Dec. 13, 1938. W. B. DUNCAN 2,139,810

APPARATUS FOR GAUGING FLUID LEVELS

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Fig. 1.

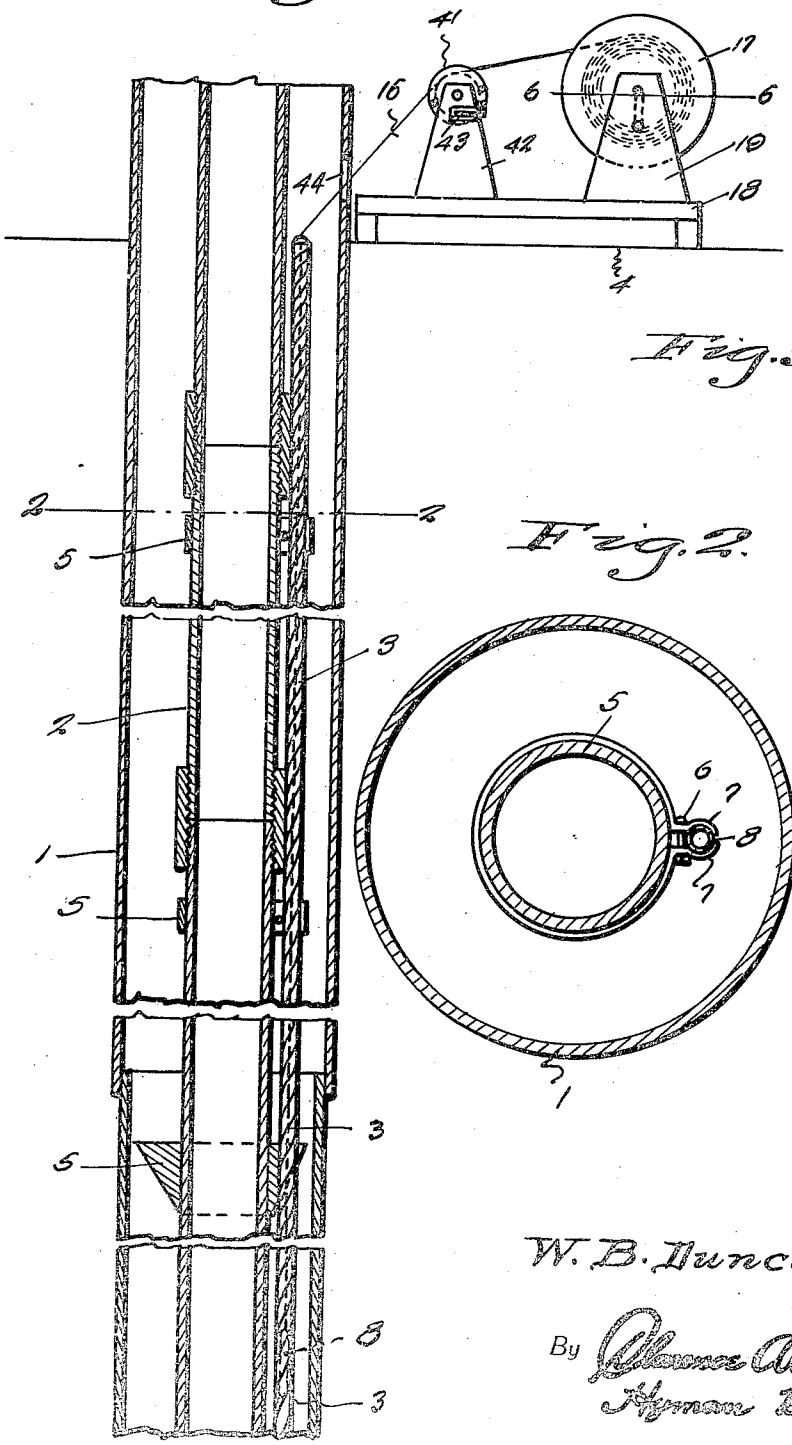


Fig. 3.

