

March 31, 1936.

A. J. PENICK ET AL
WELLHEAD ASSEMBLY

2,035,834

Filed Sept. 17, 1934

3 Sheets-Sheet 1

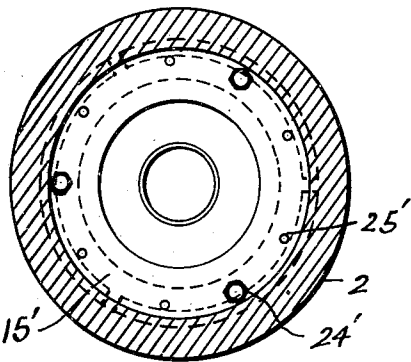


Fig. 3.

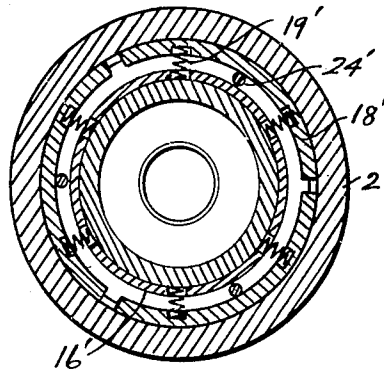


Fig. 4.

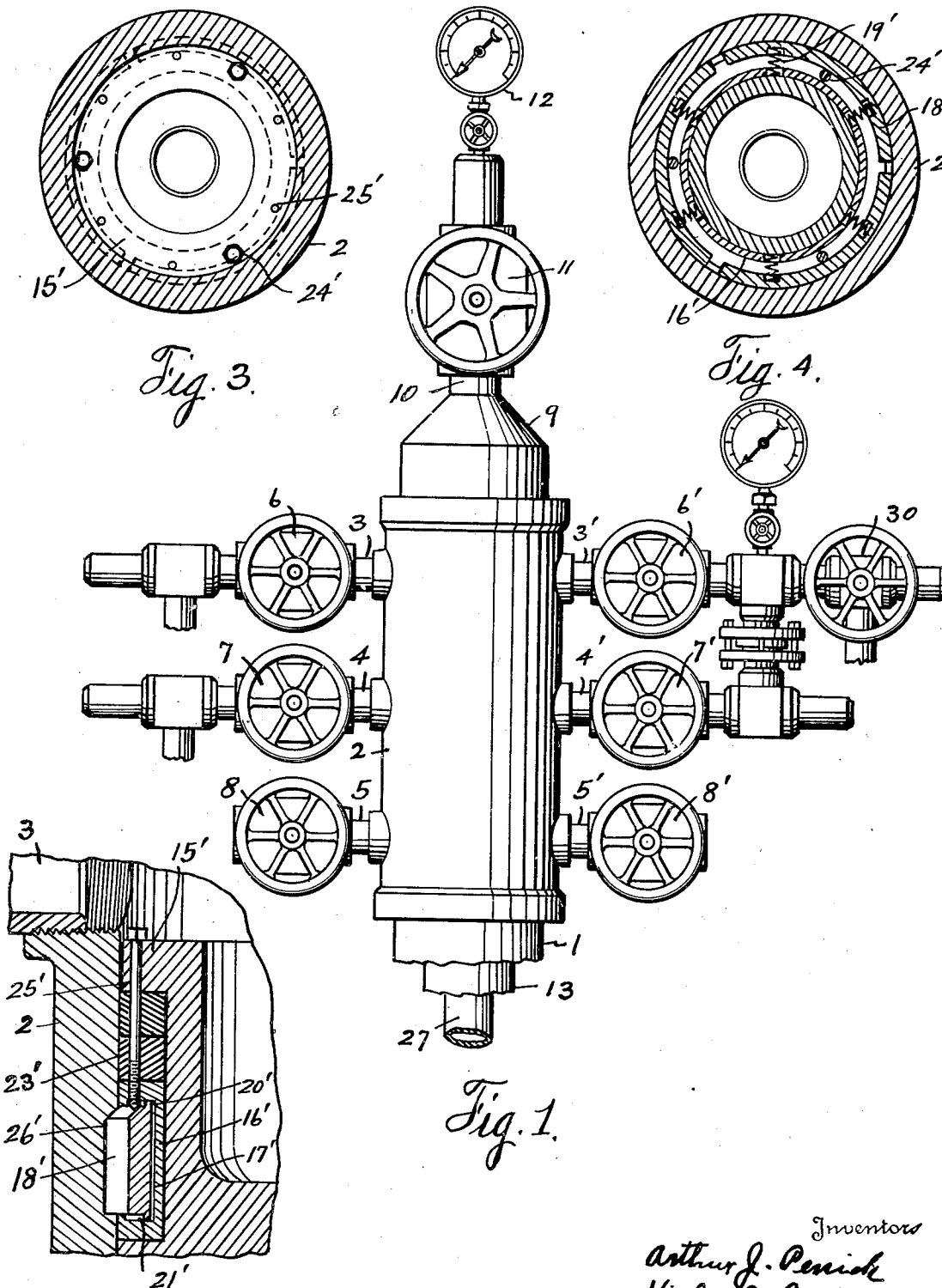


Fig. 1.

Fig. 2.

