

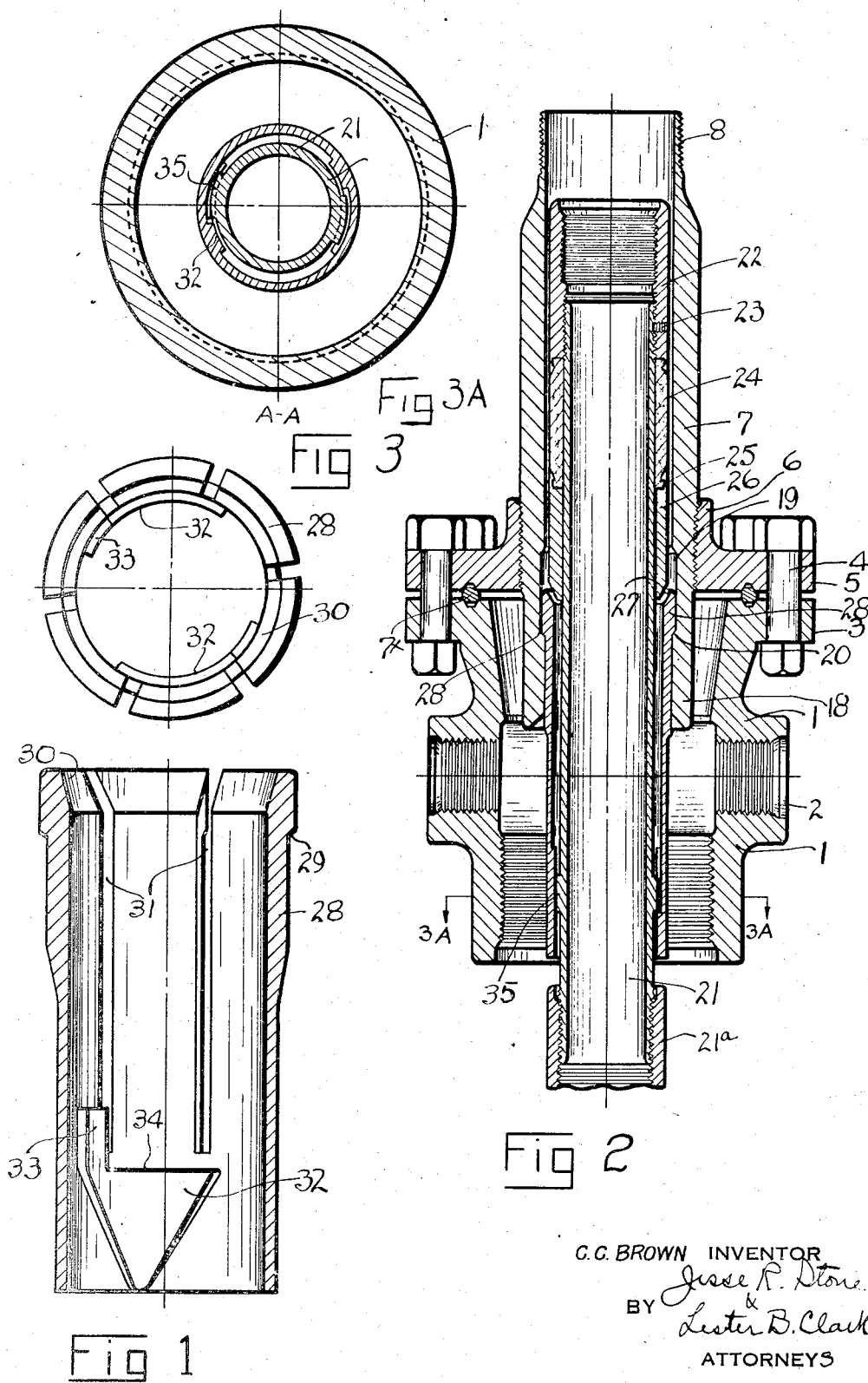
Feb. 6, 1940.

