May 19, 1953 M. R. JONES 2,639,169

WELL HEAD

Filed Nov. 26, 1948 2 Sheets-Sheet 1

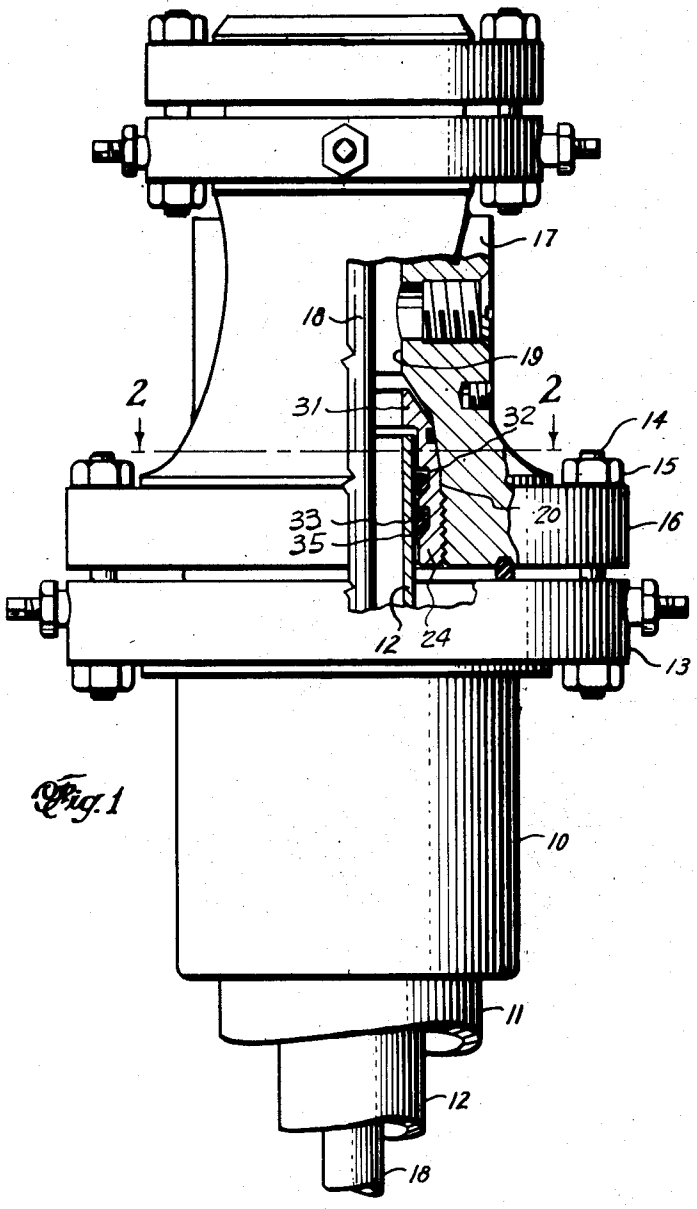


Fig. 1

Marvin R. Jones
INVENTOR

BY J. Vincent Martin and Joe E. Edwards
ATTORNEYS

May 19, 1953 M. R. JONES 2,639,169

WELL HEAD

Filed Nov. 26, 1948 2 Sheets-Sheet 2

Fig. 3

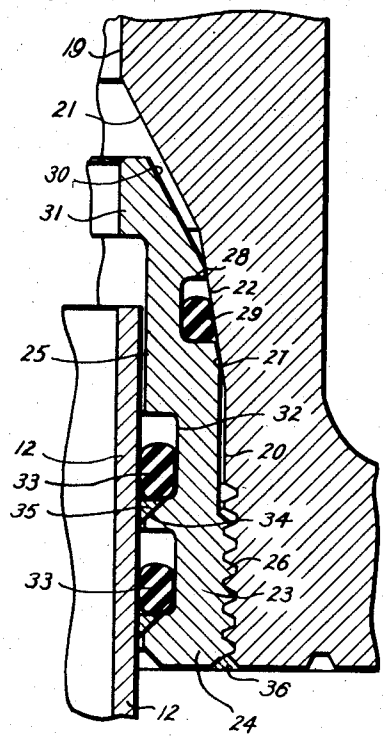


Fig. 4

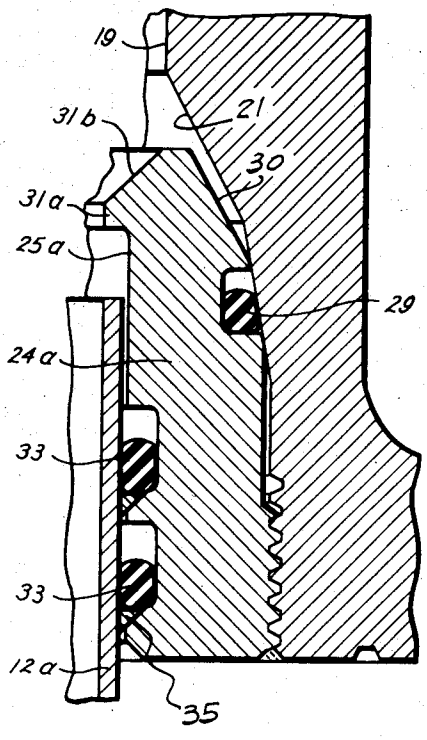
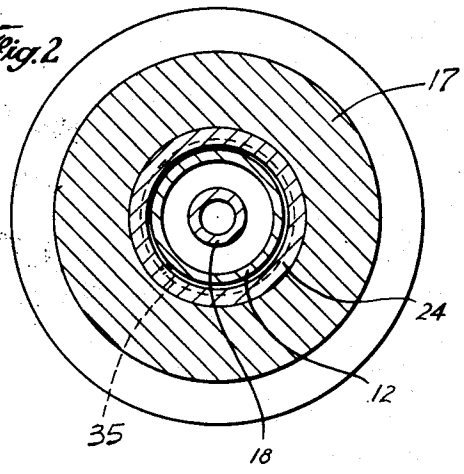


Fig. 2



Marvin R. Jones
INVENTOR

BY J. Vincent Martin and Joe E. Edwards
ATTORNEYS

Patented May 19, 1953

2,639,169

UNITED STATES PATENT OFFICE

2,639,169

WELL HEAD

Marvin R. Jones, Houston, Tex., assignor to Oil Center Tool Company, Houston, Tex., a corporation of Texas

Application November 26, 1948, Serial No. 62,075

2 Claims. (Cl. 285—122)

1

This invention relates to new and useful improvements in well head assemblies and relates particularly to improvements in well heads.

In well head assemblies, it is the usual practice to mount a casing head upon an outer or surface casing and to support an inner string of well casing by suitable means within the well head. A tubing head is ordinarily mounted, as by bolting, on the casing head and supports the string of well tubing which extends axially within the casing strings. The inner casing which is suspended within the casing has its upper end projecting or extending upwardly within the lower portion of the bore of the tubing head and it is, of course, desirable to provide a seal between said projecting or extending upper end of the casing and the bore of the tubing head. To assure a proper seal around the casing by a pressure sealing means, the tubing head must be in relatively close proximity to the exterior of said casing.

A casing head of a particular size, may be utilized to support casing strings of different diameters and since the upper end of the inner casing string supported by said casing head extends into the bore of the tubing, the bore of the tubing head must vary for each size of inner casing string. However, the usual tubing head bore is of a fixed diameter and therefore, said tubing head is adaptable for use with only a particular size casing which means that a change in the size of the casing being supported by the casing head requires replacement of the complete tubing head.

It is, therefore, one object of this invention to provide an improved tubing head having an insert bushing in the lower end of its bore whereby said tubing head is adaptable for use with different size inner casing strings without the necessity of entirely replacing the tubing head with another tubing head having another size bore.

An important object of the invention is to provide an improved tubing head having the lower end of its bore enlarged and adapted to receive an annular bushing or sleeve, which bushing or sleeve may have the desired diameter bore for receiving a particular size inner well pipe or casing; replacement of the bushing by a bushing of different size converting the tubing head so that it may be employed for sealing around an inner pipe or casing of another diameter.

A further object of the invention is to provide an improved tubing head having an adapter bushing or sleeve removably mounted in its lower end, with said sleeve having means formed in the wall of its bore for mounting a suitable packing

2

or sealing means for sealing off around the inner well pipe or casing which extends into the bore of said bushing or sleeve.

