Jan. 2, 1951 W. H. ENDSLEY 2,536,431

WELL TUBING PLUG

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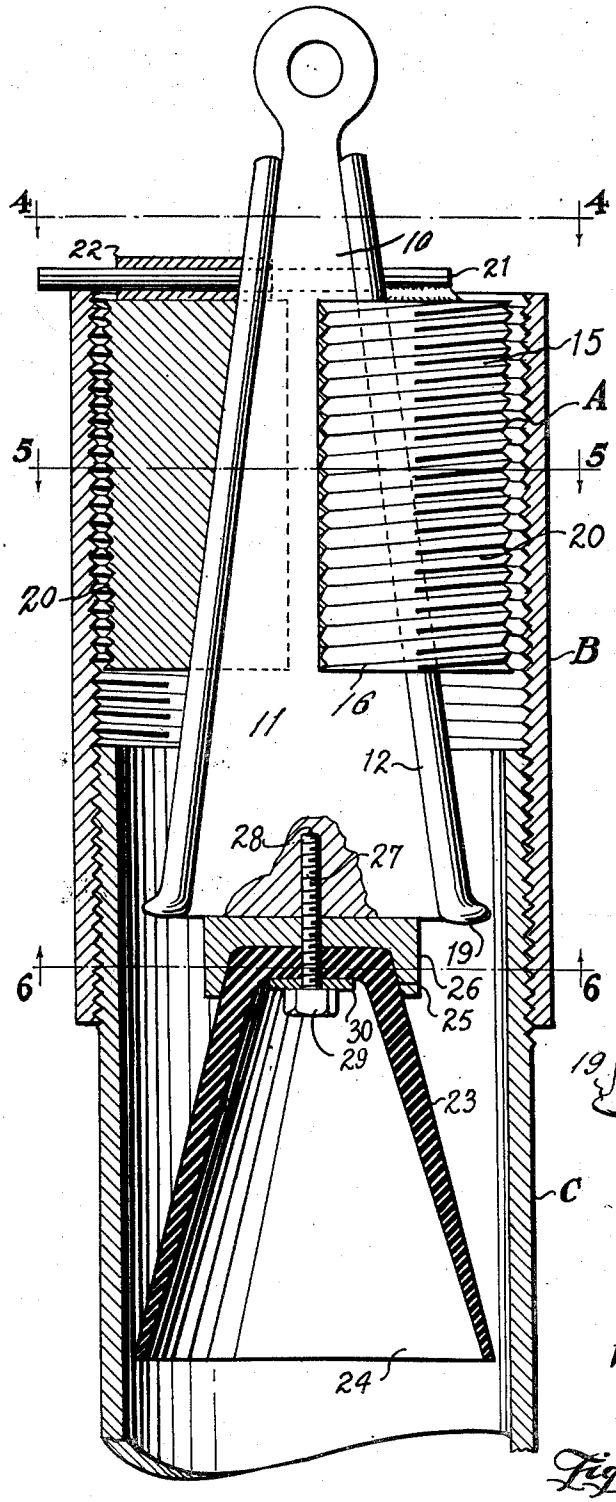