C. C. BROWN

2,189,575

TUBING SUPPORT

Original Filed April 26, 1934 4 Sheets-Sheet 1



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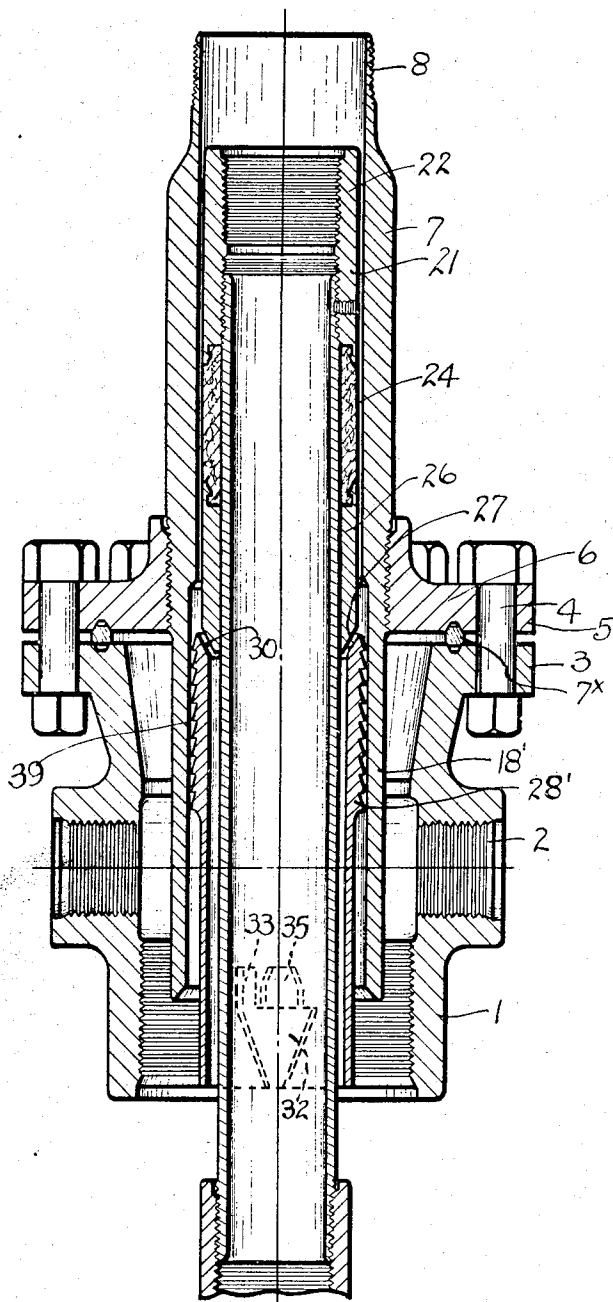


