

Dec. 8, 1931.

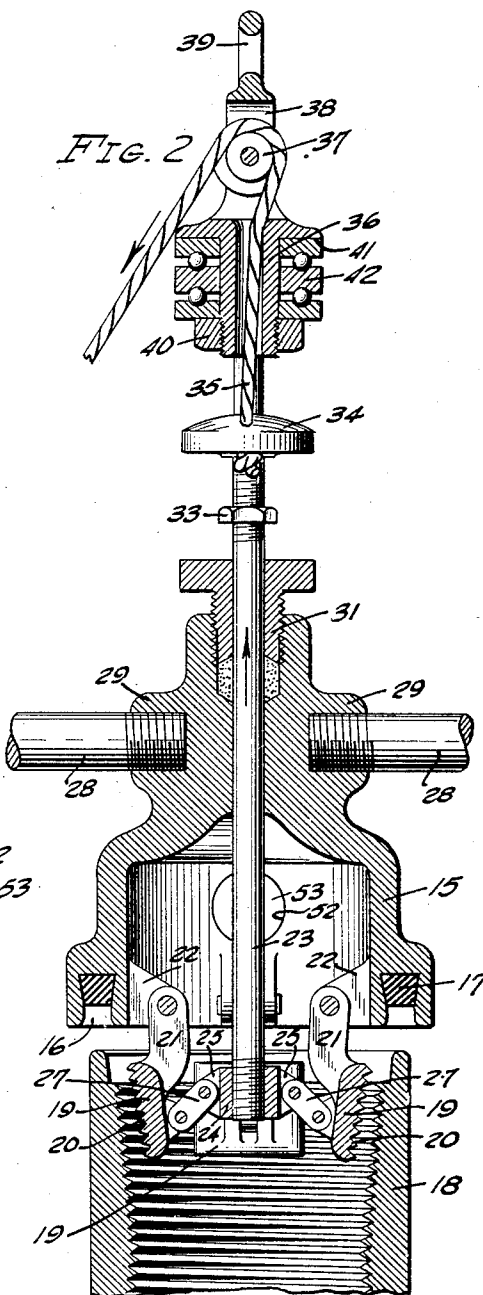
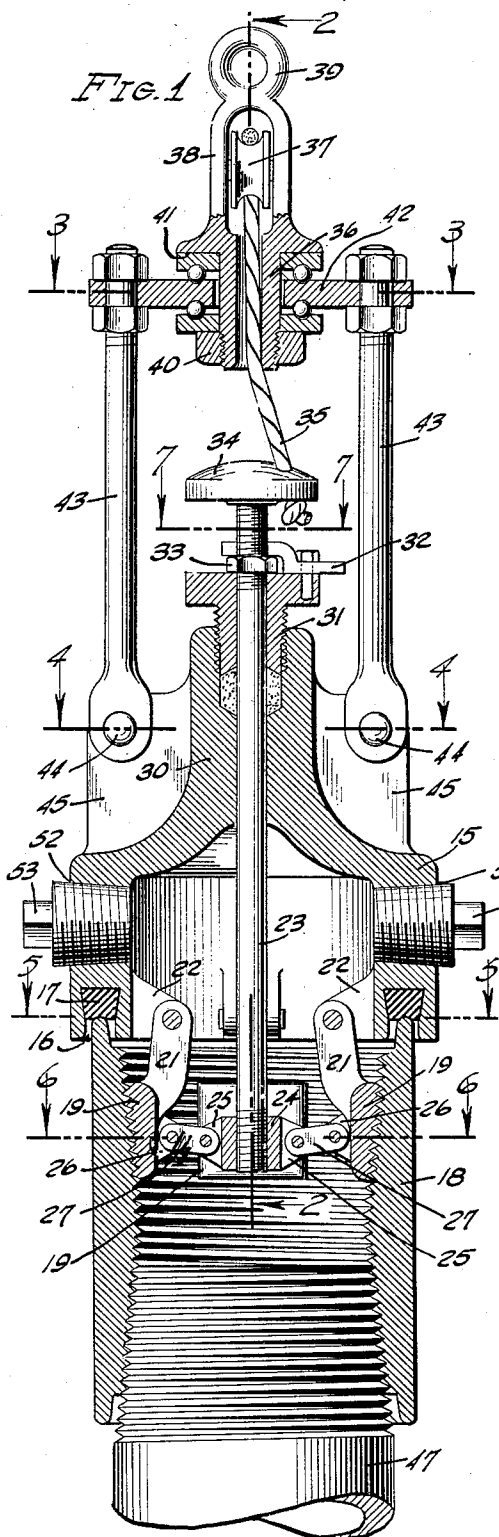
G. J. McHARDY

