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TUBING HEAD

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Fig. 1.

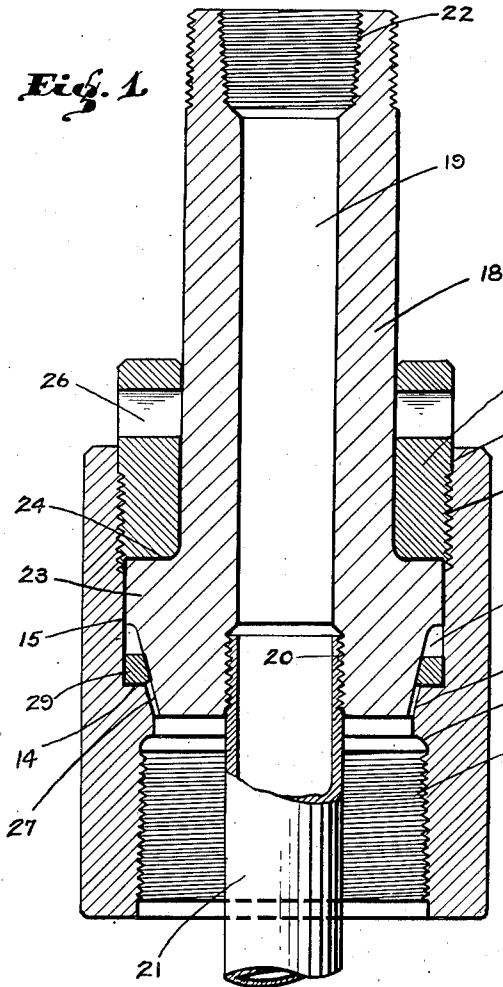


Fig. 2.

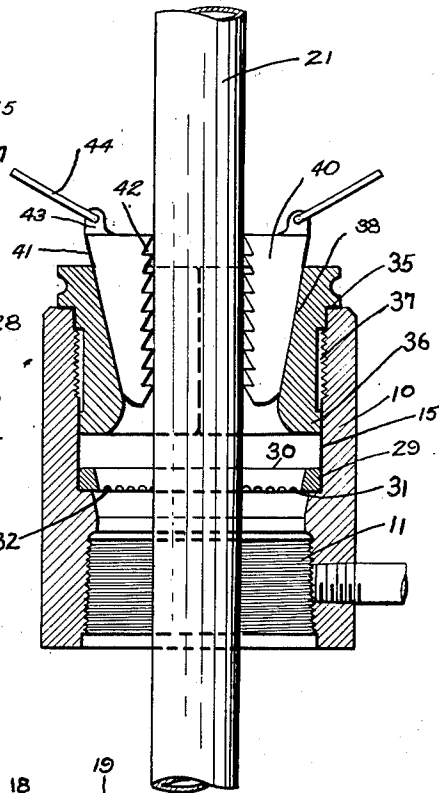


Fig. 3.

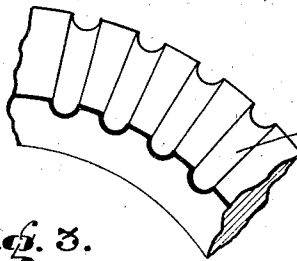
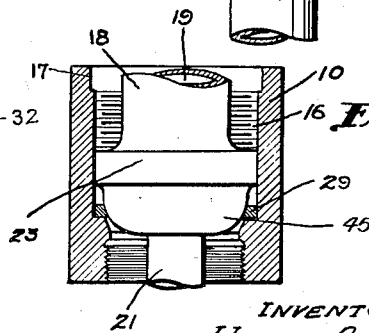


Fig. 4.



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TUBING HEAD

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4 Claims. (Cl. 285—22)

This invention relates to appliances to be used in connection with wells and particularly oil wells, and pertains to a tubing head structure. In the operation of wells and especially in connection with oil wells where fluid under pressure is present in the well it is desirable to provide a simple and effective means for packing the flow tubing within a well which will utilize the pressure of the fluid to maintain the tubing head in a packed and sealed condition without requiring the use of bolts and other fastening members difficult to place in position and to adjust in a tightening operation.