Fig 4

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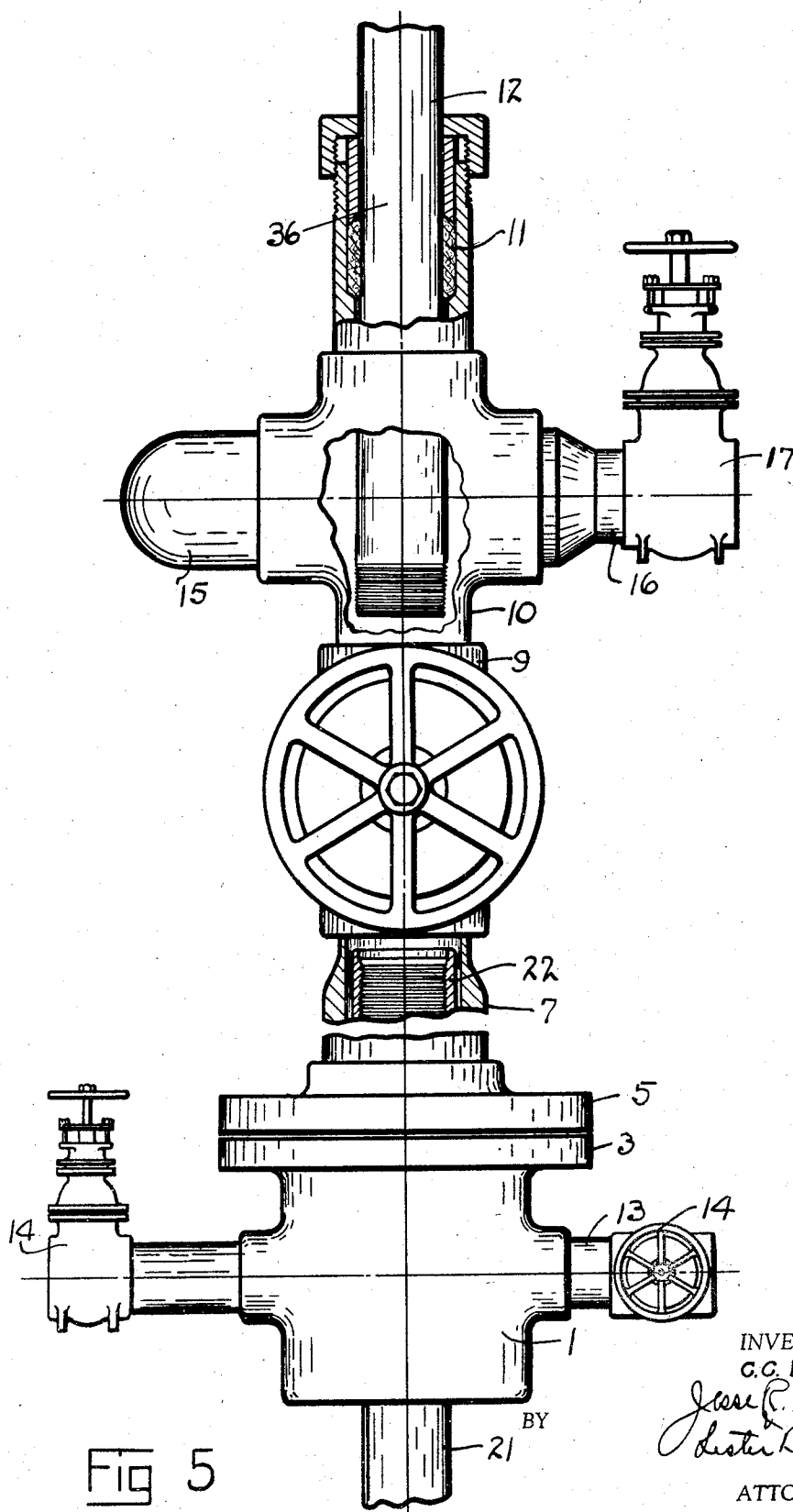