1,835,418

SEAL APPARATUS FOR WELL TUBING AND CASING

Filed June 19, 1928

3 Sheets-Sheet 1



INVENTOR
GEORGE J. McHARDY
BY *Munn & Co.*
ATTORNEYS

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G. J. McHARDY

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FIG. 3

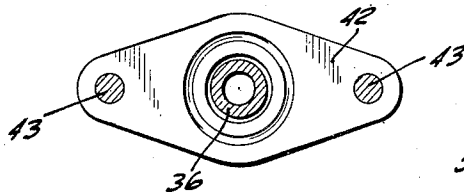


FIG. 4

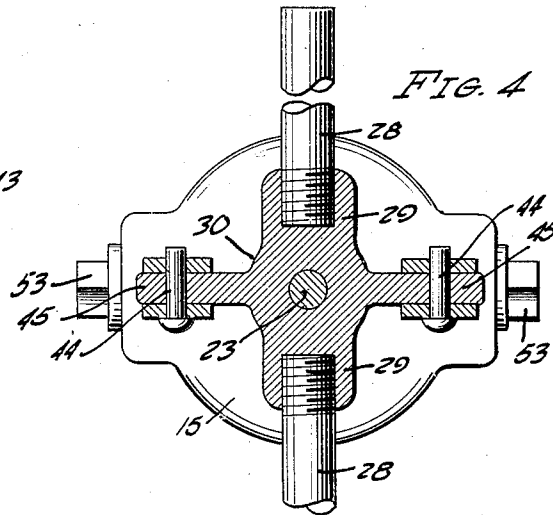


FIG. 5

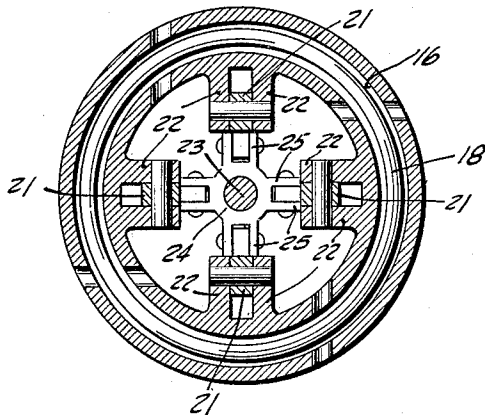


FIG. 6

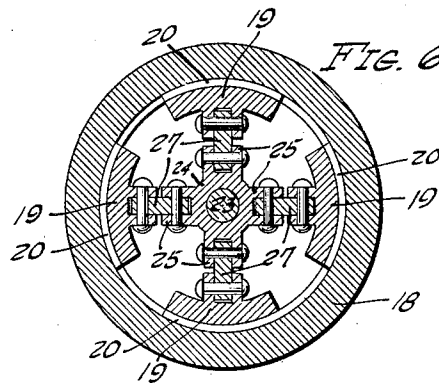


FIG. 7

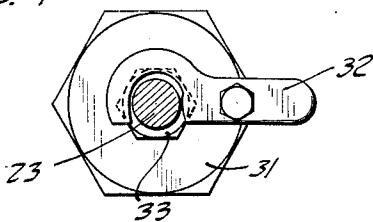


FIG. 9

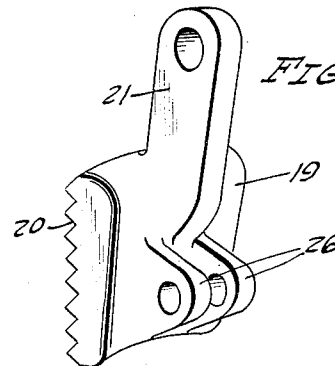
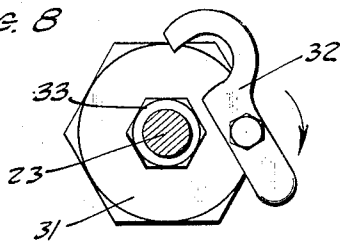


FIG. 8



INVENTOR

GEORGE J. McHARDY

BY *Munn & Co.*
ATTORNEY

Dec. 8, 1931.