The present invention contemplates the provision of a tubular packing sleeve adapted to be mounted at the upper end of a well casing, preferably at being threaded thereonto and which member is provided with a packing seat to receive the lower end of a tubing member which lower end is formed with a frusto-conical projection extending downwardly through the seat and being circumscribed by a packing ring characterized as having an internal inclined face agreeing in angularity with the downwardly projecting end of the tubing member, and being forced into sealing relation thereto by the fluid pressure, said tubing member being held in position by a nut screwed into the upper end of the packing sleeve. The invention further contemplates the provision of simple guide bushings cooperating with the packing sleeve to guide the tubing through the head and into the casing.

The invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is an enlarged view in vertical section showing the packing head in its assembled and operative position and connected with the tubing.

Fig. 2 is a view in vertical section showing certain of the parts disclosed in Fig. 1 and indicating further the manner in which the removable guide bushings are positioned to protect the packing sleeve while the well tubing is being placed in position.

Fig. 3 is a fragmentary view in perspective showing the under face of the packing gasket to disclose the manner in which the pressure fluid may flow under the packing gasket to exert an upward force thereagainst.

Fig. 4 is a view in section and elevation showing a form of the invention with the head having a convex end.

Referring more particularly to the drawing, 10 indicates a tubular packing sleeve which may be mounted at the upper end of the usual well cas-

ing, not shown in the drawing. This sleeve is provided with a lower threaded bore 11 to receive the upper threaded end of the well casing. Above the threaded bore is an annular shoulder 12 forming a slightly restricted throat. The shoulder has an upwardly and outwardly inclined face 13 terminating at its upper end in a flat face 14 disposed in a plane transversely of the longitudinal axis of the sleeve 10. The shoulder 14 terminates at its outer end at its juncture with the cylindrical wall face of bore 15 within the sleeve 10. A portion of the upper length of the bore 15 is threaded as indicated at 16 and the mouth of the bore is counterbored as indicated at 17, for a purpose to be hereinafter described. Extending downwardly into the bore 15 is a tubing coupling member 18 having a central fluid passageway 19 therethrough. The lower end of this passageway is formed with a threaded counterbore 20 to receive the upper threaded end of a well flow tubing 21. The upper end of the passageway 19 is formed with a threaded counterbore 22 to receive other pipe connections to be provided therefor. The main body of the member 18 is in the form of a cylindrical tubular member at the lower end of which an enlarged head 23 occurs. This head is of a diameter substantially agreeing with the inside diameter of the bore 15 and is of a considerably greater diameter than the outside diameter of the main tubular portion of the coupling member 18. This provides a substantially flat shoulder 24 against which a tubular packing nut 25 may rest and by which the coupling member 18 will be held within the sleeve 10. The nut 25 is externally threaded to be mounted within the threaded bore 16 of the sleeve 10 and is formed with an unthreaded portion which is designed to fit within the smooth unthreaded counterbore 17 at the upper end of the sleeve 10. Spanner wrench openings 26 are formed in the upper projecting portion of the nut 25 to facilitate in its tightening. The enlarged head portion 23 is formed with a tapered frusto-conical end 27, the angle of its face being in substantial agreement with the angle of the inclination of the face 13 on the shoulder 12 of the sleeve 10. The length of the inclined face of the frusto-conical portion of the head 23 is considerably greater than the length of the inclined face 13 of the shoulder 12 and terminates a considerable distance above the square flat face 14 of the shoulder 12. This provides an annular space 28 which accommodates a packing gasket or ring 29. The gasket is formed of metal preferably having greater ductility than the metal from

