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TUBING HANGER AND CASING SEAL

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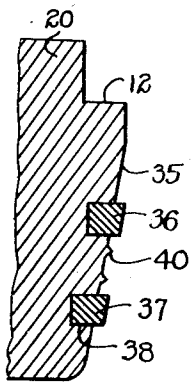


Fig. 2.

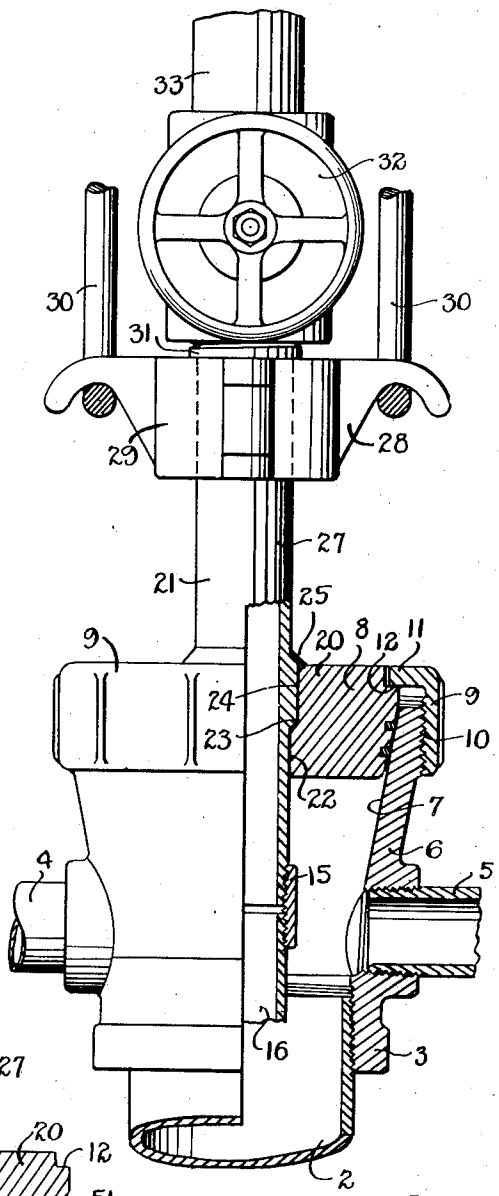


Fig. 1.

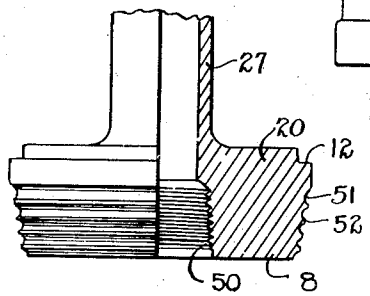


Fig. 3.

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TUBING HANGER AND CASING SEAL

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6 Claims. (Cl. 285—22)

The invention relates to an improvement in a combination tubing hanger and casing seal particularly of the type adapted for use in suspending tubing in wells.

Various types of tubing hangers have been devised heretofore which were adapted to support the tubing and seal the casing head, but in the present construction it is contemplated that the structure will be simplified and so arranged that the head as a whole or the tubing hanger as a part may be readily handled and positioned with the usual equipment used in handling tubing, and that a particular type of surface will be provided on the tubing hanger in order to insure a seal with the casing head under various circumstances.

It is one of the objects of the invention to provide a tubing hanger wherein the portion of the tubing supported in the hanger projects above the hanger a sufficient distance to permit the attachment thereto of the usual elevator employed in handling the tubing about the well.

Another object of the invention is to provide a one-piece tubing hanger and neck extending therefrom which is adapted to receive the elevator used in handling tubing in and about the well.

Another object of the invention is to provide a particular type of engaging surface on the tubing hanger so that a seal will be maintained with the casing head at all times and even in event of fire or if excessive heating of the parts occurs.

Another object of the invention is to provide a tubing hanger which may be run into the well with the last section of tubing by being connected to the usual elevator which is employed in handling the remainder of the string of tubing.

Another object of the invention is to provide a tubing hanger which is adapted to receive a valve on the upper end thereof and which is provided with a neck which is of the same diameter as the tubing being supported and which is of sufficient length to permit attachment of a pipe elevator.