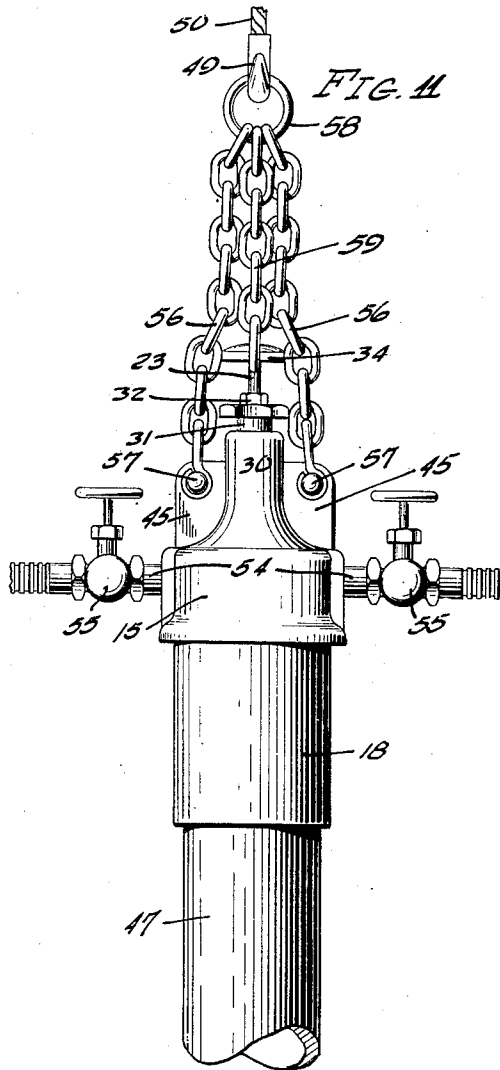
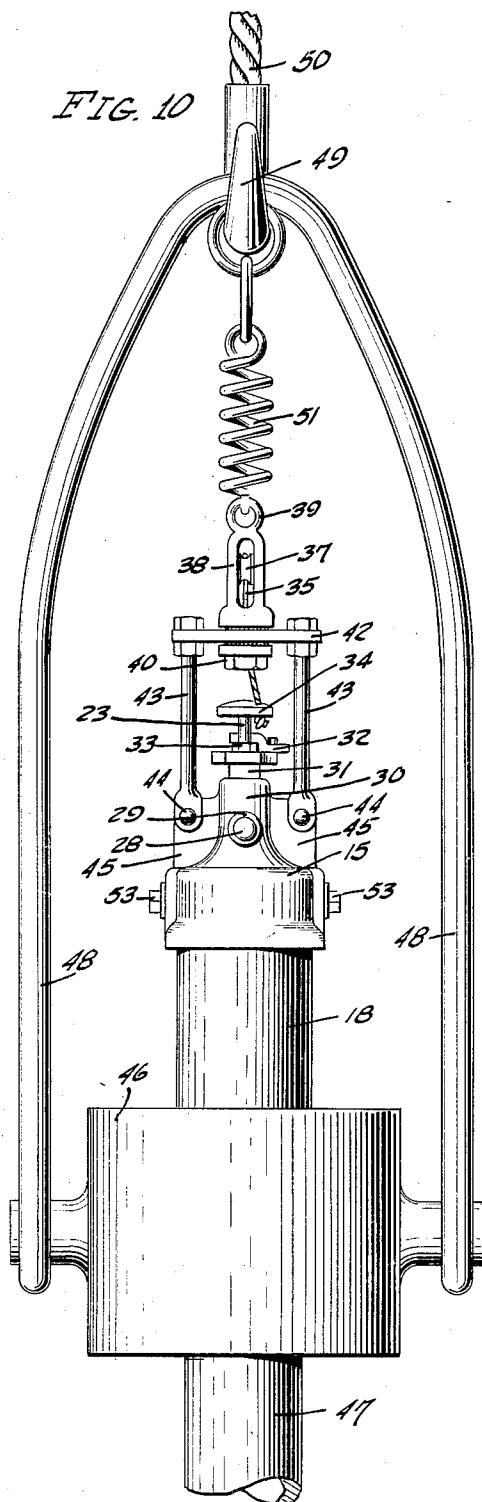
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3 Sheets-Sheet 3



INVENTOR
GEORGE J. McHARDY
BY *Munn & Co.*
ATTORNEYS

UNITED STATES PATENT OFFICE

GEORGE J. McHARDY, OF LONG BEACH, CALIFORNIA

SEAL APPARATUS FOR WELL TUBING AND CASING

Application filed June 19, 1928. Serial No. 286,533.

