July 31, 1945. H. ALLEN 2,380,388

WELL HEAD AND CASING SUSPENSION STRUCTURE

Filed Oct. 21, 1940 2 Sheets-Sheet 1

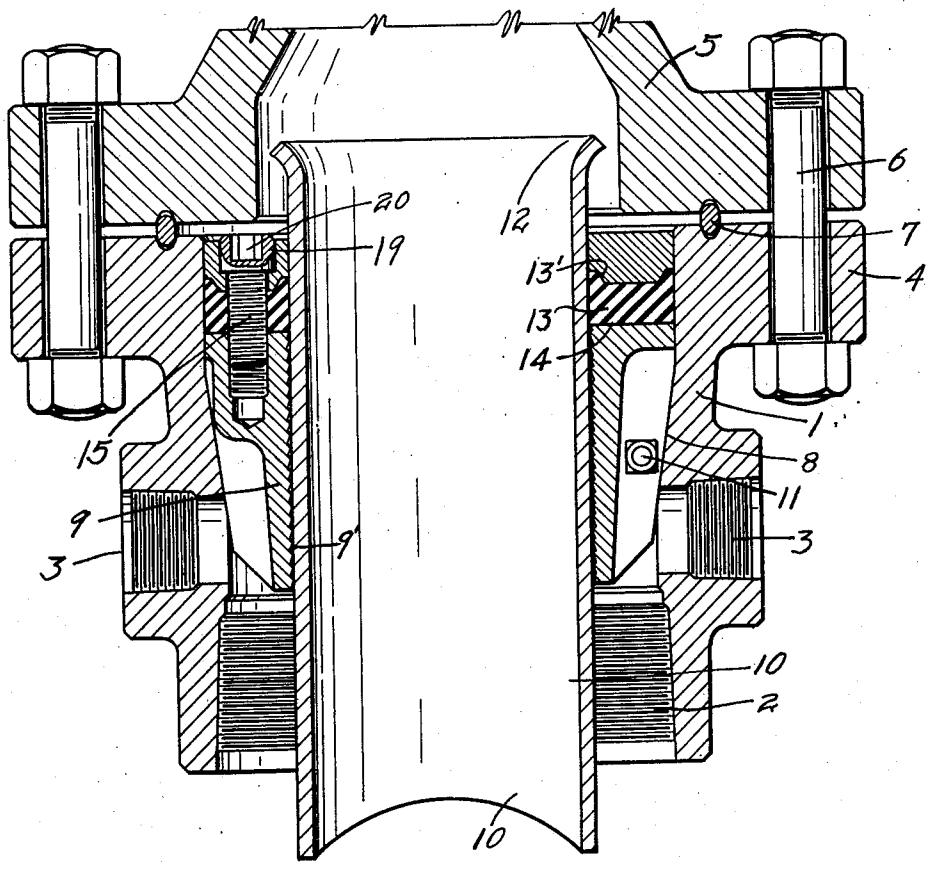


FIG. 1.

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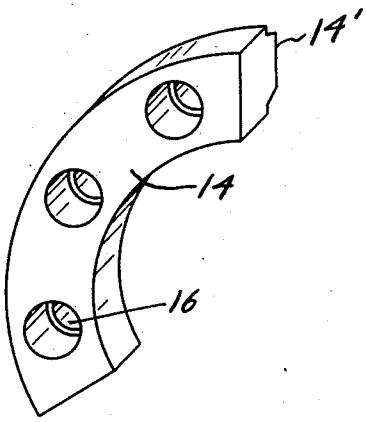


FIG. 2.

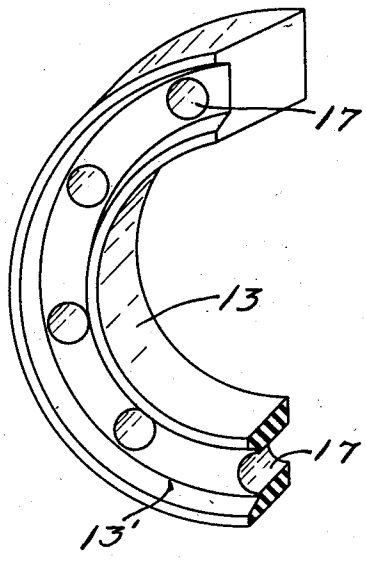


FIG. 3.

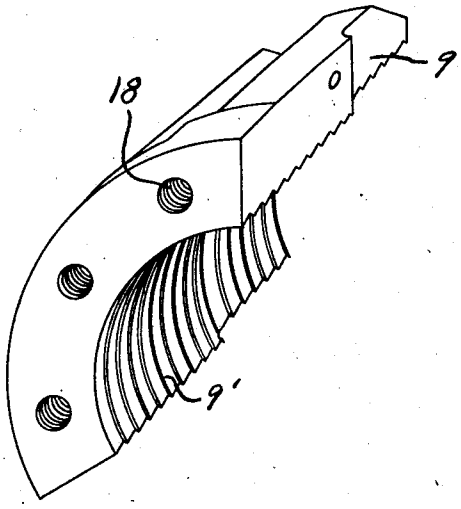


FIG. 4.

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Patented July 31, 1945

2,380,388

UNITED STATES PATENT OFFICE

2,380,388

WELL HEAD AND CASING SUSPENSION STRUCTURE

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Application October 21, 1940, Serial No. 362,028

1 Claim. (Cl. 166—14)

This invention relates in general to a casing head for oil and gas or similar wells, and more particularly has reference to means for supporting a casing in a casing head and sealing the casing to the casing head.