which the members 10 and 19 are made. The outer periphery of the gasket 29 substantially agrees with the diameter of the bore 15 of sleeve 10. The upper face as indicated at 30 is preferably flat and the lower face 31 lies in a parallel plane to the upper face, but is preferably formed with radial recesses 32 which permit fluid under pressure to flow in between the under face 31 of the gasket and the flat face 14 of the shoulder on which the gasket normally rests. The upper pressure of the fluid therefore tends to force the gasket ring 29 on to the tapered extension of the head 23 to thus wedge the body of the ring in between the tapered face of the head 23 and the vertical face of the cylindrical bore 15. The head 23 is held in its lowermost position by the nut 25 and fluid pressure exerted against the under face of the gasket 29 will tend to form a fluid seal to prevent leakage of fluid up around the head and out through the nut. It will thus be evident that by this arrangement it will not be necessary for the fitting parts to be machined with great precision, since the pressure fluid which is being sealed off will have the effect of producing a tight sealing fit between the parts.

It is desirable to place the sleeve 10 upon the well casing prior to "running the tubing" into the well. This makes it possible to seal off the casing quickly after the tubing has set. In order that this may be accomplished without damage to the sleeve 10, the collar 12 formed therein, and the gasket 29, guide bushing segments 33 and 34 are provided to be temporarily mounted in the mouth of the sleeve 10. These bushing segments are semi-circular in shape and are provided near their upper edge with an overhanging lip 35 which rests upon the upper end of the sleeve 10. Shoulder members 36 are formed near the bottom of the slips and rest against the smooth portion of bore 15 in the sleeve, while a recess 37 spans the threaded portion 16 within the bore and protects the threads from damage. The inner wall of the bushing segments incline inwardly and downwardly as indicated at 38 to provide a guide throat through which the tubing 21 may be directed.

The inner tapered guide faces 38 of the segmental bushings receive tubing slips 40 having the usual outer tapered faces 41 and inner serrated faces 42. The upper ends of the slips are provided with lugs 43 to receive handles 44 by which the slips may be manipulated.

It may be desirable to form the head structure 23 with a hemispherical lower end 45 in place of the conical end 27 shown in Fig. 1 of the drawing, at the same time constructing the packing ring 29 so that its inner face is tangent to the arcuate surface of the member 45. This allows some adjustment between the parts of the tubing head and the packing ring in the event the members are not exactly in vertical alignment as would be the case if the hole was not straight.

In operation of the present invention the casing sleeve 10 is mounted in position at the upper end of a well casing after which the annular gasket 29 is disposed upon the seating face 14 of the shoulder 12. The guide bushings 33 and 34 are then positioned in the smooth portion of the sleeve 10 as shown in Fig. 2, after which the tubing 21 may be "run in" to the casing to a desired depth. When this is completed the arcuate guide bushings 33 and 34 may be lifted from their seated position and the tubular coupling member 18 disposed within the sleeve after it

has been threaded on to the upper end of the tubing 21. The nut 25 may then be tightened down upon the gasket 29 in a manner to force the frusto-conical end of the head 23 into and through the gasket. Due to the fact that the cone of the head 23 projects through the gasket ring 29 and the taper on the face of this cone portion is at a relative small angle to the longitudinal axis of the head it will be evident that the gasket ring will be positively expanded as the cone portion is forced through it. This will tend to form a fluid tight seal between the inner face of the gasket ring and the cone between the outer face of the gasket ring and the cylindrical bore 15 of the sleeve 10, and at the same time tend to hold the gasket ring downwardly upon the horizontal face 14 at the bottom of the bore 15. This will produce an initial seal which will prepare the structure so that further packing action will be obtained by the upward force of the fluids within the well. Attention is directed to the fact that the internal diameter of the gasket 29 is substantially less than the diameter of the opening formed by the inclined face 13 of the shoulder 12. This will cause an annular space 27 to occur between the inclined face 13 and the inclined face of the frusto-conical end of the head 23. By this arrangement the fluid under pressure which may be within the casing and which is forced upwardly against the end of the coupling member 18 will force its way through the annular space 27 and against the under face of the gasket 29. The radial passageways 32 in the under face of the gasket will permit this pressure fluid to exert its force across the entire width of the under face of the gasket and will thus tend to force the gasket upwardly to conform to the tapered face of the head 23 which it circumscribes and at the same time to be forced outwardly against the wall of the bore 15 in the sleeve 10.