Fig 5

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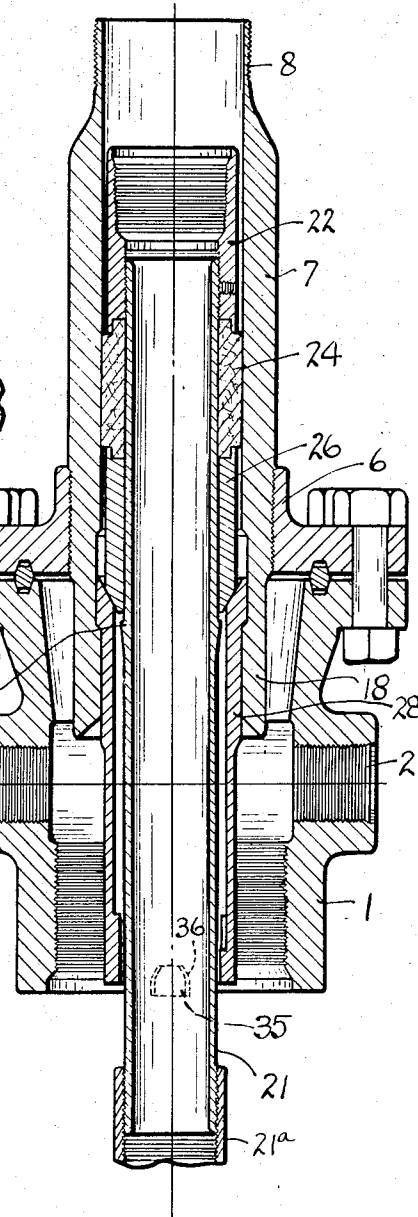
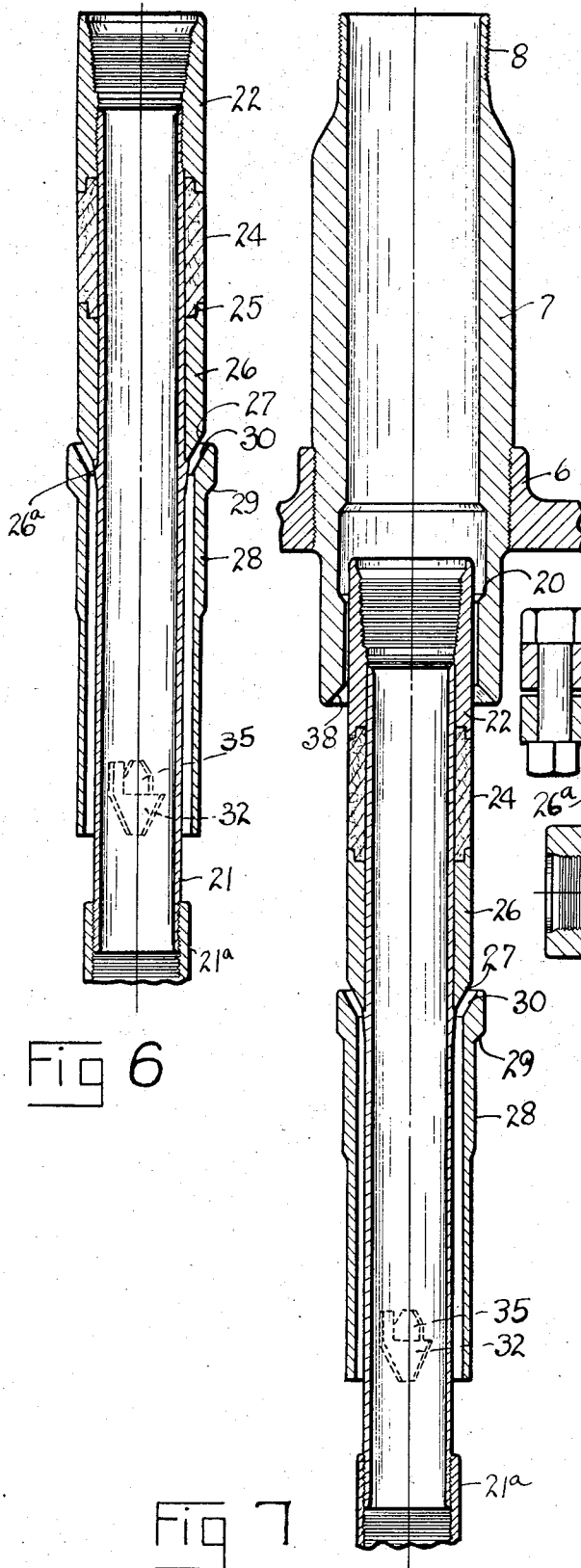


Fig 8

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UNITED STATES PATENT OFFICE

2,189,575

TUBING SUPPORT

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Application April 26, 1934, Serial No. 722,443

Renewed May 3, 1935

14 Claims. (Cl. 166-14)

My invention relates to a means and method of supporting tubing at the upper end of the well.

It is an object of the invention to provide a tubing support which may be employed to support the tubing in the casing head or means attached thereto at the upper end of the well and to provide therewith a structure which will allow the support to be introduced downwardly through the casing head when desired and then again raised and supported in the casing head.