A still further object of the invention is to provide an improved tubing head, of the character described, wherein the upper portion of the adapter bushing or sleeve overhangs the upper end of the inner well pipe casing and forms a tool guide for guiding tools into the bore of the pipe or casing, and at the same time functions to protect the upper end of said casing against damage due to tools being run therethrough striking said upper edge.

The construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Figure 1 is a view partly in section and partly in elevation of an improved tubing head constructed in accordance with the invention and mounted upon a casing head,

Figure 2 is a horizontal cross-sectional view taken on the line 2—2 of Figure 1,

Figure 3 is an enlarged sectional detail of an adapter bushing mounted in place and surrounding an inner casing string, and

Figure 4 is a similar view showing an adapter bushing of different size mounted in position within the tubing head.

In the drawings, the numeral 10 designates a casing head which may be of any desired construction and which is adapted to be mounted on the upper end of an outer or surface casing 11. An inner well pipe or casing string 12 is supported or suspended by means (not shown) within the casing head and has its upper end projecting upwardly beyond the upper end of the casing head. An external annular flange 13 is formed on the upper end of the casing head and is adapted to be secured by bolts 14 and nuts 15 to the base flange 16 of a tubing head 17. The tubing head is adapted to support or suspend the well tubing 18 which extends axially through the inner casing string.

In carrying out the present invention, the tubing head is formed with the usual axial bore 19 and the lower end of this bore is enlarged as indicated at 20. The enlargement of the bore is effected gradually by providing inclined annular surfaces 21 and 22, the surface 22 actually forming the upper portion of the enlarged section 20

of the bore. Internal screw-threads 23 are formed in the wall of the enlarged portion 20 of the bore at the lower end thereof.

As has been noted, the upper end of the inner casing string 12 extends upwardly beyond the upper end of the casing head 10 and therefore projects or extends into the lower enlarged portion 20 of the bore 19 of the tubing head. The casing head is adapted to support inner well pipe or casing strings of varying diameters and in order to provide an efficient seal between this upper projecting end of the inner casing and the tubing head, it is desirable that the lower portion of the bore of the tubing be variable to conform to the diameter of the inner casing. For this purpose, an annular bushing or sleeve 24 is arranged to be removably mounted within the enlarged portion 20 of the bore of the tubing head. This bushing is clearly shown in Figure 3 and has an axial bore 25 which is slightly larger than the diameter of the particular inner casing string 12 which is supported by the casing head 10. The outer surface of the bushing or sleeve 24 generally conforms to the enlarged lower portion 20 of the bore of the tubing head and external threads 26 are formed on said bushing for connection with the internal threads 23 within the bore. Above the threads the exterior surface of the bushing is inclined or bevelled as indicated at 27 with this inclination being complementary to the inclination of the inclined annular surface 22 within the bore of the tubing head. Within the surface 27, the bushing is formed with an annular groove 28 adapted to receive a sealing ring 29, such as the usual well-known O-ring, whereby an effective seal between the external surface of the bushing and the bore 20 of the tubing head is provided. The engaging inclined surfaces 22 and 27 also provide a metal-to-metal seal between the parts. Above the inclined surface 27, the exterior of the bushing is inclined at 30 and spaced from the inclined area 21 of the tubing head bore. At its extreme upper end, an inwardly directed annular flange 31 or ring, which is preferably integral with the bushing, is provided and this flange or ring overhangs the upper edge of the inner casing string 12.

For sealing off between the bore 25 of the bushing and the exterior of the inner casing 12, the wall of the bore of the bushing is formed with annular grooves or recesses 32, each of which is adapted to receive a sealing ring 33 such as an ordinary O-ring. To compensate for slight variations in the external diameter of the casing 12, which variations may be within allowable manufacturing tolerances, the lower end of each groove or recess 32 is provided with an annular bevelled surface 34 which coacts with a split supporting ring 35. The split ring 35 functions as the bottom of the recess or groove and because its outer peripheral surface is bevelled, the supporting ring coacts with the bevelled or inclined surface 34 of the groove to assure that the ring will always engage the exterior of the casing 12. In this manner, each sealing ring 33 when placed under pressure, is prevented from being extruded or forced outwardly from the groove into the space between the casing 12 and the wall of the bore 25. Of course, it is possible that other types of sealing members, such as the well-known lip type pressure seal, may be employed.

