5-5 of Figure 3.

Figure 6 shows a side elevation, partly in section, showing the casing head with the supporting segments retracted, with a blowout preventer on the head, and showing the tubing, tubing hanger and hanger support removed, and

Figure 7 shows a view similar to that shown in Figure 6, with a controlling valve interposed between the casing head, and blowout preventer.

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 upper end of the casing 2, and having a flow line 3 leading outwardly therefrom into which may be incorporated the control valve 4.

The casing head is of approximately the same inside diameter as that of the casing beneath and above the flow line 3, has the annular inside channel 5 to receive the arcuate, oppositely arranged segments 6, 6.

These segments may be inserted into place and the upper and lower annular ribs 7, 7, may then be formed by welding around the inner margin of the groove 8 to form stops to limit the inner movement of the segments. Adjusting rods 9, 9, are threaded through the wall of the casing head and their inner ends have swiveling connections with the respective segments 6 where- by said segments may be adjusted inwardly into supporting position, or outwardly to clear the passageway through the casing head. Around the rods 9 and located in the packing boxes 10 is the packing 11 which is maintained in place by the glands 11.

There is a tubular support formed of upper and lower wear rings 12 and 13, and the intermediate annular packing 14, all maintained in assembled relation by means of the bolts 15 which are fitted upwardly through the lower wear-ring 13 and the packing 14 and screwed into the upper wear ring 12.

The lower end of the lower wear ring 13 is reduced externally to provide the external annular downwardly facing shoulder 16 adapted to rest on the supporting segments 6 when the latter are in their inward or active position, as shown in Figures 1, 2, and 3, so as to sustain the support for the tubing hanger hereinafter referred to.

There is an enlarged coupling preferably formed of the upper and lower sections 17, 18, which are screwed together and which form a tubing hanger for suspending the tubing 19 in the well.

The section 17 has the oppositely arranged ar-

uate countersunk recesses 20, 26, adapted to receive the correspondingly shaped arcuate dogs 21, 21, which are seated therein and which are normally held in their outer positions by means of the flat springs 22, 22, which are located in said recesses and press outwardly against said dogs.

The dogs are maintained against displacement from the recesses by means of the outside upper and lower ribs 23, 23, which may be welded in the outer margins of said recesses to maintain the dogs against displacement.

The upper end of the hanger support has the oppositely disposed and downwardly converging guide notches 24, 24, as more clearly illustrated in Figures 3 and 4. When it is desired to lower the tubing hanger through the support so that the tubing may be lowered further into the well for washing the well before the tubing is permanently located, the hanger may be lowered by means of a section of pipe 25, attached to the upper end of the hanger, with the dogs 21 aligned with the guide notches 24, and when the dogs enter said notches, they will be retracted inwardly and the hanger may pass on down through the hanger support to locate the tubing at the desired places in the well for washing purposes and the hanger and tubing may then be elevated. The upper end of the hanger is inwardly beveled, as at 26, so that upon elevation thereof, the hanger will be guided through the support and the upper ends of the dogs 21 are upwardly and inwardly beveled, as at 27, so that as the hanger is elevated, when the beveled upper ends of said dogs contact with the lower end of the hanger support, they will be retracted or forced inwardly, and the tubing hanger will move on upwardly through the hanger support and when said dogs clear the upper end of said support, the springs 22 will force them outwardly and the hanger may then be turned a quarter turn and seated on the hanger support, and the tubing will thus be suspended from said support, by the hanger, in the well.

The support for the hanger, when located on the segments 6, may be secured thereon against upward movement by means of the locking bolts 28, 28. These bolts are threaded through the wall of the head 1, and their outer ends are surrounded by packing 29 which is maintained in place by the glands 30 which surround said bolts and are screwed into the head 1. The upper end of the hanger support has the upwardly converging annular external face 32, and the inner ends of the bolts 28 have correspondingly tapered faces 33 which engage the face 32, when said bolts are screwed into their inner, or active, position whereby the hanger support may be forced downwardly and held securely seated on the segments 6, and from time to time, as necessary, said bolts may be tightened up to compress the packing 14 to maintain a fluid-tight joint between the support and head, as well as between the support and hanger.

As shown in Figures 1, 2 and 3, a flanged coupling 34 is bolted to the flange at the top of the casing head by means of suitable bolts 35, and a gasket 36 is interposed between the flanges of said connected parts to form a leak-proof joint between them. A Christmas tree, as 37, or other tubular connection, may be connected to the coupling 34, and when the tubing is located in place, the letting-in string 25 may be detached and withdrawn.