The invention resides in the construction of the tubing hanger and the means connected therewith which permits the manipulation of the support through the casing head for the setting of packers or washing the well or other similar operations, but still allowing the support of the tubing in adjusted position when desired.

I further aim to provide an attachment for the upper end of the tubing which will provide a seal about the tubing when the well is equipped for operation.

It is another object of the invention to provide a support or hanger which may be adjusted to various levels in the well depending upon the position of the tubing when the well is completely equipped. It is desired to adjust the tubing at the lower end and support it in the casing head at the proper level when the adjustment at the lower end has been completed.

These and other objects residing in the particular construction and arrangement of the parts thereof will be more clearly understood from the drawings herewith.

Fig. 1 is a central longitudinal section through a tubing hanger forming a part of my invention.

Fig. 2 is a central longitudinal section through a casing head and nipple connected therewith cooperating with my tubing and hanger.

Fig. 3 is a top plan view of the hanger shown in Fig. 1.

Fig. 3a is a transverse section taken on the plane 3a-3a of Fig. 2.

Fig. 4 is a central longitudinal section through a modified form of tubing hanger.

Fig. 5 is a side view of a well head equipment employing my invention, certain parts being broken away for greater clearness.

Fig. 6 is a central longitudinal section through the upper end of my tubing with the hanger thereon.

Fig. 7 illustrates the device shown in Fig. 6 in a position below the casing head in which it is to be supported.

Fig. 8 shows the tubing and hanger in position within a casing head, the parts being shown in central vertical section.

Referring to the embodiment of the invention disclosed particularly in Fig. 2, I have shown a casing head 1 of ordinary construction in which there are two side openings 2 threaded for connection with pipes or plugs which may be employed for conducting fluid in the drilling of the well. The upper end of the casing head is flared somewhat and provided with a radial flange 3 having openings therethrough to receive bolts 4, by which it may be connected with the flange 5 upon the bushing 6. Rings 7 between the mating flanges act as a seal to prevent the escape of fluid about the joint.

The bushing 6 is threaded interiorly for engagement with a nipple 7 extending upwardly above the casing head and threaded at 8 for connection with a gate valve 9 or other coupling member, depending upon the arrangement desired. As will be seen in Fig. 5, the gate valve 9 may be connected to the lower end of a cross 10 above which is a stuffing box 11, which tends to form a seal about the tubing or flow pipe 12 which may pass therethrough.

It is also to be noted from Fig. 5 that the pipes 13 connected in the openings 2 in the casing head may be equipped with hand operated valves 14. The T-shaped coupling 15 is equipped in the present instance by a plug 16 closing one side thereof but having an outlet pipe 16 in the opposite port in which may be connected the gate valve 17.

The nipple 7 which is connected in the bushing 6 has a downward extension or skirt 18. This may be of any desired length and I have shown the same as being recessed somewhat at 19 to form a lower beveled shoulder 20 upon which the tubing hanger may engage.

The tubing is shown as having a hanger section 21 to cooperate with the casing head equipment. This section has preferably a packer at the upper end thereof, it including a collar or coupling member 22 engaged with the tubing section and held against unscrewing by a set screw 23. Below this collar is a sleeve 24 of packing material such as rubber or other composition. This sleeve is engaged at 25 with a lower ring or collar 26 of metal, the lower end of which is beveled at 27 to engage the upper end of the hanger 28.

The lower collar 26 is slidable upon the tubing and will act to compress the packer when moved upwardly relative to the packer sleeve 24. The collar 26 is limited in its downward movement by

a small shoulder 28a formed on the tubing section as shown in Figs. 6 and 8.

The hanger 28 may be best understood from Figs. 1 and 3. It is a tubular member, the upper end of which is thickened or upset externally and provided with a shoulder 29 to engage within the nipple 7. The upper end of the hanger is beveled at 30 on its inner surface for contact with the lower end of the sleeve 26. Said hanger sleeve 28 is slidable on the tubing section between the collar 26 and the lower coupling 21a on the tubing section. The sleeve is slotted at 31 from the upper end downwardly to a point spaced somewhat from the lower end so as to give the upper end thereof a certain resiliency allowing the upper extremity to be moved inwardly when the occasion arises.

