D. L. DRISCOLL.

SAFETY TUBING ANCHOR.

APPLICATION FILED FEB. 24, 1914.

1,118,538.

Patented Nov. 24, 1914.

2 SHEETS—SHEET 1.

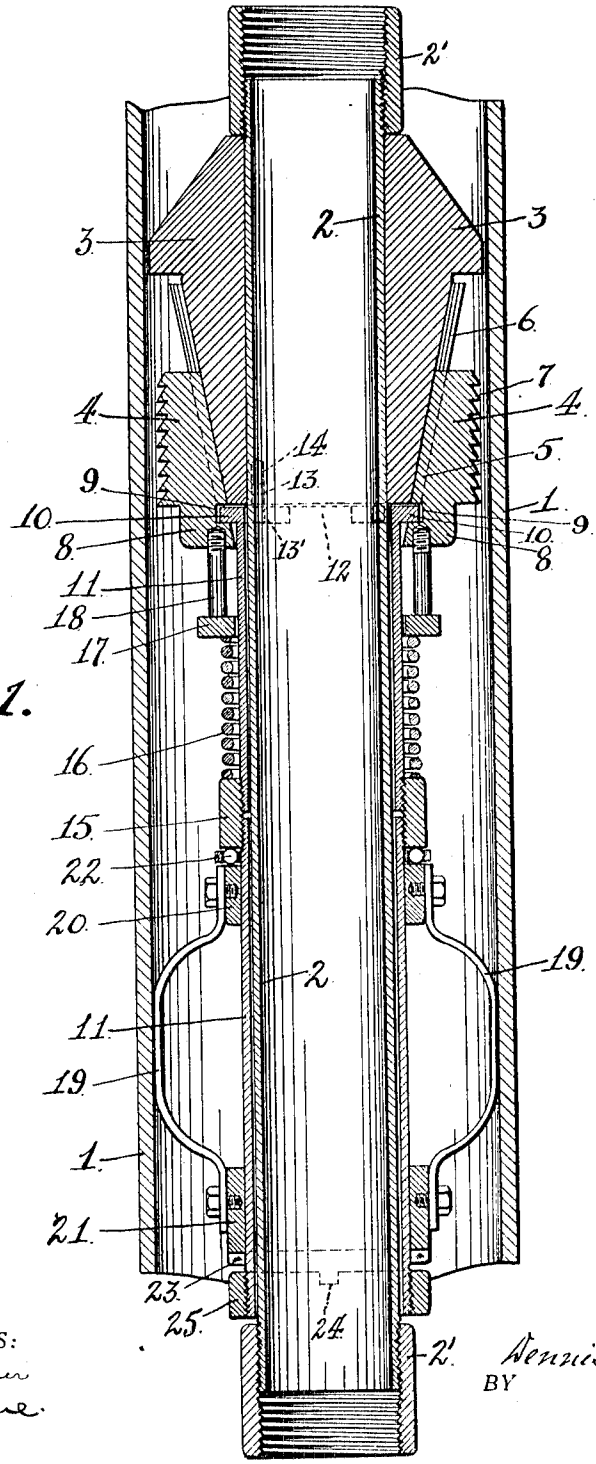


Fig. 1.