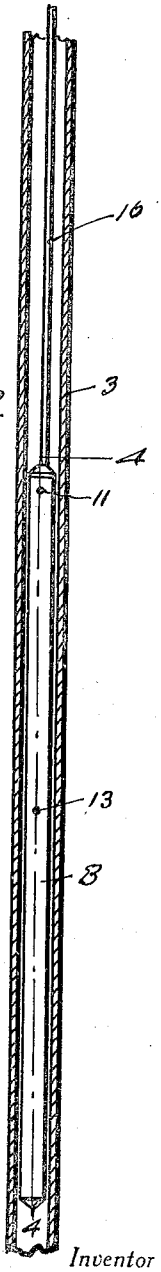


Fig. 2.

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Fig. 4.

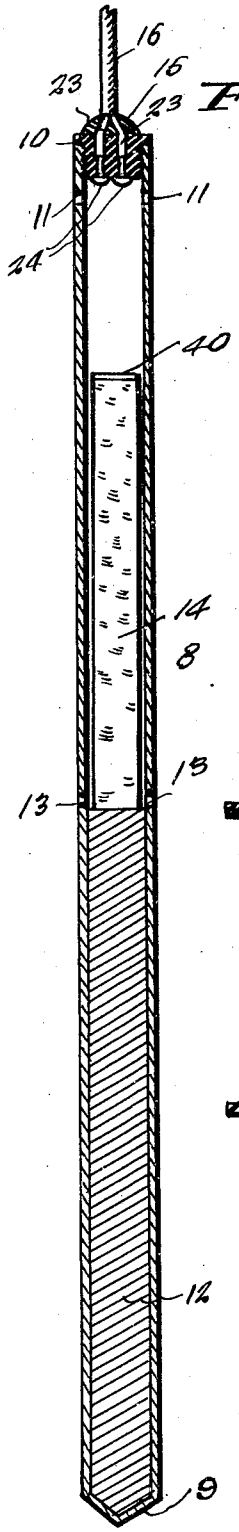


Fig. 5.

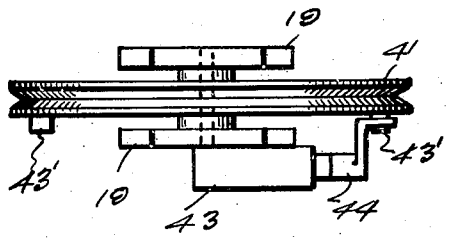
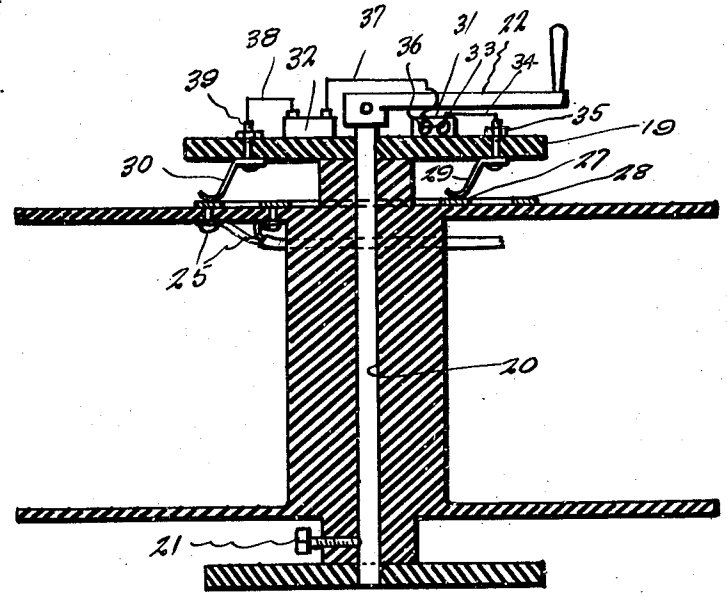


Fig. 6.



