

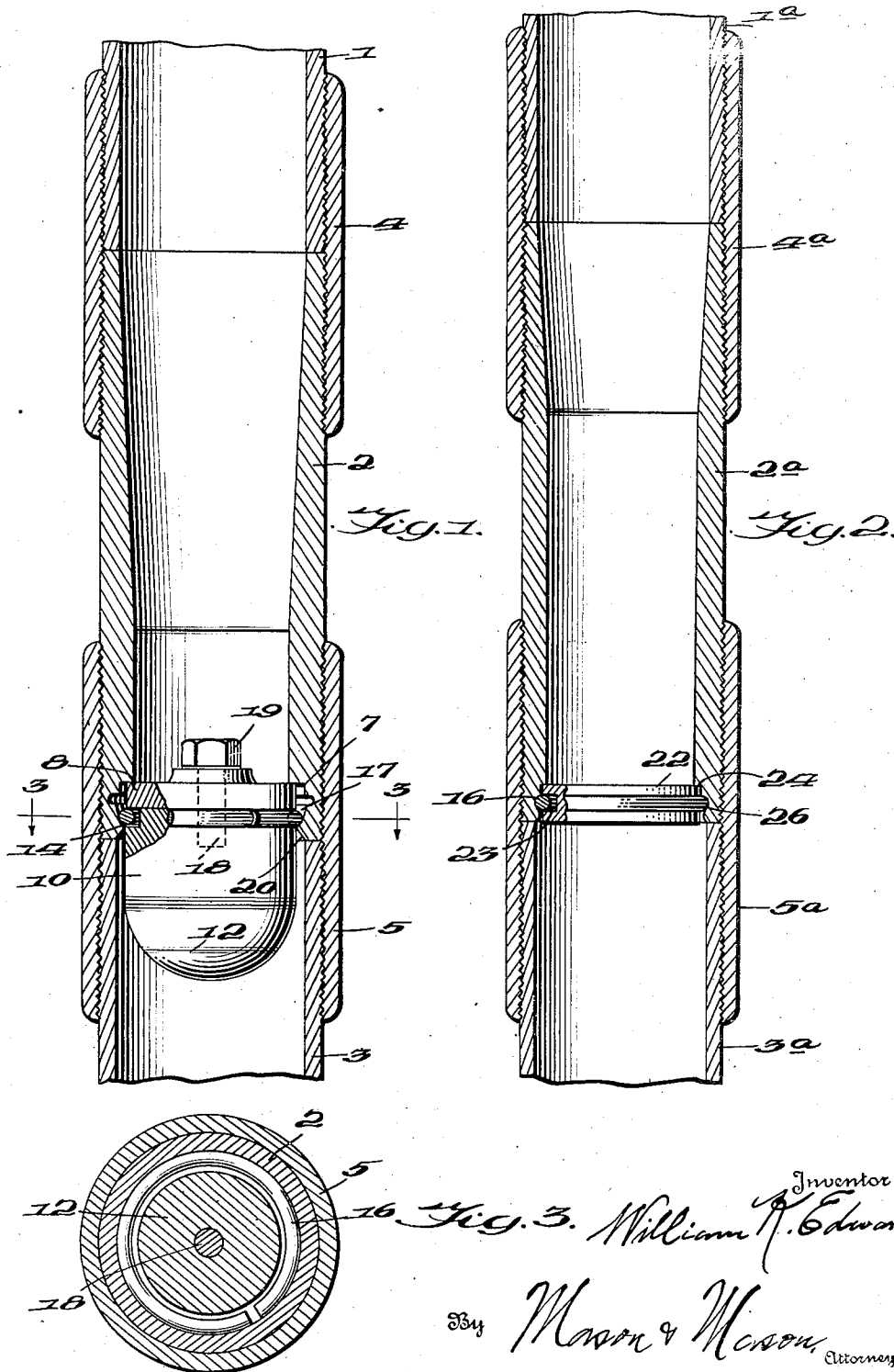
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W. K. EDWARDS

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BOTTOM TUBING PLUG FOR OIL WELLS

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Inventor
William K. Edwards
By *Mason & Mason*, Attorneys.

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BOTTOM TUBING PLUG FOR OIL WELLS

William K. Edwards, Big Spring, Tex.