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3 Sheets-Sheet 2

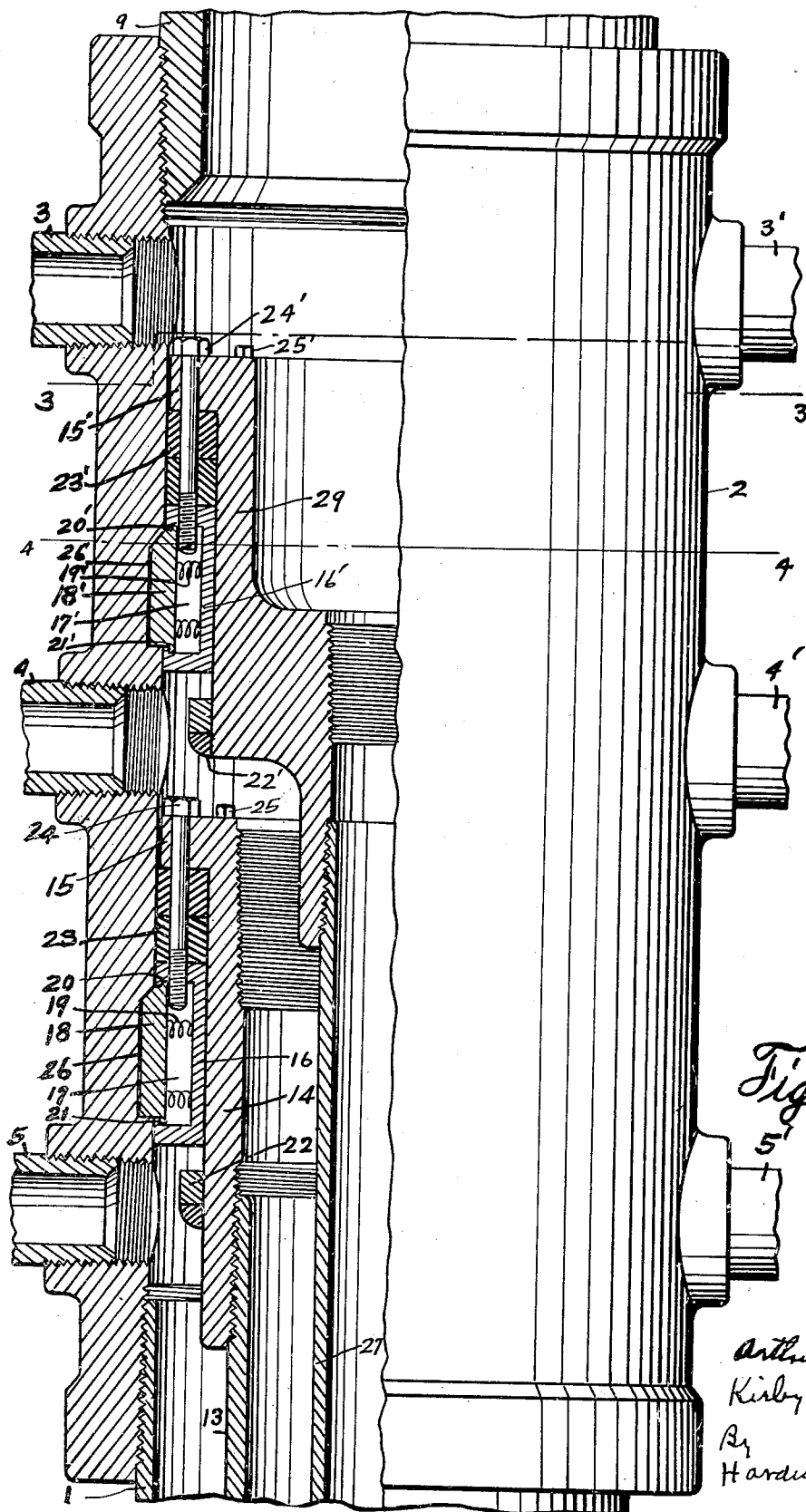


Fig. 5.