Fig. 1

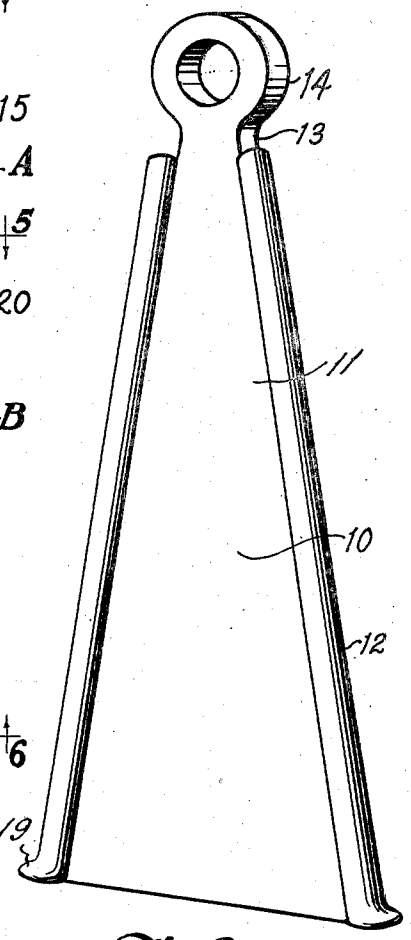


Fig. 2

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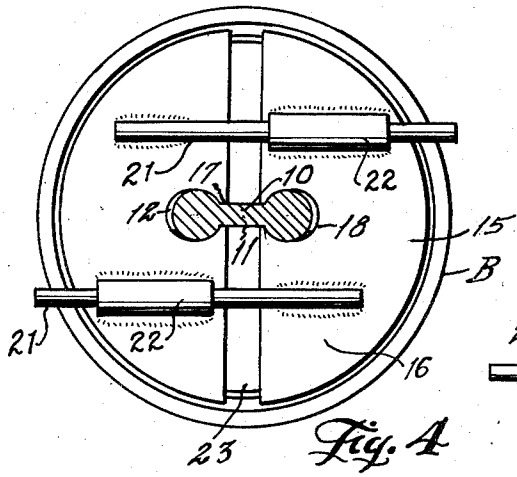