My invention relates to and has for a purpose the provision of an apparatus by means of which stands of tubing or casing, as withdrawn from an oil well, can be capped and sealed to prevent discharge of oil from the upper end thereof and the attendant disadvantages arising therefrom.

My invention is particularly designed to seal the upper end of a stand of tubing or casing when elevated within a derrick in order to prevent spilling of oil from the tubing or casing onto the workmen and parts of the derrick, and especially the discharge of oil from points remote from the derrick, as a result of the wind blowing the oil as it seeps from the elevated tubing or casing.

It is also a purpose of my invention to provide an apparatus of the above-described character, which permits the attachment and detachment of the sealing cap to and from the tubing or casing with great facility and dispatch so as not to impede the rapidity of operation of the conventional elevator in hoisting the successive stands of tubing or casing from the well.

A further purpose of my invention is the provision of a sealing cap which may be employed in the circulation of a flushing fluid through a well casing to clear the perforations of the casing.

I will describe only one form of sealing apparatus for well tubing and casing embodying my invention and will then point out the novel features in claims.

In the accompanying drawings:

Fig. 1 is a view showing in vertical section one form of sealing apparatus embodying my invention in sealing position with respect to the collar of a well tubing;

Fig. 2 is a vertical sectional view taken at right angles to Fig. 1 and showing the cap in released or non-sealing position;

Figs. 3 to 7 inclusive are horizontal sectional views taken on corresponding lines of Fig. 1;

Fig. 8 is a view similar to Fig. 7 showing the latch in released position;

Fig. 9 is an enlarged detail perspective view of one of the dogs shown in Figs. 1 and 2;

Fig. 10 is a view showing in side elevation a conventional elevator in applied position to a stand of well tubing, and my sealing apparatus in applied position to the cat line of the elevator and tubing;

Fig. 11 is a view showing in side elevation my sealing apparatus as applied to a well casing with a modified form of releasing means for the sealing cap.

Similar reference characters refer to similar parts in each of the several views.

My invention in its present embodiment comprises a sealing cap 15 of inverted cup formation, and of a diameter corresponding to the tubing or casing to which it is adapted to be applied, as shown in Figs. 1, 2, and 5. The lower edge of the cap is provided with an annular groove 16 of substantially dovetail form in cross-section to receive a correspondingly shaped sealing ring 17 formed of rubber or any other suitable material, which will effect the proper seal when the cap is in applied position upon a tubing or casing. By constructing the ring of dovetail form, when it is seated within the groove 16, it will be locked therein against accidental displacement. When the cap is in sealing relation to a tubing or casing it occupies the position shown in Fig. 1, in which the upper edge of the tubing (in the present instance the upper edge of a connecting collar 18) is received in the groove 16 and so as to have abutting relation to the sealing ring 17.

By the provision of a suitable mechanism, the sealing cap can be drawn downwardly into tight sealing relation to the upper end of the collar 18 so as to effectively seal the latter against the discharge of liquid or gas. This mechanism, in the present instance, comprises a plurality of dogs 19, the outer faces of which are formed with screw-threads 20. In this embodiment I have shown four dogs 19 spaced 90° apart, and each dog is provided with an arm 21 pivoted between a pair of ears 22, the latter being cast integral with and disposed on the interior of the cap 15.

By this pivotal mounting the dogs are capable of occupying a contracted position, as shown in Fig. 2, and an expanded position, as shown in Fig. 1, in which the threads 20 are

adapted to engage the threads on the interior of the collar 18.

The dogs are capable of being moved to either of the two above-described positions by means of a plunger 23 having threaded connection at its lower end with a collar 24 provided with radially disposed ears 25 arranged in pairs, as shown in Fig. 6. The inner faces of the dogs 19 are likewise provided with ears 26, and links 27 are pivotally mounted in corresponding ears 25 and 26 to provide operative connections between the collar 24 and the dogs 19.