Still another object of the invention is to provide a tubing hanger having a face adapted to contact with the casing head and which face is provided with compressible packing rings, and a non-compressible sealing portion is adapted to form a seal in event the compressible packing is ineffective.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the drawing, wherein—

Fig. 1 is a side elevation of the casing head tubing hanger and casing seal construction in accordance with the invention, and wherein certain parts have been shown in section to illustrate their construction.

Fig. 2 is a broken sectional view of one form of the tubing hanger.

Fig. 3 is a slightly modified form of the tubing hanger wherein the elevator receiving neck is formed integral with the hanger and the sealing surface is slightly modified from that shown in Fig. 2.

In flowing and pumping the fluid from wells, it is usual to support a string of tubing in the well through which the fluid is to flow or be pumped. The well usually embodies a casing such as that which is suitably anchored in the ground and which casing is provided among other fittings, with a casing head 3 which head here illustrated is a well known form having the outlets 4 and 5 projecting laterally therefrom. The body 6 of the casing head is provided with a bowl or tubing hanger supporting area 7 which may be either straight or tapered. The present construction illustrates a tapered bowl which is adapted to receive a tubing hanger 8. This hanger is held in position by a cap member 9 which may be either threaded or flanged. The present construction illustrates a threaded area 10 so that rotation of the cap 9 closely clamps the hanger 8 in the bowl 7 because the cap has an overhanging portion 11 which engages with the shoulder 12 on the hanger.

It is usual to run the tubing into the well with a coupling such as 15 on the upper end of the last section 16 of the tubing. As this last section is lowered into position with the coupling 15 extending above the casing head it is usual to support the tubing by means of slips in the shoulder 7. When the last section has been run into position and the exact elevation at which the tubing is to be landed is determined, the tubing hanger 8 is then connected to the coupling 15 as seen in Fig. 1. The tubing hanger 8 includes the body 20 which is preferably of solid material and which is adapted to fit in the casing head bowl 7. In the Fig. 1 embodiment a piece of pipe 21 is shown as projecting through the opening 22 formed in the body 20. This opening may be of uniform diameter with the pipe welded therein or it may be provided with a shoulder 23 in which a complementary enlarged portion 24 on the pipe 21 may be seated. This last form of the invention is preferable because a rigid support for the piece of pipe is provided and the same may be

then welded as at 25, or otherwise fixed in position.

Attention is particularly directed to the fact that the pipe 21 extends a considerable distance above the body 20 of the tubing hanger in order to provide an elevator receiving portion or neck 27. This neck may be of any desired length but is particularly adapted to receive an elevator such as 28 so that the tubing hanger may be suitably handled about the derrick floor, or the tubing may be properly landed after it has been attached to the hanger. The neck 27 is preferably of the same diameter as the tubing 16. In running the tubing into the hole the elevator 28 has been used and the same elevator may be connected to the neck 27 to pick up the tubing hanger and support it while it is being connected to the tubing string and while the tubing is being landed by positioning the tubing hanger in the casing head.

The elevator 28 is of any desired construction and usually embodies the hinged jaws 29 and the elevator bales 30. The upper end of the neck 27 may have an enlarged flange rib 31 therein or it may be of uniform diameter and the elevator under such circumstances would abut directly against the valve 32 or a coupling such as 15 which would be attached to the upper end of the neck 27. Elevators containing slips to grip a smooth pipe are well known and may be used.

It is desirable to have the valve 32 attached to the tubing hanger when the same is being landed because when the tubing has been lowered to practically its final position the greatest amount of mud has been displaced from the well and the danger of a blowout is greatest at this time. Therefore, if the valve 32 is present it may be either closed or quickly closed and the tubing hanger 8 landed in the shoulder 7 almost instantly. In event a blowout was apparent the cap 7 being carried by the body 20 would be in position and a few rotations would have the well securely closed to shut in any escape of mud.

The valve 32 is any type of gate or closure valve, and a flow line such as 33 is shown as extending from the valve. Such flow line usually leads to the christmas tree assembly, which construction is well known.