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3 Sheets-Sheet 3

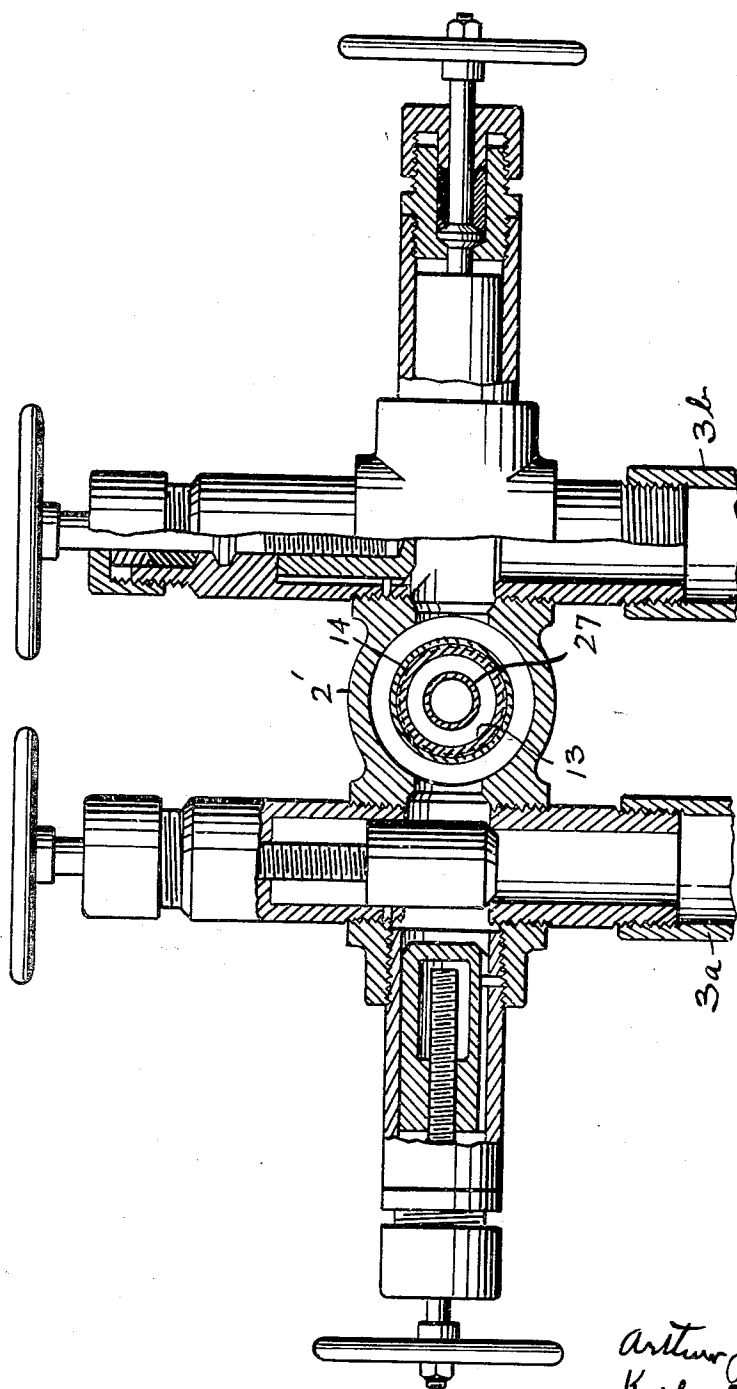


Fig. 6.

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UNITED STATES PATENT OFFICE

2,035,834

WELLHEAD ASSEMBLY

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Application September 17, 1934, Serial No. 744,354

12 Claims. (Cl. 166—14)

This invention relates to a well head assembly.

An object of the invention is to provide equipment of the character described adapted to be supported on the surface casing and, in turn, to support both the well casing and the well tubing in their proper relation in the well.

Another object is to provide novel means for securing the casing and tubing hangers in the head.

A further object is to provide a head having a novel arrangement of flow lines therefrom designed to serve the purpose of the ordinary Christmas tree.

The invention comprises a unitary structure which comprehends a braden head, a casing head and a tubing head.

With the above and other objects in view this 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 of the complete equipment.

Figure 2 shows an enlarged, fragmentary, vertical sectional view.

Figure 3 shows a cross sectional view taken on the line 3—3 of Figure 5. Figure 4 shows a cross section view taken on the line 4—4 of Figure 5.

Figure 5 shows an enlarged, fragmentary vertical sectional view, and

Figure 6 shows a cross sectional view of a modified form of the equipment.

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 surface casing which is set in the top of the well. A cylindrical head 2 is connected to the upper end of this surface casing. This head has the upper, intermediate and lower outflow lines 3, 3'; 4, 4', and 5, 5' spaced apart vertically, on each side, and controlled by the corresponding gate valves 6, 6'; 7, 7' and 8, 8'. A reducer cap 9 is screwed to the upper end of the head 2 and has a tubular extension 10 controlled by a gate valve 11 and also equipped with a pressure gauge 12.