It will thus be seen that by this arrangement a tubing head is provided which may be readily assembled, which may be easily operated under emergency conditions, and which does not require the use of various fastening means other than the one tubular nut. It will be evident further that the pressure of the fluid within the well rather than tending to produce leakage through the head will act automatically to increase the sealing effect of the gasket and to hold the structure in a fluid sealed and leak proof condition.

While I have shown the preferred form of my invention, as now known to me, it will be understood that various changes may be made in the combination, construction, and arrangement of parts, by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a tubing head structure, an annular metallic packing ring having opposite parallel faces, a straight cylindrical side wall and an inwardly and downwardly tapered central opening there-through, the lower face of said packing member being formed with a series of recesses radially corrugating said face to permit a pressure fluid to exert force against the under face of the gasket.

2. A tubing head comprising a cylindrical sleeve adapted to be mounted at the upper end of a well casing, an annular shoulder formed there-

around at a point intermediate the ends thereof, said shoulder having an upwardly presented flat face, a non-resilient packing gasket normally resting upon said face and characterized by having parallel upper and lower faces, a straight cylindrical outer face and a downwardly and inwardly inner face, the lower face of said packing gasket overhanging the shoulder in the cylindrical body member and formed with a plurality of radially extending fluid recesses thereacross forming a corrugated face thereon, a coupling member telescoping into the portion of the sleeve above the shoulder and formed with a frusto-conical end projecting into the tapered opening of the packing gasket, said frusto-conical end of the coupling member and the inwardly tapered inner face of the packing gasket arranged so as to form an annular space between the same, whereby fluid under pressure may flow into the radial recesses, forcing the packing gasket against the frusto-conical face of the coupling member, said means holding the coupling member in assembled relation to the cylindrical sleeve.

3. A tubing head comprising a cylindrical body member adapted to be mounted upon a well casing and having a flat packing shoulder therein at a point intermediate the ends thereof in a plane at right angles to the longitudinal axis of the cylindrical body member, an annular metallic gasket having a substantially flat corrugated face formed with a plurality of radial recesses and normally resting on said shoulder, a tubing coupling member telescoping into said cylindrical body and having an enlarged frusto-conical lower end projecting through said gasket from a point above and spaced from the said gasket to a point below the gasket and within the lower portion of the cylindrical body member, said gasket normally supporting the frusto-conical member to maintain a space between the face of said member and the cylindrical body, said space being closed at its upper end by the flat face of the gasket, said gasket also formed with a

flat outer face resting against the inner wall of the cylindrical body member above the shoulder, a tapered inner face which supports the frusto-conical end of the coupling member, said combination providing a packing around the coupling member above the gasket whereupon the exertion of fluid pressure against the lower face of the gasket will force said gasket upwardly into the recess, thereby packing the head.

4. A tubing head comprising a cylindrical body member adapted to be mounted upon a well casing and having a cylindrical bore therein interrupted by a flat packing shoulder at right angles to the normal axis of the body member and continuing in a downwardly and inwardly tapered bore, an annular metallic gasket substantially fitting the cylindrical bore and being seated upon the shoulder thereof, the seating face of said gasket being formed with radial grooves thereacross and the width of the face being greater than the width of the shoulder whereby its inner edge will overhang the shoulder, a tubing coupling telescoping into the cylindrical bore of the body member and terminating in a downwardly extending inwardly tapered frusto-conical portion adapted to project downwardly through the annular gasket ring and to contact the inwardly tapered face forming the wall of the opening through the ring, the taper of the frusto-conical portion being parallel to but spaced from the taper of the tapered portion of the bore in the body member to provide an annular space between the portion of the frusto-conical member below the packing ring and the bottom and the tapered bore of the body member whereby fluid under pressure from beneath the coupling will enter the groove and force upwardly to increase the wedging action of the annular metallic gasket into the space between the frusto-conical portion of the coupling and the cylindrical wall of the body member.

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