Oct. 20, 1953 C. W. EARL ET AL 2,655,996

PARAFFIN CLEANER

Filed Oct. 4, 1951 2 Sheets-Sheet 1

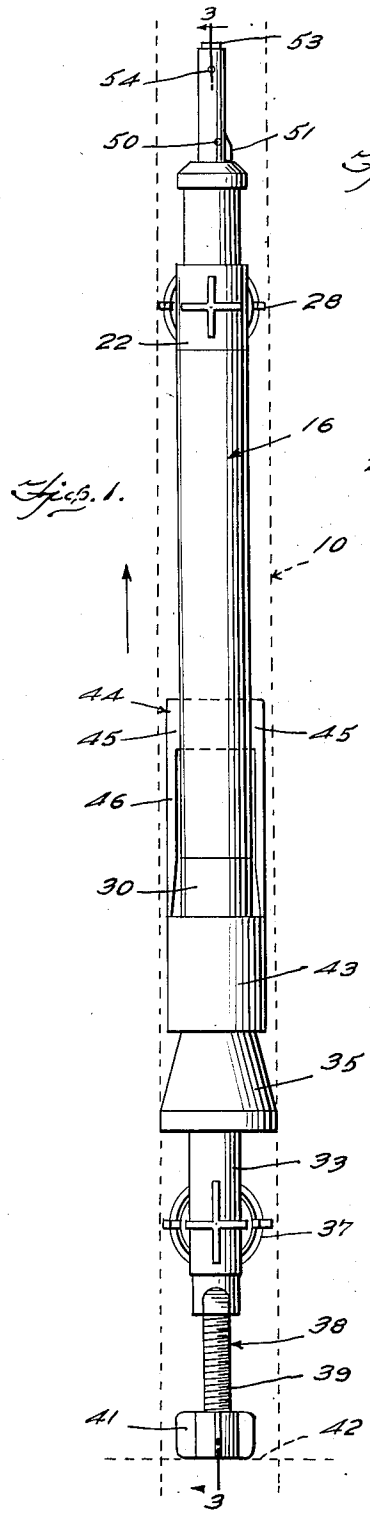


Fig. 1.