In the uppermost position of the plunger 23, the collar 24 is elevated so that the dogs 19 are drawn to the contracted position by the links 27 and hence out of engagement with the threaded wall of the collar 18. By forcing the plunger 23 downwardly to the position shown in Fig. 1, the collar and links are actuated to throw the dogs 19 outwardly into engagement with the threaded wall of the collar 18. In this position of the dogs the threads 20 thereof mesh with the collar threads so that by rotating the cap 15 in the proper direction the cap can be screwed downwardly into tight sealing relation to the upper end of the collar. Rods 28 are threaded in bosses 29 on the cap 15 to provide radial arms adapted to be manually gripped in effecting rotation of the cap to screw it downwardly onto the collar.

An important feature of my invention is the link connection between the collar 24 and the dogs 19. In moving the collar 24 downwardly from the position shown in Fig. 2 to that shown in Fig. 1, it will be noted that the inner pivots of the links pass slightly below the outer pivots of the links, that is to say, past dead center. Assuming that the plunger 23 is prevented from any further downward movement, as it actually is in practice, any inward pressure exerted on the dogs will be ineffective to cause the actuating mechanism therefor to collapse so that once the dogs are moved into gripping position with respect to the collar they are maintained in such position until released by upward movement of the plunger 23.

The plunger 23 is movable in a rising extension 30 of the cap 15, and upon which extension the bosses 29 are formed. A packing gland 31 is associated with the plunger and extension to prevent the escape of fluid around the plunger, and on this gland is mounted a latch 32 pivoted to occupy the position shown in Figs. 7 and 8 to engage or disengage a nut 33 threaded on the plunger. When the latch engages the nut the plunger is secured against upward movement to release the dogs 19. It will, of course, be understood that the nut 33 defines the lowermost position of the plunger so that it cannot move beyond the position shown in Fig. 1, as previously described.

A head 34 is secured to the upper end of the plunger 23 and the knotted end of a cable 35 is extended through the head upwardly through a sleeve 36, and around a pulley 37 from whence it extends downwardly.

The pulley 37 is mounted in a yoke 38 formed integral with the sleeve 36 and provided with an eye 39. The lower end of the sleeve is provided with a nut 40 and its upper end with a shoulder 41. Between the nut and shoulder are ball-bearings having rolling contact with the opposite sides of a cross-bar 42 in such manner that the cross-bar is rotatable on the sleeve. The bar 42 connects the upper ends of a pair of rods 43, the lower ends of the latter being pivoted at 44 on flanges 45 of the extension 30.

In the adaptation of my invention to a well tubing, as shown in Figs. 1 and 10, it is designed to be used in conjunction with a conventional elevator, the cap 15 being applied to the upper end of the collar 18 and the two-part head 46 of the elevator embracing the tubing 47 beneath the collar 18, and the bails 48 connected to the hook 49 of the cat line 50. My apparatus is designed to be suspended from the hook 49, but to effect the complete and automatic withdrawal of the dogs 19 from the collar 18, an operation necessary to apply my apparatus to a second stand of tubing following the complete elevation and setting aside of the first stand of tubing, I connect the eye 39 with the hook 49 by means of a coiled contractile spring 51. Whether my apparatus is suspended directly from the hook 49 or through the spring 51, the connection between the sleeve 36 and the bar 42 allows free rotation of the cap 15 in order that it may be rotated following movement of the dogs 19 into gripping relation with the collar 18 in order to permit screwing of the cap into sealing position on the collar. This swivel connection also prevents the cable 35 from becoming twisted and entangled with adjacent parts of the apparatus so that it may be operated to elevate the plunger 23.

The operation of the apparatus in its adaptation to a well tubing is as follows:

Assuming that a stand of tubing is about to be elevated from a well through the application thereto of the conventional elevator illustrated in Fig. 10, my apparatus is now applied to the collar 18 in the following manner: The cap 15 is seated on the collar 18 with the dogs 19 extended into the collar, but in the released position shown in Fig. 2. By striking the head 34 with a hammer or other suitable instrument, the plunger 23 is driven downwardly to its lowermost position, thereby forcing the dogs 19 outwardly into contact with the screw-threaded wall of the collar. By now rotating the cap 15 through the medium of the rods 28 the dogs 19, in having

screw-threaded engagement with the collar 18, function to screw the cap downwardly and into tight sealing relation to the collar 18.