There is a stop member 32 formed on the inner surface of the hanger adjacent the lower end. This stop member is embossed on the inner face of the hanger and has a generally triangular shape with an upwardly extending arm 33 at one side thereof. The upper face of the triangle at 34 forms a shoulder to be engaged by a lug 35 upon the tubing section 21. I preferably have two lugs 32 on the hanger arranged in opposite relation thereon as shown Fig. 3. There will also be two cooperating lugs 35 on opposite sides of the tubing, as will be seen from Figs. 2 and 3a.

The lugs 35 on the tubing section are shown in dotted lines in Figs. 6, 7 and 8. The lug has its upper end beveled at 36 so that when it is moved upwardly relative to the hanger from below it may engage the lower point of the lug 32 on the hanger and be deflected laterally so as to move to one side of the lug 32 to a position above the same after which the rotation of the tubing will bring the lug 35 into a position against the arm 33 and above the shoulder 34 as seen in Figs. 6 and 7.

The well tubing is frequently used as a means of performing operations at the lower end of the well, such as setting the packer or washing the screen and other similar operations, and in doing the same it is necessary to raise and lower the tubing through the casing head before the tubing is finally hung in set position for use as a flow line. My form of hanger herein disclosed allows these operations and still enables the operator to hang the tubing properly after the operations have been completed.

When it is necessary to lower the tubing through the nipple 7 into the position shown in Fig. 7, it is necessary that the hanger 28 be moved downwardly past the shoulder 29. To do this the lower beveled end 27 must not engage with the interior beveled portion 30 of the hanger. This is prevented by engaging the lug 35 upon the tubing section above the shoulder 34 on the hanger lug 32, as shown in Fig. 7. This may be accomplished by rotating the tubing to bring the lug 35 into the position previously described.

In raising and lowering the tubing section 21, an upper section of the flow line shown at 36 in Fig. 5 is extended downwardly through the stuffing box 11 and threaded into the upper end of the coupling 22. The operator is thus enabled to raise and lower the tubing as desired.

When the lug 35 is engaged above the shoulder 34 a downward thrust thereon will force the lower shoulder 29 upon the hanger against the shoulder 29 in the nipple 7 and the resiliency of the upper end of the hanger will allow the upper end to spring inwardly past the shoulder 29 and allow the same to be moved downwardly into the well. When the operations have been completed

and the tubing is to be hung in proper position it is raised upwardly and the upper end of the hanger will engage within the upper beveled end 30 of the nipple 7 and it can be again forced upwardly into the position shown in Fig. 2.

To set the packer sleeve 24 and adjust the hanger in locked position the tubing is then rotated relative to the hanger to bring the lug 35 on the tubing section away from the shoulder 34 on the lug 32 of the hanger. The tubing may then be moved downwardly relative to the hanger and will engage in the beveled upper end 30 and force the upper end into expanded position with the shoulder 29 thereon engaging above the shoulder 29 in the nipple 7. The weight of the tubing may then be allowed to rest upon the hanger which will act to move the collar 26 upwardly along the tubing section and expand the packer sleeve 24 as shown in Fig. 8. Thus a seal may be made about the upper end of the tubing during the operation of raising the liquid from the well, even where the well will flow naturally or when pumping operations are necessary.

It will be noted that when the tubing is being employed in operations at the lower end of the well there will be a seal around the tubing due to the stuffing box 11 above the casing head. When the operations have been completed and the tubing is hung in position, as shown in Fig. 8, then the section 36 may be unscrewed from the tubing section 21 and moved upwardly as shown in Fig. 5, and the gate valve 9 may then be closed. When the upper end of the well is then arranged as desired, the gate valve may be opened and the fluid from the well may pass outwardly through the line 18.