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6 Claims. (Cl. 166—13)

This invention relates to means for preventing the oil from flowing through tubing in high pressure oil wells while the tubing is being run into the well.

Means have heretofore been provided for preventing the flow of oil through the tubing while the same is being lowered into the well, such means being ordinarily in the form of a disk which is capable of being punctured, either by a puncturing tool or through impact from a weight which is dropped down the tubing, to allow the oil to flow through the tubing after the latter has been inserted in position. Such devices are more or less objectionable because fracture of the disk either by a weight dropped into the tubing, or a tool forcibly moved against the disk, is possible, as portions of the disk are frequently not removed by these methods. Thus parts of the disks which remain act as an obstruction to the flow of oil, and for this reason the frangible disk method of checking the flow of oil in tubing has not been a success.

An important feature of the present invention consists in a plug which is held in a position to obstruct the flow of oil through the tubing by frictional means. The plug may be dislodged either by hydraulic pressure applied from above by a pump, or may be knocked out by dropping a weight on it from above. In either case the plug is removed as an obstructing element, as an entirety, and drops through the tubing to the bottom of the well so as to be out of the way, thus permitting a free flow of the oil when such result is desired. Preferably, the frictional means for retaining the plug in position is, as herein shown, in the form of an expansible split ring of resilient metal which normally expands into a groove in the walls of the tubing, and holds the plug against dislodgment by the pressure of the oil from below, and retains the plug in position until it is desired to remove it in either of the ways above mentioned. Under a preferred form of the invention the plug is in the form of a curved member so that when the plug is dislodged its shape is such as to prevent the possibility of dislodgment in that portion of the tubing below where the plug is placed, as for example, when a perforated screw joint of tubing is provided below the plug to act as a strainer; or where the extension of the well tubing below the plug is in the form of a pipe section.

The foregoing, and other important features of the invention will be hereinafter more particularly described in connection with the accompanying drawing, in which:—

Fig. 1 is a view, partly sectional, illustrating the preferred form of my bottom tubing plug in position in the oil well tubing;

Fig. 2 is a similar view illustrating a modification, and

Fig. 3 is a sectional view on the line 3—3, Fig. 1. Sections of the oil well tubing 1, 2, and 3 are connected by coupling collars 4 and 5, as is usual. Referring to Fig. 1, at a suitable point, preferably near the termination of a section of tubing 2, a ground valve seat 7 is provided. The tubing plug is composed of an upper disk portion 8 and a lower extension 10 which, as herein shown, is partly cylindrical and terminates at its lower end in a convexly curved portion 12, this part of the plug resembling generally the shape of a bullet, or plumb bob. The part 10 of the plug is provided at its upper terminal with a recess or groove 14 within which is located an expansion ring 16 having a normal tendency to expand outwardly beyond the plug. This ring, when the plug is in the position shown in Fig. 1 in the tubing, is restrained against outward expansion by a recess 17 formed in the inner wall of the tubing section 2 a suitable distance below the ground seat 7.

The disk-shaped part 8 of the plug seats upon the upper surface of the lower section 10 and is clamped in position thereon by a threaded bolt 18 having a head 19, and engaging an internal thread in a central orifice of the plug member 10. By such bolt the parts of the plug 8, 10, are clamped together and the upper portion of the recess 14 in the member 10 is closed by the overlapping portion of the disk, thereby forming a complete groove for the expansible ring 16.

It will be seen from the above construction that the bottom tubing plug, comprising the above described parts, is inserted by forcibly moving it upwardly in the tubing until the upper face of the disk 8 seats against the ground seat 7, the expansion ring being forced inwardly during such movement and contracted until the plug has become seated, whereupon the ring expands outwardly beyond the perimeter of the cylindrical portion of the plug member 10, and frictionally holds the plug as an entirety snugly and reliably within the tubing. When in this position the disk 8 is seated on the ground joint 7 and an oil tight joint is thus formed to prevent the possibility of any oil passing above the plug, due to the oil pressure in the well. The inner surface of the tubing section 2, below the seat 17 for the expansion ring, is inwardly beveled as indicated at 20, so that in the operation of forcing the plug

into position the expansion ring will be caused to contract temporarily until it passes the inwardly contracted portion of the inside of the tubing at the termination of the bevel 20 therein.