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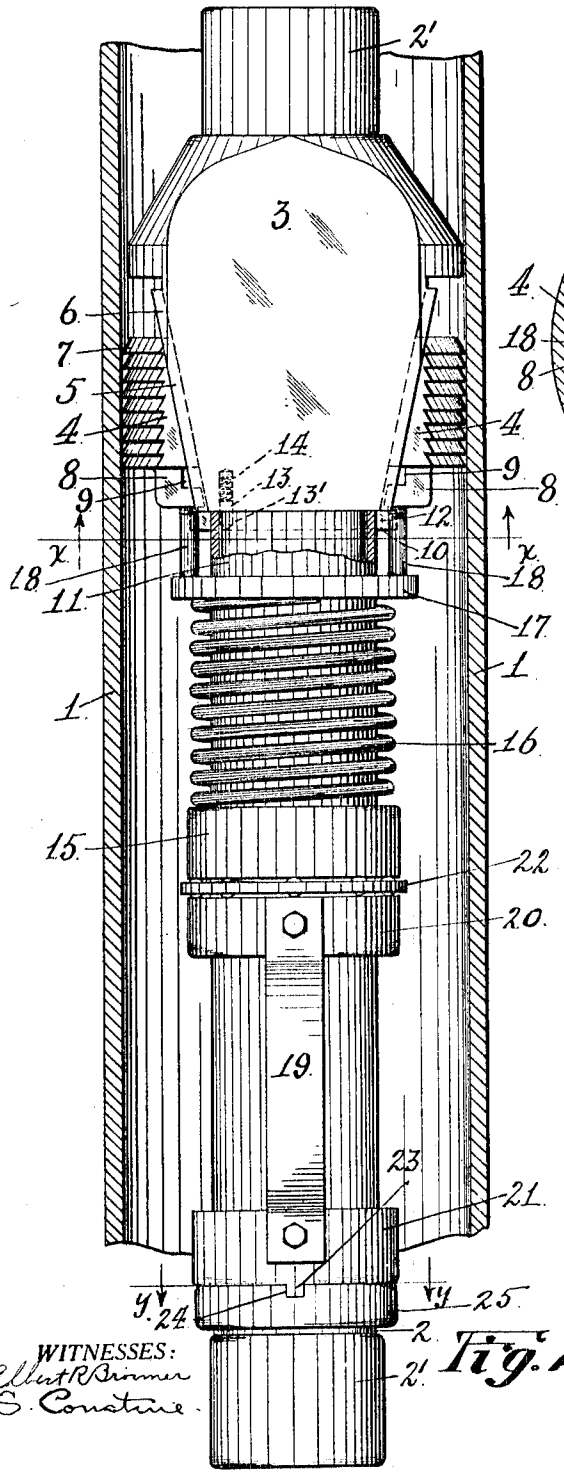


Fig. 2.

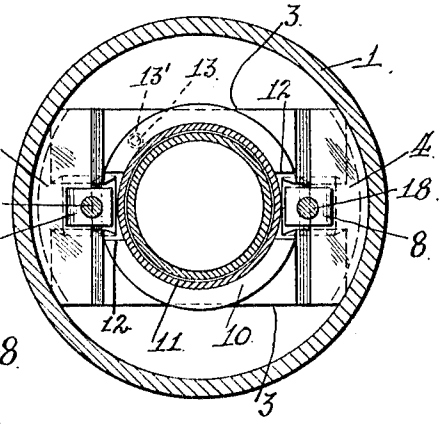


Fig. 3.

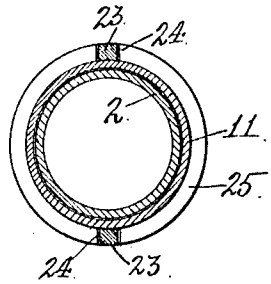


Fig. 4.

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SAFETY TUBING-ANCHOR.

1,118,538. Specification of Letters Patent. Patented Nov. 24, 1914.

Application filed February 24, 1914. Serial No. 820,485.

To all whom it may concern:

Be it known that I, DENNIS L. DRISCOLL, a citizen of the United States, residing at Covina, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Safety Tubing-Anchors, of which the following is a specification.

My invention relates to the class of safety-anchors for well-tubing.

Most wells, and particularly oil and water wells, require lining or casing to maintain an open hole. Generally oil and water wells of any consequence are drilled, and in such wells the diameter is comparatively small. The lining, which becomes part of the well, is usually a metallic tube of suitable diameter and length, similar to the familiar wrought iron and steel pipe. This is called "casing", and a long length of casing is called a "string". The casing is usually perforated where it passes through the oil or water bearing strata, so the fluid may percolate into the casing. As oil and water bearing strata are often very deep, the perforated portion of the casing may be as much as 4,000 feet below the surface of the earth.