5 With the cap applied as described, the eye 39 is now connected to the cat line hook 49 through the spring 51 so as to maintain that portion of the apparatus above the cap in upright position. By now hoisting the elevator
10 through manipulation of the cat line, the stand of tubing is withdrawn from the well and up into the derrick, the cap 15 meanwhile maintaining its sealing position on the collar 18 to prevent the escape of oil or any
15 other fluid from the upper end of the tubing. After the tubing has reached its limit of elevation, the lower end of the stand is disconnected from the remainder of the tubing in
20 order that it may be swung to one side and stored within the derrick.

In order that my apparatus may be applied to a succeeding stand of tubing, it is removed from the first stand in the following manner: The plunger 23 is moved to the elevated position shown in Fig. 2 by pulling on the cable
25 35, thus causing the dogs 19 to disengage the collar 18. Immediately the dogs are free of the collar, the spring 51 which constantly acts to elevate the cap through the intermediate parts of the apparatus, now acts to elevate the cap, and in so doing withdraws the
30 dogs, links, and collar from the collar 18. Now that my apparatus is free of the tubing, it will be clear that following placing of the tubing in the derrick and releasing the elevator, the apparatus, together with the elevator, can be lowered for connection to the
35 next stand of tubing. In this manner the many stands of a well tubing can be successively capped during elevation within the derrick to prevent the escape of fluid from the tubing.

In Fig. 11 I have shown my apparatus applied to a well casing, and in this adaptation
45 it will be understood that the cap 15 is of larger diameter to correspond to the diameter of the casing, and consequently much heavier than the cap used for the tubing. Where the cap is used in connection with the casing it is
50 designed to seal the upper end of the casing in order to permit the circulation of fluid through the casing to clear the perforations of sand and other impediments. To this end the cap is provided with two openings 52
55 (Fig. 1), normally closed by screw plugs 53. These plugs may be withdrawn to permit the insertion and connection of pipes 54 to the cap, the pipes being provided with valves 55 and one pipe discharging a flushing fluid into the casing and the other pipe allowing discharge of the fluid from the casing.

In the employment of such a flushing fluid it is of course necessary that the upper end of the casing be sealed to prevent the escape of
65 fluid, and by applying my cap in the manner

previously described it will be manifest that the casing is effectively sealed against the escape of fluid.

To remove the cap from the casing I employ the chain arrangement shown in Fig. 11.
70 Two chains 56 of equal length are connected at their lower ends to pivots 57 on the flanges 45, it being understood that the rods 43 are removed. The upper ends of the chains 56 are connected to a ring 58, the latter in turn
75 adapted to be engaged by the hook 49 of the cat line. A third and shorter chain 59 is connected at its upper end to the ring 58 and at its lower end to the head 34 of the plunger 23.

With the chains attached as described upon elevation of the cat line, the chain 59 being shorter than the chains 56, the upward pull is first transmitted to the plunger 23 to move the latter to the elevated position shown in
80 Fig. 2, thereby releasing the cap from the casing. With continued elevation of the cat line, the chains 56 are fully extended to transmit a lifting force to the cap 55 thereby elevating the latter free of the casing and with-
85 drawing the dogs and actuating mechanism therefor from the casing.

Although I have herein shown and described only one form of sealing apparatus for well tubing and casing embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

I claim:

1. An apparatus for sealing the upper ends of stands of well tubing against oil leakage as they are withdrawn from a well comprising a cap adapted to engage and close the
105 upper end of a stand of tubing, means adapted for suspension from a cat line for supporting the cap in a manner to yieldably urge the cap upwardly to non-closing position in respect to the tubing end, means for releasably
110 securing the cap in closing position on the tubing end and against the action of the first means, and means for actuating the second means to secure and release the cap to and from the tubing end whereby when the cap is
115 released the first means may function to lift the cap free of the tubing while the latter is suspended from an elevator.