The numeral 13 designates the well casing whose upper end is attached to the tubular hanger 14. This hanger has an external, annular flange 15 at its upper end. Around the casing hanger there is an annular channel member 16, having an external annular channel 17 therearound, and seated in this channel 17 are the arcuate locking dogs 18, similar to those shown in Figure 4. These

dogs are seated against coil springs 19 in the channel 17 and their upper ends are inwardly beveled for a purpose to be later explained. Their upper and lower ends fit closely against the corresponding upper and lower side flanges of the channel member 16, and said member 16 has the outside upper and lower stops 20, 21 to engage the ends of the dogs and retain said dogs in place. Around and secured to the hanger 14, beneath the channel member 16 there is a retainer stop 22.

Between the flange 15 and the channel member 16 there is a packing assembly 23 which forms a fluid tight joint between the hanger 14 and the head 2. Set bolts, as 24, are fitted downwardly through the flange 15 and the packing assembly and are screwed through the upper flange of said channel member; and between these bolts 24 are smaller bolts 25, which are similarly disposed through said flanges and packing in a manner illustrated in Figures 2 and 3.

Within the head 1 above the outflow lines 5, 5' there is an annular groove 26, whose lower side is abrupt and whose upper side converges upwardly. The dogs 18 are shaped to fit snugly in said groove 26.

The numeral 27 designates the tubing which is suspended from the tubing hanger 29. The parts 15' to 26', associated with the hanger 29 are similar to the corresponding parts 15 to 26, associated with the hanger 14 and hence will not be further described in detail; except, however, the width of the dogs 18 and corresponding groove 26 is somewhat greater than that of the dogs 18' and groove 26'.