It is the general practice with wells, as above described, to place within the casing a metallic conducting pipe, or tube, for conveying the fluid to the top of the well. This conducting pipe, called "tubing" or "string of tubing", is similar to the casing, but, of course, is smaller so that it may be placed within it. Whenever it is necessary to pump the fluid from the well, as is generally the case, a pump of the plunger type is fitted to the lower end of the tubing and operated from the top by means of a string of sucker rods. Frequently, for various reasons, it is necessary to remove the string of tubing from the well. This is accomplished by lifting the string through means of suitable tackle and devices attached to the top of the string. As the strings of tubing are very long, suitable lengths are unscrewed as the tubing is lifted above the top of the well. While a section is being unscrewed, the remaining portion of the string is suspended by suitable device attached to the tubing at the top. It will be seen from the above that when the tubing is being removed from a well, the string is suspended from the top and the lower end may be quite a distance from the bottom of the well. This also is true when the tubing is raised to bring the pump above the bottom of the well, as may often be the case. Now should any accident occur to the various devices used to suspend or raise the tubing, or, as frequently happens, should the string of tubing part at some joint below the top of the well, the unsupported portion of the tubing will drop to the bottom of the well with disastrous results.

My invention is designed particularly to overcome the danger of dropping tubing, but the principles are also applicable to other well tools or devices.

My invention consists in the novel safety-anchor, which I shall now fully describe by reference to the accompanying drawings in which—

Figure 1 is a vertical section of my anchor showing it in set position for passing down through the casing, to the point at which it is to be tripped. Fig. 2 is an elevation of the anchor showing it tripped. Fig. 3 is a section on line x—x of Fig. 2. Fig. 4 is a section on line y—y of Fig. 2.

1 is the well-casing.

2 is a section of tubing which in the purview of my invention forms not only part of the tubing-string into which it is let by suitable couplings at each end, such as are indicated at 2', but also forms the stock proper for carrying the assembled parts of my safety anchor.

3 is the body for the slip-jaws 4. These jaws, which in this art, are commonly termed "slips" are, in general, of the usual character, being slidably fitted to upwardly divergent tapered seats on the body 3, by means of suitable connections, as, for example, by tongues 5 on the back of the slips and grooves 6 in the taper faces or seats of the body. The outer faces of the slips are toothed as shown at 7, and said slips may be in any suitable number. As they slide down on their seats, their toothed faces clear the casing, and as they move up, said faces contact with and are ready to grip the casing. The body 3 is, in suitable manner, made fast and rigid on the tube section 2. The base of each slip 4 is formed with an extension or ear 8, which is provided on its inner face with a groove 9, to receive a flange 10, on the head of a sleeve 11, which is freely mounted and adapted to turn upon the tube section 2. The flange 10 of the sleeve has openings 12 to enable it and the

grooved ears 8 of the slips to interengage and to disengage as the case may be. In the base of the slip-body 3 is mounted slidably a locking-pin 13, which is projected downwardly by a spring 14, and in the flange 10 of the sleeve 11 is made a hole 13′ to receive said locking pin. The sleeve 11 may be a single continuous one, but for constructive reasons it is here shown as in two parts, united by a collar 15, the upper side of which forms a supporting shoulder for the lower end of a spring 16, the upper end of the spring carrying a freely slidable ring 17 embracing the sleeve. This ring coacts with the slips, either directly or, as here shown, through the intervention of pins or studs 18 depending from the ears of the slips and contacting with the ring.

19 are friction-members in the form of springs which from their mounting may be termed "floating" in that their upper ends are secured to a head ring 20 freely mounted on the sleeve 11, and their lower ends are secured to a foot clutch-member 21 also freely mounted on the sleeve. There may be any number of these springs and they may be composed of one or more leaves. They frictionally engage the casing 1, as shown in Fig. 1. Between the bottom of the sleeve collar 15 and the top of the head-ring 20 is an anti-friction bearing 22 here shown as of the ball-bearing type. The clutch member 21 has tongues 23 which are adapted to engage grooves 24 in the upper face of a clutch collar 25 on the lower end of the sleeve 11.