2. An apparatus for sealing the upper ends of stands of well tubing against oil leakage as they are withdrawn from a well comprising a cap adapted to engage and close the upper end of a stand of tubing, means adapted for suspension from a cat line for supporting the cap in a manner to yieldably urge the cap
120 upwardly to non-closing position in respect to the tubing end, means for releasably securing the cap in closing position on the tubing end and against the action of the first means, means for actuating the second means to se-
125 130

cure and release the cap to and from the tubing end whereby when the cap is released the first means may function to lift the cap free of the tubing while the latter is suspended from an elevator, and a latch for securing the actuating means against movement to retain the second means in a position in which the cap closes the tubing end.

3. An apparatus as embodied in claim 1 wherein the first means includes a swivel connection to allow free rotation of the cap and a part of said means in respect to the cat line.

4. An apparatus for sealing the upper ends of stands of well tubing against oil leakage as they are withdrawn from a well comprising a cap adapted to engage and close the upper end of a stand of tubing, means adapted for suspension from a cat line for supporting the cap for free rotation on the cat line, said means including a spring acting to elevate the cap free of the tubing end, means for releasably securing the cap in closing position on the tubing end against the action of said spring, means for actuating the second means to secure and release the cap to and from the tubing end whereby when the cap is released the first means may function to lift the cap free of the tubing while the latter is suspended from an elevator, and a latch for securing the actuating means against movement to retain the second means in a position in which the cap closes the tubing end.

5. In an apparatus of the character described, a cap having screw-threaded dogs movable to one extreme position in which they are adapted to engage the screw threads within a pipe, and rotated to draw the cap into sealing engagement with the pipe end and another extreme position in which they disengage the pipe threads so that they may be inserted into or withdrawn from the pipe, means for actuating the dogs including a head, and links connecting the head with all the dogs.

6. In an apparatus of the character described, a cap having screw-threaded dogs movable to one extreme position in which they are adapted to engage the screw threads within a pipe, and rotated to draw the cap into sealing engagement with the pipe end and another extreme position in which they disengage the pipe threads so that they may be inserted into or withdrawn from the pipe, and means for actuating the dogs including links on the dogs and a head connected to all of the links and movable to one position in which the dogs are moved to the first extreme position wherein the links are moved past a dead center position, and another position in which the dogs are moved to the second extreme position.

7. In an apparatus of the character described, a cap having screw-threaded dogs movable to one extreme position in which they

are adapted to engage the screw threads within a pipe, and rotated to draw the cap into sealing engagement with the pipe end and another extreme position in which they disengage the pipe threads so that they may be inserted into or withdrawn from the pipe, and means for actuating the dogs to move the latter in either of said positions comprising a rigid plunger movable through the cap and operatively connected to all of the dogs.

8. In an apparatus of the character described, a cap having a packed sealing groove therein, dogs pivoted on and depending from the cap, the dogs having screw-threaded surfaces, a plunger movable in the cap, a collar on the plunger, links on the collar connected to the dogs, rods on the cap, a cross bar connecting the rods, a sleeve rotatable on the cross bar, a pulley on the sleeve, and a cable on the plunger extended through the sleeve and around the pulley for lifting the plunger.

9. In an apparatus of the character described, a cap having a packed sealing groove therein, dogs pivoted on and depending from the cap, the dogs having screw-threaded surfaces, a plunger movable in the cap, a collar on the plunger, links on the collar connected to the dogs, rods on the cap, a cross bar connecting the rods, a sleeve rotatable on the cross bar, a pulley on the sleeve, a cable on the plunger extended through the sleeve and around the pulley for lifting the plunger, an eye on the sleeve, and a contractile spring connected to the eye.

10. In an apparatus of the character described, a cap having a packed sealing groove therein, dogs pivoted on and depending from the cap, the dogs having screw-threaded surfaces, a plunger movable in the cap, a collar on the plunger, links on the collar connected to the dogs, rods on the cap, a cross bar connecting the rods, a sleeve rotatable on the cross bar, a pulley on the sleeve, a cable on the plunger extended through the sleeve and around the pulley for lifting the plunger, an eye on the sleeve, a contractile spring connected to the eye, a nut on the plunger for limiting its downward movement, and a latch engaging the nut for locking the plunger against upward movement.

Signed at Los Angeles, in the county of Los Angeles and State of California, this 4th day of June, 1928.

GEORGE J. McHARDY.