The outflow line 3' is also equipped with a gate valve 30, and the line 4' may be connected into the line 3' between the valves 6' and 30. The fluid flowing through the tubing 27 may be discharged through either or both of the lines 3, 3' and the fluid flowing through the casing 13 may be discharged through either or both of the lines 4, 4'. It may be desirable to discharge the fluid from the line 4' into the line 3', as illustrated in Figure 1, and if this fluid be gas it will assist in the flow of liquid from said line 3'.

Gas, or oil, flowing up around the casing 13 may be discharged through either, or both, of the lines 5, 5'.

With the closure cap 9 removed, the casing 13 may be let down into the well in the usual way and the top section of the casing with the hanger 14 attached then connected onto the casing and a letting in string then screwed into the hanger and the casing further lowered. Before the hanger is lowered into the head the bolts 24

should be unscrewed until their lower ends clear the upper ends of the dogs 18 and said dogs forced inwardly and the bolts 25 then screwed downwardly until they engage the outer sides of the dogs 18 to hold said dogs collapsed, or in their inner position. The casing may then be lowered until the hanger 14 is beneath the lines 4, 4' and clean water forced in through the line 5 or 5' and down into the well and back up through the casing and out through the line 4 or 4' until the well is thoroughly washed. The casing may then be elevated, if its hanger is beneath the groove 26, and the bolts 25 unscrewed until their lower ends clear the upper ends of the dogs 18 and the casing then manipulated until the dogs 18 register with the groove 26 whereupon said dogs will seat in said groove and the hanger 14, and casing 13, will thereby be anchored in place and the letting in pipe then backed off and removed. The bolts 24 may then be screwed down until their lower ends engage in front of the dogs 18 to secure the hanger against displacement.

In a similar manner the tubing 27 may be lowered and washed and its hanger 29 secured in place and the closure cap 9, with the parts 10, 11 and 12 mounted thereon, may then be installed and the well will then be ready for production.

If it be desired to swab the tubing or carry on other work therein or therethrough the extension 19 above the valve 11 may be removed and the valve 11 opened and such work proceeded with.

If it be desired to remove the tubing the closure cap 9 may be removed and the bolts 24' unscrewed until they clear the upper ends of the dogs 18' and a section of pipe may be screwed into the hanger 29. Upon an upward pull the dogs 18' will be forced inwardly and unseated from the groove 26' by reason of the engagement of their beveled upper ends against the correspondingly beveled upper side of said groove and the hanger 29 will thereby be released and the tubing may be withdrawn. In a similar manner the casing 13 may also be released and withdrawn.

In Figure 6 this type of head is shown wherein the flow lines, as 3a and 3b are equipped with the type of valves disclosed in our patent on Tubing control head issued by the United States Patent Office on August 28, 1934, No. 1,971,381.

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 cylindrical head having approximately uniform outside and inside diameters from end to end and adapted to be attached to a casing in a well and having outlets one above another and inside annular grooves forming seats between said outlets, hangers in the head having expansible means thereon engageable in said seats to support the hangers in the head.

2. In a well head assembly a cylindrical head adapted to be attached to a casing in a well and having an approximately uniform inside diameter and also having outlets at different elevations and inside grooves, forming seats, beneath the corresponding outlets, hangers in the head, radially movable interlocking means on the hangers adapted to seat in the grooves to form supports for the hangers.

3. In a well head assembly a one piece cylindrical head adapted to be attached to a casing

in a well and having a uniform inside diameter and also having outlets and inside grooves, forming seats, beneath the corresponding outlets, hangers in the head, radially movable interlocking means on the hangers adapted to seat in the grooves to form supports for the hangers, and releasable means for maintaining said interlocking means seated.

4. In a well head assembly a cylindrical head adapted to be attached to a casing in a well and having outlets at different elevations and inside grooves, forming seats, beneath the corresponding outlets; hangers in the head, radially movable interlocking means on the hangers adapted to seat in the grooves to form supports for the hangers, separate retainers alternatively applicable to maintain the interlocking means seated or unseated.