Fig. 4

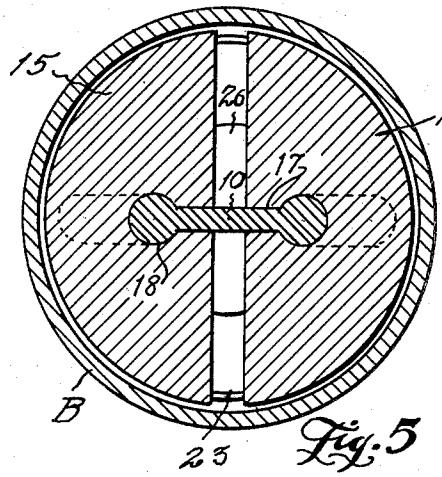


Fig. 5

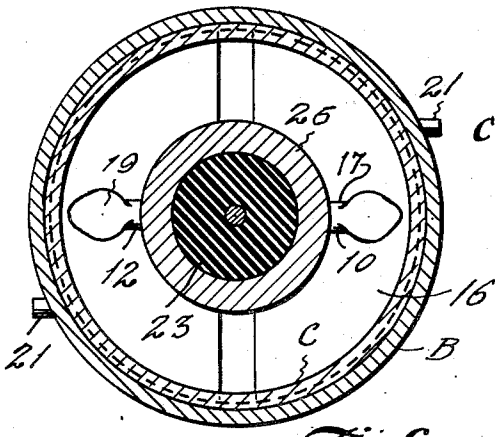


Fig. 6

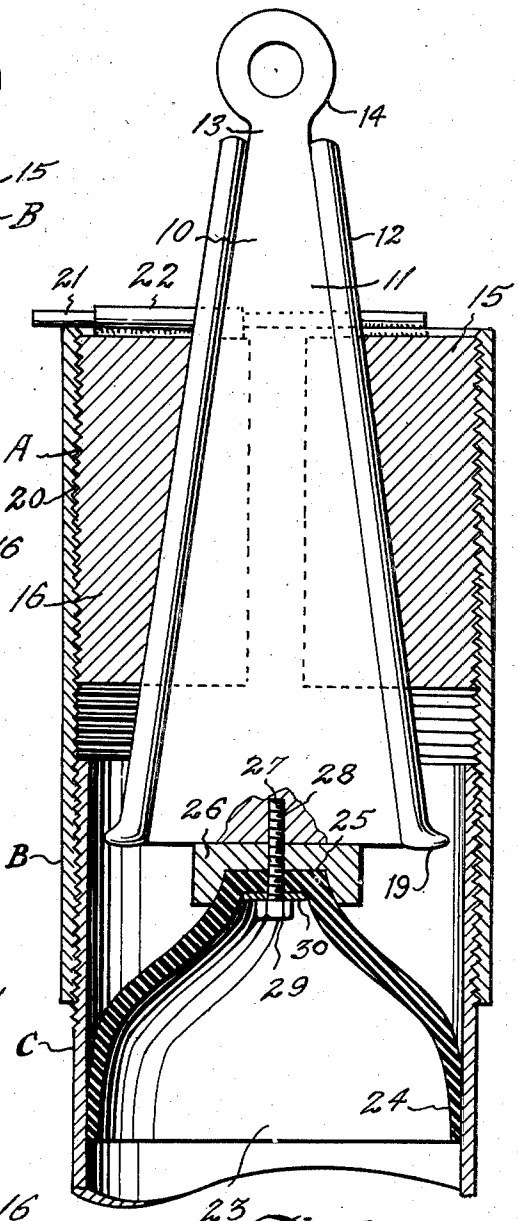


Fig. 3

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WELL TUBING PLUG

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Application September 20, 1945, Serial No. 617,558

5 Claims. (Cl. 166—13)

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This invention relates to new and useful improvements in well tubing plugs.

One object of the invention is to provide an improved plug adapted to be inserted in the upper end of a well tubing to close the same against the discharge of fluids when the tubing is being pulled from a well.

A particular object of the invention is to provide an improved plug having means for locking it in a collar at the upper end of a well tubing.

A further object of the invention is to provide a well plug having means for preventing it from dropping down the bore of the tubing when being inserted thereinto.

Another object of the invention is to provide an improved plug having a common operating member carrying expansible pipe gripping members and a fluid-pressure responsive packer, which makes for a simple and efficient tubing plug.

A 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:

Fig. 1 is a vertical sectional view of a plug constructed in accordance with the invention disposed in the upper end of a well tubing,

Fig. 2 is an isometrical view of the mandrel,

Fig. 3 is a view similar to Fig. 1 showing the plug fastened in the tubing,

Fig. 4 is a horizontal cross-sectional view taken on the line 4—4 of Fig. 1,

Fig. 5 is a similar view taken on the line 5—5 of Fig. 1, and

Fig. 6 is a horizontal cross-sectional view taken on the line 6—6 of Fig. 1.

In the drawings, the numeral 10 designates a generally flat wedge-shaped mandrel. The sides 11 of the mandrel are flat and upwardly and inwardly inclined guide ribs 12 are formed along each edge of the mandrel. These ribs terminate short of the top of the mandrel to form a short neck 13 which is surmounted by an eye 14. The ribs are circular in cross-section and each has a diameter somewhat greater than the thickness of the mandrel.

An expansible pipe gripping member 15 is mounted to slide vertically on the mandrel. This member includes a pair of substantially semicircular slips or blocks 16 which are mounted transversely on the mandrel. Each slip is formed with

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a vertical keyhole slot 17 in its inner face, inclined complementary to the ribs which are received therein. The slips 16 are mounted on the mandrel 10 by sliding them downwardly thereon, whereby the ribs 12 are received in the heads 18 of the slots 17 and the flat body of the mandrel engages in the complementary portions of said slots and extends across the gap between said slips. To prevent the slips from sliding off the lower ends of the ribs 12, any suitable means may be used, such as lugs 19.

The outer semicircular faces of the slips are provided with teeth or screw threads 20 and these threads are preferably of a size and pitch to engage in the internal screw threads A of a tubing collar B which is usually screwed onto the end of a tubing section C. These collars are employed to couple the adjacent ends of tubing sections and when the upper section is removed, the collar is left open so that the plug may be inserted therein and the threads 20 engaged with the threads A. For limiting the downward movement of the plug in the collar B, pilot bars 21 are welded on top of the slips 16 in alternate relation on each side of the mandrel 10. Each bar is made long enough to slide through a sleeve 22 welded on the opposite slip and projecting beyond the slips sufficiently to overhang and engage upon the upper edge of the collar B and support the plug. It is obvious that as the mandrel is moved upwardly and downwardly, the slips will be expanded and retracted.