It seems apparent from the foregoing description that a simple and economical tubing hanger has been provided which can be handled by the same elevator which has been used in running the tubing and which can be readily and quickly positioned to close completely the casing head and tubing.

In order that the tubing hanger will insure a complete seal with the casing head, the contact face 35 of the body 20 has been specially constructed to receive the packing rings such as 36 and 37. These rings are positioned in radial recesses such as 38 which are formed in the periphery of the body 20. These recesses may be perpendicular to the longitudinal axis of the tubing hanger as shown, or they may be perpendicular to the face 35 as desired.

The packing rings 36 and 37 may be of any desired material, but it has been found by experience that in some instances the usual type of packing is destroyed by contact with other pieces of equipment or by cutting in event of leakage as well as by deterioration. In some instances this packing is destroyed by heat in event of fire in and about the well. If these packing rings are destroyed in the usual type of head there is then insufficient sealing to prevent leakage and disaster results. In the present construction, however, it is contemplated that additional protection will be afforded by the provision of the projecting annular ribs or rings 40. In Fig. 2 there are two such ribs and it is to be understood that any desired number may be provided. These ribs project slightly from the plane surface constituting the face 35. They are, however, of lesser diameter as a whole than the compressible packing rings 36 and 37. When the hanger is properly seated the seal will be accomplished by the packing rings 36 and 37. If, however, the packing rings are destroyed or the hanger is subjected to excessive weight it will be permitted to settle slightly in the shoulder 7 until the projecting rim 40 engages the surface of the shoulder. These sharp rings will preferably cut into the shoulder slightly due to the weight of the string of tubing and in this manner a complete seal will be insured even though the packing is destroyed.

The foregoing construction is particularly of advantage in the event of fire because if the packing rings are consumed or destroyed a seal will be maintained in the casing head by the present form of tubing hanger. Fig. 3 shows a slightly modified form of the invention wherein the body 20 and the neck 27 have been formed as an integral member. The opening 22 through the body 20 is, however, threaded as at 50 in order to receive the upper end of the last tubing section. When this construction is used there will be no coupling on the upper end of the section but the pipe tubing will be connected directly to the hanger.

The face of this tubing hanger in the Fig. 3 modification is formed with a plurality of grooves 51 which are spaced by the crests or ribs 52. A plurality of these grooves and crests are provided as shown, and it is contemplated that no compressible packing will be used with this form of hanger. The crests 52 will engage the casing head bowl and a perfect seal will be obtained in this manner.

Having described my invention, what I claim is:

1. In a tubing hanger a seating face, a compressible packing disposed thereon, an annular rib projecting from said face adjacent said packing and adapted to engage the hanger seat when said packing is compressed beyond a predetermined distance, said rib being sharp to cut into the hanger seat.

2. A sealing head for wells including a bowl, a tubing hanger disposed therein, means to clamp said hanger in said bowl, and both metallic and non-metallic sealing members carried by said hanger and adapted to seat in said bowl, said metallic sealing members comprising a sharp rib to cut into the hanger seat.

3. A sealing head for wells including a bowl, a tubing hanger disposed therein, means to clamp said hanger in said bowl, and both metallic and non-metallic sealing members carried by said hanger and adapted to seat in said bowl, said metallic seal comprising an annular projecting ring on said hanger to cut into the hanger seat to form a seal.

4. A sealing head for wells including a bowl, a tubing hanger disposed therein, means to clamp said hanger in said bowl, and both metallic and non-metallic sealing members carried by said hanger and adapted to seat in said bowl, said metallic seal comprising an annular projecting ring on said hanger adapted to seat automatically

in said bowl when said non-metallic packing does not support the hanger.

5. A sealing face for tubing hangers including a tapered annular surface, a plurality of packing rings disposed in said surface and projecting therefrom, a sealing ring formed integral with said surface and projecting therefrom a lesser distance than said packing rings and adapted to assume the weight of the hanger for sealing if said packing rings are compressed or displaced.

6. A tubing hanger including a body, a sealing face thereon to be seated in the hanger support, and a plurality of alternate crests and grooves formed in said face to effect a seal with the support, said crests being adapted to seat in the support by the weight of the tubing on the hanger.

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