5. In a well head assembly having a tubular head adapted to be attached to a casing in a well and having an outflow line and an internal seat beneath said line; a tubular hanger in the head for supporting a pipe in the well, expansible means on the hanger arranged, when expanded, to engage the seat and support the hanger, and when contracted to clear the seat, and means on the hanger arranged to be alternatively engaged with said seat engaging means to maintain the latter in expanded or contracted position.

6. In a well head assembly having a tubular head adapted to be connected to a casing in a well and having outflow lines arranged one above the other; a seat in the head beneath each outflow line, tubular hangers assembled in the head and adapted to support pipes, one within the other in the well, radially movable seat engaging means on each hanger adapted to engage the corresponding seats, when expanded or moved outwardly, and to clear said seats when contracted, or moved inwardly, separate means on the hangers alternately applicable to the seat engaging means to lock the latter in expanded or contracted position.

7. In a well head assembly comprising a tubular head adapted to be attached to a casing in a well, outflow lines at different elevations on the head, valves controlling said lines, said head having inside annular grooves forming seats beneath the respective outflow lines; hangers in the head adapted to support pipes within the casing and one within the other, series of dogs on each hanger, yieldable means normally holding the dogs outwardly in position to engage the seats and support the hangers, means on the hangers movable into active position to lock the dogs in seat engaging position, and movable into inactive position to release the dogs to allow them to move into inward position to clear the seats and means on the hangers movable into active position to engage the dogs to lock the dogs in such inward position and movable into inactive position to release said dogs to allow the dogs to move into seat engaging position.

8. In a well head assembly having a tubular head adapted to be attached to a casing in a well and having an outlet and an inside seat beneath the outlet; a hanger in the head adapted to support a pipe in a well, radially movable seat engaging means on the hanger, yieldable means normally acting against the seat engaging means to hold the latter expanded into position to engage the seat and support the hanger, said seat engaging means and head having coacting parts effective to contract the seat engaging means, upon

upward movement of the hanger, to permit the removal of the hanger upwardly from the head.

9. In a well head assembly having a tubular head adapted to be attached to a casing in a well and having an outflow line and an internal seat beneath said line; a tubular hanger in the head for supporting a pipe in the well, expansible means on the hanger arranged, when expanded, to engage the seat and support the hanger, and when contracted to clear the seat and means on the hanger arranged to be alternatively engaged with said seat engaging means to maintain the latter in expanded or contracted position, and means forming a fluid tight joint between the hanger and head.

10. In a well head assembly having a tubular head adapted to be attached to a casing in a well and having an outlet and an inside seat beneath the outlet; a hanger in the head adapted to support a pipe in a well, radially movable seat engaging means on the hanger, yieldable means normally acting against the seat engaging means to hold the latter expanded into position to engage the seat and support the hanger, said seat engaging means and head having coacting parts effective to contract the seat engaging means, upon upward movement of the hanger, to permit the removal of the hanger upwardly from the head, and means around the hanger above the

seat engaging means for forming a fluid tight joint between the hanger and head.

11. A well head assembly comprising a tubular head having an approximately uniform diameter from end to end and having upper and lower outflow lines connected into the head, upper and lower seats within the head beneath the respective outflow lines, hangers of approximately the same outside diameters and adapted to be inserted downwardly into the head and whose lower ends are shaped for the attachment of outer and inner pipes thereto said hangers having radially movable supporting means thereon adapted to rest on the respective seats for the corresponding hangers.

12. A hanger adapted to be inserted into a tubular well head to support an inside pipe in a well, radially movable seat-engaging means on the hanger, yieldable means normally acting against the seat-engaging means to hold the latter outwardly in position to engage a seat and support the hanger, said seat-engaging means being movable inwardly to clear the seat, and means on the hanger arranged to be alternately engaged with the seat-engaged means to maintain the latter in said outer, or inner positions.

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