At times it may be desired to carry on drilling

operations through the head 1 in which event the coupling 34, the hanger support, hanger and tubing, may be withdrawn and the segments 6 then retracted by an appropriate manipulation of the rods 8.

Attention is here called to the particular shape of the segments 6. As illustrated in Figure 5, the inside curvature of these segments define the arc of a circle of larger diameter than the outside diameter of the hanger support so that when said segments are in their inner or active position the shoulders 16 of the hanger support will rest on the middle portions only of said segments and the outer ends of the segments will clear said support. The segments are thus shaped in order that when withdrawn to the outer position, their inner ends will completely clear the inside wall of the head 1 so as not to restrict said head or interfere with the lowering of drilling or other apparatus therethrough. As shown in Figure 6, the coupling 34, the hanger support, hanger, and tubing have been removed and the segments 6 retracted so that no obstruction will be offered by the head 1 to the lowering of drilling apparatus into the well, said head having an inside diameter not less than that of the casing 2. If operations are being carried on in the presence of internal pressure in the well, a blowout preventer 38 may be installed and secured in position by means of the bolts 35 with the gasket 36 forming a fluid-tight joint between the blowout preventer and casing head. In some instances a gate valve, as 39, of any selected construction may be interposed between the casing head 1 and the blowout preventer 38, and in this instance, the valve casing will be bolted to the casing head by the bolts 35 with the gasket interposed between the valve and the casing head, and the blowout preventer will be bolted on to the upper end of the valve by the bolts 35' and the gasket 36' interposed between the valve and blowout preventer to break the joint between them. In this assembly last referred to, the inside diameter of the blowout preventer casing, the casing of the valve 39, the casing head 1, and the casing 2 will be approximately the same so that any drilling tool or other apparatus that the casing 2 is large enough to receive may be lowered through the casing head and the assembly thereon.

It is to be understood that the blowout preventer 38 includes a pressure head shaped to be fitted therein around the drill stem 40, and said pressure head will be inserted in place only in the event a blowout is actually threatened; however, only the blowout preventer casing is shown.

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 assembly comprising a casing head, retractable supporting means therein, a tubular support mounted on said supporting means, a tubular hanger in the support, retractable supporting means on the hanger arranged to engage the support to support the hanger and the tubing suspended therefrom and being movable inwardly to clear the support to permit downward movement of the hanger through the support, the retractable means on said hanger having the upper end thereof beveled to effect the retraction thereof upon upward movement of the hanger through the support.

2. A well head assembly comprising a tubular casing head, radially movable supporting means therein, means to manually move said means inwardly into active position or outwardly into inactive position, a tubular hanger support in the head arranged to be supported by said means when the latter is in said active position, the upper end of said support being upwardly and inwardly beveled, locking bolts threaded through the head and having their inner ends beveled to engage the beveled end of said support, a tubular hanger fitted through the support and having radially movable means thereon arranged, when in outer position, to rest on said support, and when in inner position to clear the support to permit the hanger to pass downwardly through the support.

3. A device of the character described comprising a tube adapted to be set in a well, a tubular support in the tube, a tubular hanger fitted through the support, retractable supporting means on the hanger arranged upon downward movement of the hanger to land on the support, retractable supporting means in the tube on which said support may rest, said support having a packing member therein arranged to form a fluid-tight joint with the tube and with the tubing hanger.

4. A device of the character described comprising a tube adapted to be set in a well, a tubular support in and located adjacent the upper end of said tube, a tubular hanger fitted through the support and having an external, retractable abutment thereon engageable with the support to sustain the hanger and the tubing depending

from the hanger and means in the tube on which said support may rest, said support having a packing member incorporated therein arranged to form a fluid tight joint with the tube as well as with the hanger.

5. In combination a tubular casing head, a retractable seat therein, a tubular support shaped to enter the casing head and land on and be supported by said seat, a tubular tubing hanger shaped to fit through the support, a retractable abutment on the tubing hanger engageable with the support to support the hanger on the support, said support having packing means incorporated therein arranged to be compressed by the weight sustained by the hanger to form a fluid tight joint with the casing head and with the hanger.

6. A device of the character described comprising a tubular casing head having radially movable supporting means therein, means to move the supporting means inwardly into active position, a tubular hanger in the head arranged to be supported by said means when the latter is in active position, said hanger having an upper abutment, a support independent of the hanger and comprising upper and lower wear rings, the former of which is arranged beneath said abutment and the latter of which is arranged to land on said supporting means when the latter is in active position and sealing means between the upper and lower wear rings and effective to form a seal between the hanger and the casing head.

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