In the prior art, for example, the casing has previously been hung by means of two collars, the lower of which seated upon a shoulder in the casing head and the upper of which was disposed above it and supported a coupling or other lateral projection on the oil string. A packing ring was provided between the two collars so that when the weight of the casing was set down on the upper collar, the packing would be expanded laterally to form a seal and the casing would be hung at the same time.

Another structure in the prior art involves the use of slips for supporting the casing in the casing head. After these slips were set, a separate ring was placed above the slips and welded both to the casing head and to the inner casing. This eliminated the use of expansible packing and made it possible to hang the casing without providing a collar at the exact point where the casing was to be hung. Much work in the field and time lost was saved by this step. However, in some cases, due to expansion of the casing or for some other cause, the welded connections have broken and damage has resulted therefrom.

An object of this invention is to provide a structure for hanging a casing at any point in its length within a casing head and sealing the casing to the casing head.

Another object of this invention is to provide segmental slips for insertion in the space between a casing and a casing head and means on the upper edges of the slips for expanding a sealing ring into sealing engagement between the casing and casing head.

In accordance with the present invention, a structure is provided in which the casing can be hung at any point, regardless of the position of the collars thereon, and may be hung before a seal is made. A seal may then be made, which is not dependent upon the weight of the oil string to expand a packing for producing the seal. At the same time, there is no welded connection which might become broken as has been the case in the past. On the other hand, the casing is free to move upwardly through the seal without in any way destroying or impairing the seal.

In the drawings:

Figure 1 is a vertical cross-sectional view through a casing head and casing suspension and seal constructed in accordance with this invention.

Fig. 2 is a perspective view of a portion of the expanding means for expanding the packing ring, which forms the seal provided by this invention.

Fig. 3 is a similar view with a part broken away and shown in section illustrating the packing ring of this invention.

Fig. 4 is a perspective view of one of the slips employed in accordance with this invention.

As clearly shown in Fig. 1, the casing head 1 has threads at its lower end 2 for connecting it to a surface string of casing. It has lateral flow lines 3 and a laterally extending flange 4 at its upper end so that a bonnet 5 may be secured to it by means of bolts 6. A seal is formed between the bonnet and casing head by means of a metal sealing ring 7 positioned in appropriate registering grooves in the adjacent surfaces of the casing head and bonnet.

The casing head is provided with a tapered bowl portion 8 adapted to receive the slips 9 by which the inner or oil string of casing 10 is supported in the casing head. As shown in the drawings, the slips are formed as segments of an annulus and are provided with teeth or serrations 9' on the inner surface thereof to engage and grip the casing 10. The outer surface of the slips is inclined to the inner surface to nest in the tapered inner surface of the bowl-shaped portion 8 of the casing head.

After the oil string has been cemented in place, a strain will be placed on the oil string by means of the draw-works or hoisting apparatus until that portion of the total weight of the casing, which is desired to be supported by the casing head, is being supported on the draw-works. The slips 9 are then dropped into place and are held on the same level with each other by means of bolts 11, which are loose and merely act as dowel pins. The casing is then released from the draw-works and the blow-out preventer, which has been in place on the casing head during the drilling operations and during the running of the casing, is removed. The casing is then cut off just above the upper end of the casing head, as shown, this cutting being done by means of a cutting torch or any other suitable manner, and the upper end of the casing is preferably beveled or flared at 12 as desired, so that the tubing may subsequently be passed down through the casing without the collars of the tubing catching on the upper end of the casing.

The sealing ring 13 may be in the form of a split ring and is now placed about the casing 10

on top of the slips 9. The segments 14 of the segmental expanding ring are now placed on top of the packing and the bolts 15 are placed through the openings 16 in the segments 14 and the openings 17 in the ring 13 and threaded into the tapped openings 18 in the slips 9. It is noted that the heads 19 of the bolts 15 are countersunk into the segments 14 and that each of these bolt heads is provided with a non-circular socket 20 for the reception of a wrench for tightening them. The bolts are then tightened down, thus compressing the sealing ring 13 axially of the casing and expanding said sealing ring transversely of the casing axis to form a seal between the inner casing 10 and the casing head 1.

The upper surface of the sealing ring 13 is provided with a groove 13' to receive the projection 14' of the expanding ring 14. This groove and projection are of trapezoidal cross-section and are effective to facilitate transverse expansion of the sealing ring.

It will be seen that by this means the necessity for hanging the casing at a coupling is eliminated and thus the advantages of the welded seal structure are obtained. However, no welding is involved and hence the casing is free to move upwardly, if conditions cause it to do so without injuring the seal. The structure, therefore, provides substantially all the advantages of the previous forms without their disadvantages.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art, without departing from the spirit of the invention or exceeding the scope of the appended claim.

I claim:

A structure of the character described, comprising a casing head having an opening therein, a casing extending through said opening, slips interposed between the casing and the opening for supporting the casing in said opening, a sealing ring surrounding said casing and positioned within said opening above said slips, an expanding ring mounted on said sealing ring, means carried by said slips and independent of said casing head for drawing said expanding ring toward said slips to compress the sealing ring axially of the casing and expand it laterally into sealing engagement with the exterior of said casing and the interior wall of said opening, said sealing ring having a groove of trapezoidal cross-section with flaring sides in the upper surface thereof, and an annular projection of trapezoidal wedge-shaped cross-section on the lower edge of the expanding ring nested in the groove of the sealing ring to facilitate expansion of said sealing ring.

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