5 In order to remove the plug it is merely necessary to force water down through a hydraulic pressure apparatus, such as a pump, from above with sufficient force to dislodge the plug, whereupon it falls freely down into the well and out of
10 the way, or, in lieu of water pressure, a weight may be dropped down into the tubing and by the blow delivered to the plugs cause its dislodgment from the position as shown in Fig. 1. Under either of these modes of dislodgment of the plug
15 it will be seen that the downward pressure must be sufficient to crowd the expansion ring inwardly into its groove 14, thereby permitting free downward movement of the plug.

In the modification illustrated in Fig. 2 I employ a disk 22 provided with a groove in its periphery, 23, in which is seated a split expansion ring 16 which may be identical in construction with the ring 16 illustrated in Fig. 1. In this modification, the upper outer face of the
25 disk 22 seats against the ground seat 24 in the tubing section 2a, to provide a leak-tight joint against the upward passage of oil. In this respect the modification follows the construction of the disk section 8 of the plug shown in Fig. 1.
30 The tubing section 2a is shown as connected with an upper section 1a by a threaded collar 4a, and the lower portion of the section 2a is threaded for engagement therewith by a coupling collar, the lower inner portion of which is in threaded engagement with a lower tubing section 3a. The
35 expansion ring 16 is received in the groove 23 in the outer peripheral face of the ring 22, and when the latter is seated against the seat 24 in the tubing the expansion ring is in frictional engagement with the seat 26 in the inner wall of the
40 tubing, below the ground seat 24, as shown in Fig. 2. Dislodgment of the disk in this case is effected by either of the means described with reference to the construction shown in Fig. 1;
45 that is, either of downward hydraulic pressure, or due to the force of a blow delivered by impact of a weight which may be directed down the tubing from the well platform above. While this construction has certain benefits which are common to it and to the preferred form shown in
50 Fig. 1, it of course lacks the guiding quality of the plug when the latter is dislodged, due to the curved bullet-shaped extension 12 which effectively prevents any liability of the plug lodging in the tubing below the seat of the plug, and becoming fixed in a crosswire position therein.
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I claim:—

1. A bottom tubing plug for oil wells comprising

a disk having its upper face ground to form a tight joint with the seat in a tubing section, said device provided with a peripheral groove, and a resilient expansion ring seated in the groove and arranged to frictionally engage a groove within
5 the tubing section.

2. A bottom tubing plug for oil wells comprising in combination, a section having a convexly curved outer terminal face, a groove formed partly in said section, an expansion ring fitting said
10 groove, a disk combined with said section and arranged to overlap the groove at its lower edge, and having its upper edge ground to form a surface to seat against a ground seat formed interiorly of the well tubing.
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3. A bottom tubing plug for oil wells comprising a section having an outer convexly curved terminal portion having its upper portion reduced in diameter to form a recess, an expansible
20 elastic ring in said recess, an upper disk portion constructed to overlap said recess forming a groove for said ring, and means for clamping the two portions of the plug together.

4. A bottom tubing plug for oil wells having in combination, a lower bullet-shaped portion having
25 its leading end reduced to form a clearance within the tubing, and its upper portion reduced in diameter to form a recess, an expansible ring within said recess, a disk portion arranged to have its periphery overlap the recess thereby providing
30 a groove, and a threaded bolt to engage an internal thread in the first mentioned portion for clamping the two parts of the plug together.

5. The combination of an oil well tubing section having interiorly thereof a valve seat, a recess
35 below said seat with a bottom tubing plug comprising a lower section having a reduced terminal to provide clearance for the plug when dropped through the tubing, an upper reduced
40 portion to form a recess, an expansion ring in said recess, a disk overlapping the recess and provided with a valve seat at its upper peripheral edge to engage the seat in the tubing, and clamping means for securing the several parts of the
45 plug together.

6. In a device of the character described, the combination with an oil well tubing section provided interiorly with a valve seat facing downwardly, a recess below said seat for receiving an
50 expansion ring, an inclined portion formed below the said recess, of a plug comprising a disk member constructed to engage the tubing seat, an extension member below the disk provided with a recess, a curved lower end extending a substantial
55 distance below the recess, an expansion ring in said recess, and means for clamping the several parts of the plug together.

WILLIAM K. EDWARDS.