When the size of the inner casing 12 has been determined, the proper size bushing having its bore 25 of a diameter slightly larger than the inner casing is inserted within the enlarged lower portion 20 of the tubing head 17 and is secured therein by means of the coacting screw threads 23 and 26. The bushing is threaded inwardly to seat the inclined surface 27 of the bushing against the inclined surface 23 within the bore of the tubing head, and the engagement of these surfaces limits the inward movement of bushing with respect to the tubing head bore. If desired, the lower end of the bushing may be tack welded, as indicated at 36, to the tubing head at various radial points to assure that the threaded connection will remain engaged.

The tubing head is then mounted upon the casing head and bolted thereto and the inner casing string 12 will project into the bore 25 of the bushing as has been explained. The sealing rings 33 will function to efficiently seal the space between the exterior of the casing and the bore of the bushing, while the sealing ring 29 in the external groove 28 of the bushing will seal the area between the bushing and the bore 20 of the tubing head 17. Thus, it will be seen that the bushing provides an effective means of forming a seal between the casing 12 and the tubing head at the lower portion of said head. The inwardly projecting annular flange or ring 31 on the upper end of the bushing overhangs the casing and serves to protect the upper edge thereof.

When the tubing head is to be employed with a casing string of a different diameter, it is only necessary to replace the bushing 24 and in Figure 4, a replacement bushing 24*a* having a different size bore diameter 25*a* is illustrated. The bushing 24*a* actually has an enlarged wall thickness as compared to the bushing 24, whereby the bore 25*a* is of a lesser diameter than the bore 25 of the bushing 24. Thus, a smaller diameter casing 12*a* may be supported by the casing head 10 and may project upwardly into the bore 25*a* of the substitute bushing 24*a*. The sealing rings 33 are employed to seal around the casing 24*a* while the sealing ring 29 seals the joint between the bushing and tubing head bore. Since the bushing 24*a* has a smaller bore diameter than the bushing 24, it extends inwardly within the tubing head a greater radial distance so that actually, the bushing projects inwardly beyond the wall of the bore 19 of the tubing head. Therefore, it is desirable that the overhanging flange 31*a* at the uper end of the bushing 24*a* have its inner surface inclined or bevelled, as shown at 31*b*, whereby tools which may be lowered through the bore 19, will be guided inwardly into the bore of the inner casing 12*a*. The annular flange 31*a*, of course, overhangs the upper edge of the casing 12*a* to form a protector therefor.

It will be evident that any desired number of adapter bushings, each having a bore of different diameter, may be provided for mounting within the tubing head bore. The number of bushings which are provided for each tubing head are in accordance with the number of different size inner casings which may be supported by the casing head 10 to which the tubing head 17 may be attached. Regardless of the variation in bore diameters of the bushing, said bushing always functions to permit an effective seal to be made with the exterior of the casing which projects into said bore. Also, in all instances, the upper end of the bushing overhangs the edge of the casing to protect said casing and also to

form a tool guide for guiding tools which may be lowered through the tubing head downwardly into the inner casing string.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

Having described the invention, I claim:

1. A well head assembly including, a casing head, a tubing head having an axial bore mounted on said casing head, a well pipe supported by the casing head and having its upper portion extending upwardly into the lower portion of the bore of the tubing head, an adapter sleeve element mounted within the lower portion of the bore of the tubing head and surrounding the well pipe, the upper end of said element overhanging the upper end of said pipe to protect the same and form a tool guide, and a sealing means between said well pipe and the adapter element, wherein the adapter element is removably mounted within the bore of the tubing head by screw threads, and also wherein an additional sealing means is provided between the adapter element and tubing head.

2. A well head including, an annular body having an axial bore extending therethrough, said bore having its lower end enlarged and provided with screw threads, an adapter bushing having external screw threads for engaging the threads within the lower end of the bore, and an annular sealing means between the exterior of the bushing and the bore of the well head.

MARVIN R. JONES.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
748,400	Howe	Mar. 7, 1905
2,202,055	Juffa	May 28, 1940
2,312,476	Penick et al.	Mar. 2, 1943
2,426,371	Penick	Aug. 26, 1947
2,456,081	Penick	Dec. 14, 1948