In Fig. 4 I have shown a slightly different embodiment of my hanger. In this case the construction of the tubing section is the same as in the previous embodiment but the nipple 7 has a skirt 18' extended downwardly for a longer distance than is the skirt 18 of the previously described embodiment. This allows adjustment of the tubing therein more readily. There is no particular point at which the hanger must be positioned as in the other embodiment and, to allow the same to engage with the skirt 18' of the hanger nipple, the hanger is equipped to engage the nipple at any desired elevation.

To perform this operation the hanger member 28' has its upper end formed of uniform outer diameter and has downwardly engaging teeth 39 thereon, adapted to engage the skirt 18' and be expanded into gripping contact therewith.

In this embodiment, as in the other, there is a lug 35 on the tubing section to engage a shoulder 34 on the lug 32 of the hanger. When, however, it is desired to set the tubing in adjusted position the tubing is rotated to move the lug 35 thereon from above the shoulder 34 so that the tubing may be moved downwardly relative to the hanger and engage the lower beveled end 27 upon the sleeve 26 therein, and expand the upper toothed arms on the hanger into gripping engagement with the skirt 18' of the nipple. This arrangement allows the tubing to be supported in more nicely adjusted position in the casing. It is sometimes difficult to cut the length of the tubing so that the parts will register accurately after the setting operations have been completed, but with this embodiment of my invention nice adjustments are unnecessary and the tubing may be supported at any desired elevation.

I have thus provided a tubing hanger which permits the setting of the packer and the washing of the screen and similar operations with the tubing and still enables the operator to adjust and hang the tubing after all other operations have been completed, and this may be done safely for the reason that all of these operations may be completed without removing the closure about the upper end of the casing and outside the tubing. I am enabled to perform these operations with safety and with a simple and economical construction.

What is claimed as new is:

1. The combination of a casing head, a hanger nipple having a fluid-tight connection therewith, a skirt on said nipple extending downwardly into said casing head, an inner shoulder on said skirt, a tubing section, a hanger sleeve having a sliding fit on said section, the upper end of said hanger being longitudinally slotted, an outer shoulder on said upper end, means on said tubing section adapted to engage the upper end of said hanger and expand the same to engage the shoulder on said hanger with the shoulder on said skirt, and interengaging means on said section and said hanger to prevent such engagement, when desired.

2. The combination of a casing head, a hanger nipple having a fluid-tight connection therewith, a skirt on said nipple extending downwardly into said casing head, an inner shoulder on said skirt, a tubing section, a hanger sleeve having a sliding fit on said section, the upper end of said hanger being longitudinally slotted, an outer shoulder on said upper end, means on said tubing section adapted to engage the upper end of said hanger and expand the same to engage the shoulder on said hanger with the shoulder on said skirt, and means to prevent said engagement, said last named means including a lug on said tubing section and a cooperating shoulder on said hanger.

3. The combination of a casing head, a hanger nipple having a fluid-tight connection therewith, a skirt on said nipple extending downwardly into said casing head, an inner shoulder on said skirt, a tubing section, a hanger sleeve having a sliding fit on said section, the upper end of said hanger being longitudinally slotted, an outer shoulder on said upper end, means on said tubing section adapted to engage the upper end of said hanger and expand the same to engage the shoulder on said skirt, said means including a packer sleeve and a sliding collar below said packer sleeve to expand said sleeve, and interengaging means on said section and said hanger to prevent such engagement, when desired.

4. A casing head, a tubing section therein, couplings at the upper and lower ends of said section, a packer sleeve below said upper coupling, a sliding collar engaging the lower end of said sleeve, a hanger sleeve below said collar slidable on said section, an inner shoulder on said casing head, said packer collar being engageable in said hanger to expand the same into supporting engagement with said shoulder.