As the purpose of the invention is to completely seal off the upper end of the open tubing, a conical elastic packer 23 is attached to the bottom of the mandrel. The wall of this packer is reduced in thickness toward its lower end to form a flexible annular lip 24, which may be expanded by the well fluid into sealing engagement with the inner surface of the tube C, as is shown in Fig. 3. The upper end of the packer is secured in a seat 25 formed in a thimble 26. A bolt 27 is screwed into an internally screw-threaded vertical socket 28 in the bottom of the mandrel. The head 29 of this bolt supports a metal washer 30 which, in turn, supports the packer and secures the thimble against the bottom of the mandrel.

In pulling tubing from a well, it frequently happens that the tubing is full of oil or other liquid and the upward movement of the tubing will agitate the liquid so that it will be ejected from the top of the collar B and flow down onto the derrick floor and the workmen. Such an occurrence not only makes the workmen uncomfortable, but subjects them to colds and injury

due to the slippery condition of the derrick floor, as well as causing unpleasant working conditions. In using the invention, the eye 14 is engaged on the hook of a cable or other support (not shown) whereby the plug may be lowered into the collar B and the tubing C until the pilot bars 21 rest upon the upper edge of the collar. When the plug is lowered into the tubing, the packer will be immersed in the fluid, which will offer some resistance to the downward movement of the plug, and this will tend to force the mandrel upwardly, whereby the slips 16 will be expanded and their threads 20 engaged in the teeth A of the collar. Of course, just as soon as the pilot bars 21 come to rest on the collar B, the mandrel could be pulled upwardly to expand the slips. In either event, agitation of the well liquid will expand the packer 23 into the position shown in Fig. 3. Most well liquids are entrained with gas and the latter creates a pressure which would also cause expansion of the packer.

When the packer is sealed against the tubing and the slips locked in the collar, it is obvious that neither liquid nor gas can escape from the tubing, except the small amount which may be trapped above the packer. It is pointed out that the pilot bars not only support the slips, but maintain them in horizontal alinement.

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.

What I claim and desire to secure by Letters Patent is:

1. A tubing plug including, an upwardly tapering wedge-shaped flat thin mandrel having inclined ribs along its edges, the ribs being of a width greater than the thickness of the mandrel, slips slidably mounted on said mandrel and having keyhole slots for receiving said mandrel and its ribs, and a packer depending from said mandrel.

2. A tubing plug including, an upwardly tapering wedge-shaped flat thin mandrel having inclined ribs along its edges, the ribs being of a width greater than the thickness of the mandrel, slips slidably mounted on said mandrel and having keyhole slots for receiving said mandrel and its ribs, and means carried by the slips for supporting them on a tubing collar.

3. A tubing plug including, an upwardly tapering wedge-shaped flat thin mandrel having inclined ribs along its outer edges, the ribs being of a width greater than the thickness of the mandrel, slips slidably mounted on said mandrel and having keyhole slots for receiving said mandrel and its ribs, a pilot bar carried by each slip, and a sleeve carried by each slip in which the bar carried by the other slip is slidable, whereby the slips are maintained in transverse alinement.

4. A device for plugging the upper open end of a well tubing having internal screw-threads including, an upwardly inwardly tapering wedge-shaped flat thin mandrel having upright ribs along its inclined edges, the ribs being of a width greater than the thickness of the mandrel, an inverted elastic cup secured to the bottom of said mandrel and having its marginal lower edge free to expand, and slips slidable on said mandrel and having complementary openings receiving said ribs.

5. A device for plugging the upper open end of a well tubing having internal screw-threads including, a flat thin mandrel having upwardly inwardly inclined edges, a pair of slips slidable up and down the edges of the mandrel, an inverted elastic cup secured at its top to the bottom of said mandrel and having its inner and outer walls unobstructed and free to contract and expand to their elastic limit, and a pilot bar secured to the top of each slip and extending across the top of the other slip and projecting laterally therebeyond, each slip having a retainer in which the bar secured to the other slip is slidable, whereby the slips are maintained in transverse alinement.

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