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UNITED STATES PATENT OFFICE

2,139,810

APPARATUS FOR GAUGING FLUID LEVELS

William B. Duncan, Shawnee, Okla.

Application November 4, 1937, Serial No. 172,843

1 Claim. (Cl. 73—305)

My invention relates to improvements in apparatus for gauging fluid levels in wells.

The invention is designed with the particular object in view of providing an efficient, accurate and inexpensive apparatus for finding the fluid level particularly in the casings of oil wells while the wells are being pumped and indicating the level at a point remote from the mouth of the well.

Another object is the provision of apparatus of the character and for the purpose above indicated adapted to be easily attached to and detached from present day well equipment without necessitating modification of the latter.

Other, and ancillary objects, are also comprehended by my invention all of which will be readily understood when the following description and claims are read with reference to the drawings accompanying and forming part of this specification.

In said drawings:—

Figure 1 is a fragmentary view partly in vertical section and partly in side elevation of an oil well equipped according to my invention,

Figure 2 is a view in transverse section taken on the line 2—2 of Figure 1, looking downwardly and drawn to an enlarged scale,

Figure 3 is a fragmentary view partly in longitudinal section and partly in elevation of a float casing and guide tubing therefor,

Figure 4 is a similar view of the float casing and float drawn to an enlarged scale,

Figure 5 is a detailed view in top plan of level indicating mechanism, and

Figure 6 is a view in transverse section taken on the line 6—6 of Figure 1, and illustrating a reel and parts associated therewith all forming part of the invention.

Referring to the drawings by numerals, the apparatus of my invention has been shown as applied to the usual type of oil well equipment in which 1 designates the well casing and 2 the tubing. According to my invention a flexible tubing 3, of any suitable material, is attached to the well tubing 2 to extend downwardly along the same from a point adjacent the ground level 4 to any desired depth, said tubing 3 being secured to the tubing 2 by means of clips 5 of the split ring type, secured around the tubing 2 at suitable intervals as by bolts 6 and having opposed clamping jaws 7 gripping the tubing 3 therebetween. The tubing 3 is designed to function as a guide for an elongated float casing 8 of tubular form preferably made of copper and having a lower closed end 9, an upper open end 10 and a pair of opposed outlet ports 11 adjacent said end 10. The casing 8 is loaded for substantially half its length with heavy metal as indicated at 12. Another pair of opposed inlet ports 13 are provided in the casing slightly above the loading 12. Within the upper part of the casing 8 is an elongated float 14 of any suitable material such as cork, balsam wood, or hollow metal, and of less length than the unloaded portion of the casing. In the open end 10 of the casing 8 is a closure plug 15 of insulating material threaded into said end and having suitably secured thereto a flexible hollow cable, also of insulating material, 16 designed to be wound upon and paid off of a reel 17 rotatably mounted on a platform 18 disposed in any suitable location on the ground and having a pair of upright bearing members 19 in which the reel 17 is rotatably mounted by means of a shaft 20 extending through said reel 17 and members 19 and to which the reel is fixed by means of a set screw 21. The reel 17 and bearing members 19 are preferably formed of insulating material for a purpose presently seen. A crank 22 fast on one end of the shaft 20 provides for rotating the reel as desired. The cable 16 houses a pair of circuit wires 23 extending at corresponding ends through the before-mentioned plug 15 and terminating on the under face of said plug in a pair of spaced apart contacts 24. The other ends of the wires 23 are suitably connected, as by binding posts 25 to a pair of inner and outer circular contact rings or members, respectively, 27 and 28 suitably secured to the reel 17 on one side thereof and concentrically of said reel. A pair of resilient contact shoes 29 and 30 extend from the bearing member adjacent said ring and into wiping engagement with the inner and outer rings respectively. Suitably mounted on the bearing member 19 carrying the shoes 29 and 30 is a battery 31 and a milliammeter 32. One of the brushes 29 is connected to one terminal 33 of the battery 31 by means of a lead 34 and a binding post 35. The other terminal 36 of the battery 31 is connected to one side of the milliammeter as by the lead 37. The other brush 30 is connected to the other side of the milliammeter 32 by the lead 38 and binding post 39. As will be understood the described electrical connections are designed to complete a circuit through the milliammeter when the contacts 24 are bridged so that said milliammeter will register closing of the circuit and the operator be so advised. Such closure of the circuit, or bridging of the contacts 24, is effected by the rising