The operation is as follows:—The device is set, before it is placed in the well, by compressing the spring 16, pulling down the slips 4 and rotating the sleeve 11, so that its openings 12 are out of line with the ears 8 of the slips, thereby locking said slips in the position shown in Fig. 1. The device being now connected with the tubing by the couplings 2′, is then lowered on the tubing into the well and the friction springs 19 press against the walls of the casing 1 and prevent the foot ring clutch member 21 from turning. The rest of the device, with the string of tubing, may however rotate freely in either direction, without danger of tripping the mechanism, and the whole may be lowered in the casing to any desired point. It will be seen by Fig. 1 that when the slips 4 are in the set position ready for tripping, they do not engage the walls of the casing because they are pulled down on their taper seats. It should also be noted that when the device is being lowered in the casing, that the friction springs 19 with attached rings 20 and 21 are forced or tend to be forced upward, due to the friction of the springs with the walls of the casing. Therefore, the clutch member 21 is held away from the clutch member 25 and there is no engagement between the sleeve 11 and the springs 19.

When the tubing has been lowered to the desired depth in the well, the safety anchor is made ready for tripping as follows:— The tubing is raised a few inches, or enough to bring the clutch member 25 up into contact with the clutch member 21, which is held in position by the friction spring 19 engaging the walls of the casing. At the same time, the tubing is rotated slightly so as to engage the two clutch members by their tongues 23 and grooves 24, as shown in Fig. 2. In this position the anchor is ready to be tripped.

It will be seen that through the clutch 21—25 and the contact of the friction springs 19 with the walls of the casing, the sleeve 11 is now held from turning, and that a further rotation of the tubing will turn only the body 3 with its slips 4 so as to bring the ears 8 of the slips in line with the openings 12 in the flange 10 of said sleeve 11. At this position the slips are released and are forced upward by the expansion of the coil spring 16. A slightly further rotation of the tubing brings the hole 13′ in the flange 10 of sleeve 11 in line with lock pin 13, and said pin is forced into the hole by its spring 14 and locks sleeve 11. In this position the anchor is fully set for use and the coil spring 16 forces the slips 4 upward on their taper seats in the body 3 until the teeth of the slips engage the walls of the casing. The farther the slips move upward the more they are forced outward into engagement with the casing. Also, as the teeth 7 of the slips engage the walls of the casing, it will be seen that any downward movement of the tubing is prevented, as it tends to expand or move the slips outward and make them grip the casing more firmly. The tubing, however, may be raised or even removed from the well, as the upward motion releases the grip on the casing.

From the foregoing description, it will be seen that my safety anchor may be positively set before it is lowered into the well; that it may be lifted in the casing without any danger of dropping through accident; that it may, whenever desired, be positively tripped; that once it is tripped it is locked, so the tripping mechanism cannot interfere with the gripping action; that the tubing, together with the anchor, may be lifted or removed rapidly; that once the anchor is tripped the tubing cannot fall or slide back in the casing, positively preventing the tubing from being dropped through any accident; that the device may be placed at any point, or several points, on the string of tubing; that it is set by manipulating the tubing in a simple and easy manner; that it does not interfere with the continuity of the tubing as the conductor, for all parts

are external to the central tubing on which they are assembled, and that it may be located above the lower end of the tubing string above the pump, so as to be above the perforated portion of the casing, obviating danger from causing sand to bridge between the tubing and the casing.

I claim:—

1. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; and interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them.

2. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, and a spring bolt in the base of the slip-body adapted to engage a socket in the head of the sleeve to lock the parts against relative motion after the slips are tripped.

3. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; and interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, consisting of ears extending from the slips and having grooves in their inner faces, and a flange on the head of the sleeve adapted to seat in the grooves of the ears, and provided with openings for the passage of said ears.

4. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, consisting of ears extending from the slips and having grooves in their inner faces, and a flange on the head of the sleeve adapted to seat in the grooves of the ears, and provided with openings for the passage of said ears; and a spring bolt in the base of the slip-body adapted to engage a socket in the head of the sleeve to lock the parts against relative motion after the slips are tripped.

5. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, and means for holding the sleeve against rotation while the stock is turning on its axis to trip the slips.

6. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, and means for holding the sleeve against rotation while the stock is turning on its axis to trip the slips, consisting of spring members carried by the sleeve and frictionally engaging the walls of the well casing.

7. A safety tubing anchor comprising a tubular stock with means for securing it in the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a spring and means operated by its expansion to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, and means for holding the sleeve against rotation while the stock is turning on its axis to trip the slips, consisting of spring members carried by the sleeve and frictionally engaging the walls of the well casing, said members being mounted rotatably upon the sleeve, and a clutch between

the spring members and the sleeve operated by turning the stock and sleeve on their axes.

8. A safety tubing anchor comprising a tubular stock with means for securing it to the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a collar on said sleeve; a spring seated at its lower end on the collar, and having its upper end arranged to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve, to hold the slips down and to trip them; spring-members adapted for frictional contact with the well-casing, said springs being carried by a head ring and a foot ring both rotatably fitted on the sleeve, and the foot ring forming one member of a clutch; a clutch member on the foot of the sleeve coacting with the clutch member of the foot ring of the spring members; and an antifriction bearing between the sleeve collar and the head ring of said springs.

9. A safety tubing anchor comprising a tubular stock with means for securing it to the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a collar on said sleeve; a spring seated at its lower end on the collar, and having its upper end arranged to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve, to hold the slips down and to trip them; spring-members adapted for frictional contact with the well-casing, said springs being carried by a head ring and a foot ring both rotatably fitted on the sleeve, and the foot ring forming one member of a clutch; a clutch member on the foot of the sleeve coacting with the clutch member of the foot ring of the spring members; an antifriction bearing between the sleeve collar and the head ring of said springs, and a spring bolt in the base of the slip-body adapted to engage the head of the sleeve to lock the parts together when the slips are tripped.

10. A safety tubing anchor comprising a tubular stock with means for securing it to the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a collar on said sleeve; a spring seated at its lower end on the collar, and having its upper end arranged to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve to hold the slips down and to trip them, consisting of ears extending from the slips and having grooves in their inner faces, and a flange on the head of the sleeve adapted to seat in the grooves of the ears, and provided with openings for the passage of said ears; spring-members adapted for frictional contact with the well-casing, said springs being carried by a head ring and a foot ring both rotatably fitted on the sleeve, and the foot ring forming one member of a clutch; a clutch member on the foot of the sleeve coacting with the clutch member of the foot ring of the spring members; and an antifriction bearing between the sleeve collar and the head ring of said springs.

11. A safety tubing anchor comprising a tubular stock with means for securing it to the tubing-string; a taper-seat slip-body fast on the stock; slips fitted to and slidable upon the taper-seats of the body; a sleeve in which the stock is rotatably fitted below the slip-body; a collar on said sleeve; a spring seated at its lower end on the collar, and having its upper end arranged to force the slips upward; interengaging instrumentalities between the lower ends of the slips and the head of the sleeve, operated by the relative axial movement of the stock and sleeve, to hold the slips down and to trip them, consisting of ears extending from the slips and having grooves in their inner faces, and a flange on the head of the sleeve adapted to seat in the grooves of the ears, and provided with openings for the passage of said ears; spring-members adapted for frictional contact with the well-casing, said springs being carried by a head ring and a foot ring both rotatably fitted on the sleeve, and the foot ring forming one member of a clutch; a clutch member on the foot of the sleeve coacting with the clutch member of the foot ring of the spring members; an antifriction bearing between the sleeve collar and the head ring of said springs, and a spring bolt in the base of the slip-body adapted to engage the head of the sleeve to lock the parts together when the slips are tripped.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DENNIS L. DRISCOLL.

Witnesses:
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ANDREW F. HAMMOND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."