5. A casing head, a tubing section therein, couplings at the upper and lower ends of said section, a packer sleeve below said upper coupling, a sliding collar engaging the lower end of said sleeve, a hanger sleeve below said collar slidable on said section, an inner shoulder on said casing head, said packer collar being engageable in said hanger to expand the same into supporting engagement with said shoulder, and

means on said tubing section to engage said hanger and prevent the movement of said collar against said hanger when desired.

6. A casing head, a hanger nipple having a fluid tight engagement with said casing head, said nipple extending above said casing head, a skirt on said nipple extending downwardly into said casing head, a tubing in said nipple and head, means thereon to form a seal with said nipple, and means on said tubing below said sealing means to engage said skirt and support said tubing in said casing head.

7. A casing head, a hanger nipple having a fluid-tight engagement with said casing head, a tubing in said nipple and head, a hanger slidable on said tubing to engage said nipple and support said tubing, means on said tubing to engage and force said hanger downwardly through said nipple, said means being rendered ineffective on partial rotation of said tubing, and means on said tubing to anchor said hanger in position.

8. A casing head, a bonnet thereon, a tubing extending downwardly through said bonnet and casing head, means associated with said bonnet to support said tubing, means engaging said bonnet and tubing, said engaging means being constructed to allow the movement of said tubing and engaging means downwardly through said casing head, but automatically engaging said tubing in supporting relation with said bonnet when said tubing is manipulated in said bonnet, and a packing member arranged to be compressed into sealing engagement by the weight of said tubing when said tubing member is thus supported.

9. A casing head, a bonnet member thereon, a tubing member extending downwardly through said bonnet member and casing head, interengaging means on said members, to support said tubing member on said bonnet member, said means being constructed to allow the movement of said tubing and the bonnet engaging member thereon downwardly through said casing head, but arranged to automatically engage said tubing in supporting relation with said bonnet member when said tubing is elevated into engaging position in said bonnet, and a packing member arranged to be compressed into sealing engagement by the weight of said tubing when said tubing member is thus supported.

10. A casing head, a bonnet thereon, a tubing movable longitudinally through said casing head and bonnet, a coupling member on said tubing, means associated with said coupling and said bonnet and also movable through said bonnet and adapted to be engaged through the manipulation of said tubing to support said tubing in said bonnet, and a packing member adapted to be compressed by the weight of said tubing upon said supporting means.

11. The combination with a casing head of a tubing hanger seated on said head and having a shank extending into said head, slip mechanism within said shank, a well tubing, a coupling device thereon adapted to be engaged by said slip mechanism for support, and packing carried by said coupling and positioned to engage within said shank and form a seal therewith when said coupling device is supported by said slip mechanism.

12. The combination with a casing head of a tubing hanger and a string of tubing, a downwardly opening recess in said hanger, a slip mechanism disposed within said recess, a tubular hanger member on said tubing which is upwardly

insertable in said recess to be engaged by said slip mechanism for support of said tubing, packing on said member adapted to form a seal between said member and said hanger, said tubing being hung from said member, and a releasable lift nipple adapted to engage and actuate said member whereby the tubing may be reciprocated in the well and then raised and hung by said member.

10 13. The combination with a casing head of a tubing hanger seated on said head and having a tubular part extending into said head, a well tubing adapted to pass through said head and into said tubular part, a coupling device thereon,

15 a slip mechanism adapted to be positioned between said tubular part and said tubing and to exert a supporting force on said coupling device, and a packing about said tubing between said coupling device and said slip mechanism and

20 positioned to engage within said tubular part

and form a seal therewith when said slip device exerts a supporting force on said coupling device.

14. The combination with a casing head of a tubing hanger and a string of tubing, a downwardly opening recess in said hanger, a tubular hanger member on said tubing which is upwardly insertable into said recess, a slip mechanism adapted to be positioned within said recess and to engage said tubing hanger and exert a supporting force on said tubular hanger member for support of said tubing, packing about said tubing to form a seal between said member and said hanger, said tubing being hung from said member, and a releasable lift nipple adapted to engage and actuate said member whereby the tubing may be reciprocated in the well and then raised and hung by said member.

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