of the float 14 in the casing 8 and by contact of a bridging member 40 on the upper end of the float with said contacts, the bridging member 40, as will be understood, being of metal suitable for this purpose.

In advance of the reel 17 is an idler sheave 41 over which the cable 16 is trained and which is rotatable between a pair of upstanding supports 42, on the platform 18, by the cable 16 as it passes thereover. The sheave 41 is designed to operate a suitable counter 43, for instance of the Veeder type, but adapted to register in feet and inches. Since such devices are old in the art and well understood, the details thereof have not been illustrated in the drawings. Suffice it to explain that the sheave 41 is equipped with a pair of tappets 43' cooperating with a counter actuating arm 44 to operate the latter twice during each cycle of movement of said sheave. Such operation of the counter 43 by the sheave 41 is designed to register in said counter the number of feet of cable 16 paid off of the reel 17. As is shown in Figure 1 the well casing 1 is provided with a suitable aperture 44 therein for the passage of the casing 8 into the casing 1 and tubing 3.

Referring to the use of the apparatus, the float casing, or carrier 8, is adapted to be inserted in the well casing 1 by way of the aperture 44 and then into the casing 3 weighted end foremost. In this position of the casing 13 the float 14 gravitates into the limits of its downward movement as determined by the loading 12 and the circuit is broken at the contacts 24. The cable 16 is now paid out thereby lowering the casing 8 in the casing 3. When the casing 8 reaches the fluid, that is to say is submerged therein to a sufficient depth, the fluid enters the upper part of said casing 8 by way of ports 13 and the float 14 rises in the latter until the plate 14 bridges the contacts 24 thereby closing the circuit. In this connection it is to be understood that the float 14 is sufficiently buoyant to engage the contacts 24 before the ports 11 are submerged. Such action of the float 14 is facilitated by relief of back pressure in the casing 8 by way of said ports 11. When the circuit is closed, as described, the milliammeter instantaneously records this condition and the reel 17 is stopped. At this point the counter 43 will register the number of linear feet of cable 16 paid out so that the operator may estimate the level of the fluid accordingly. When the casing 8 is raised sufficiently to allow the float 14 to gravitate into the limits of its downward position the circuit is broken, as will be understood, and the apparatus is again ready for use. By using a milliammeter a battery of very low voltage may be used and the closing of the circuit registered. The use of such a battery reduces, as will be understood, tendency of the contacts 24 to spark and thereby cause an explosion in the well casing 1 or igniting of the oil.

The operation and advantages of my invention have, it is believed, been set forth in the foregoing sufficiently to impart a clear understanding thereof without further explanation.

Manifestly, the invention as described, is susceptible of modification without departing from the inventive concept, and right is herein reserved to all such modifications falling within the scope of the subjoined claim.

What I claim is:—

An apparatus for finding the fluid level in a well casing having a well tubing therein, said apparatus comprising a reel located above ground, an electrically operative indicator alongside said reel, a tubular guide of flexible material adapted for attachment to said tubing alongside the same, an elongated tubular float carrier vertically slidable in said guide, a hollow cable connected between said reel and the top of said carrier, control wires for said indicator extending through said cable and terminating at the top of said carrier in a pair of contacts, and an elongated float in the carrier for bridging the contacts, said carrier having formed in the upper end thereof a float chamber and an outlet and inlet port therein at the top and bottom of said chamber respectively, whereby said float is free to rise in the chamber and bridge said contacts before said chamber is filled.

WILLIAM B. DUNCAN.