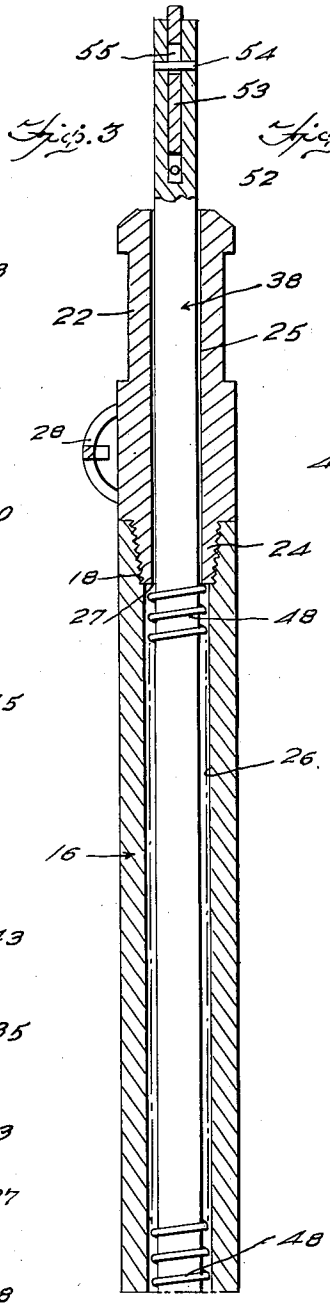


Fig. 3

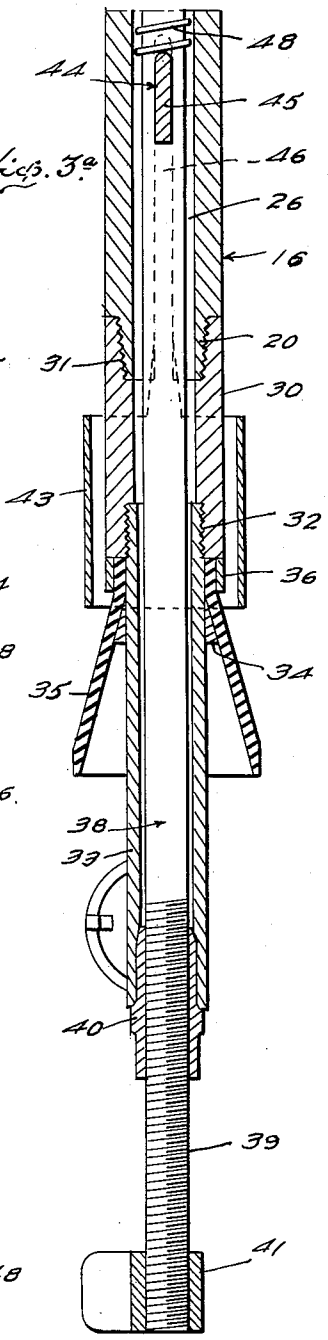


Fig. 3a

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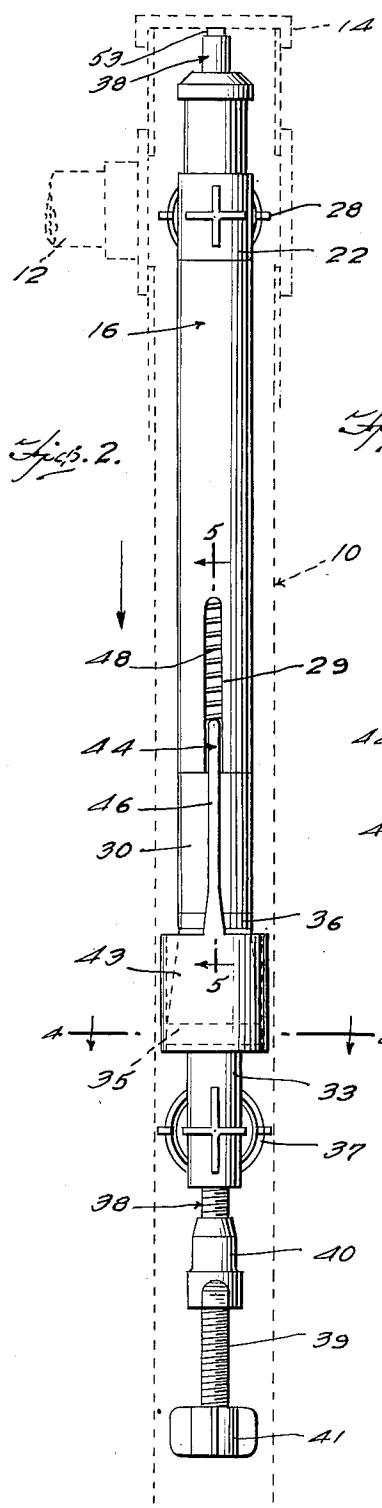


Fig. 2.

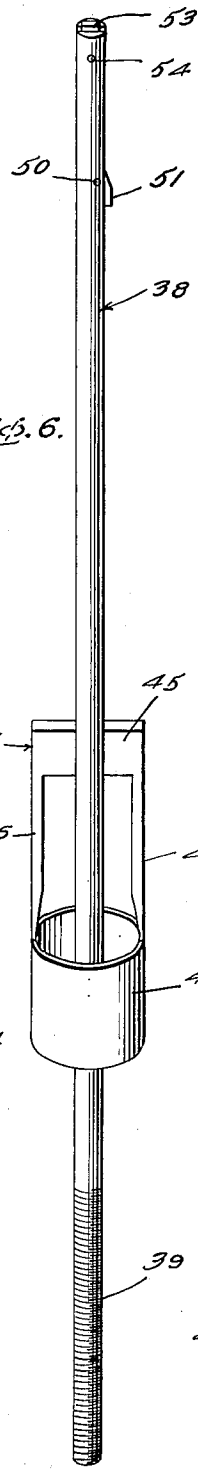


Fig. 6.

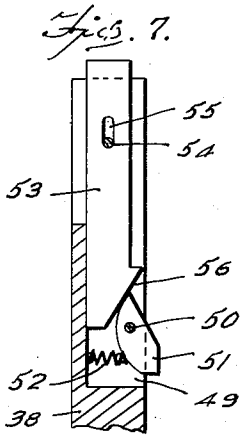


Fig. 7.

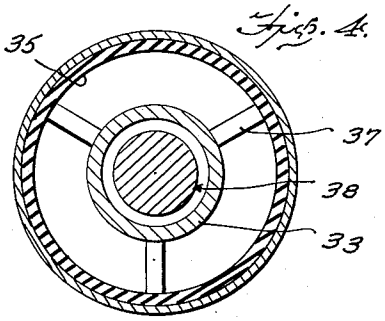


Fig. 4.

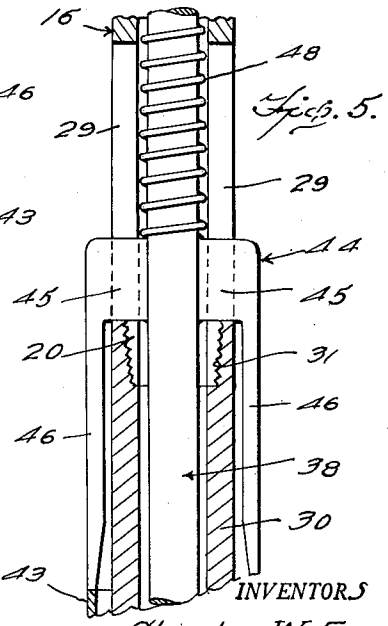


Fig. 5.

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PARAFFIN CLEANER

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Application October 4, 1951, Serial No. 249,738

6 Claims. (Cl. 166—18)

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This invention relates generally to oil wells and pertains particularly to improvements in paraffin cleaners.

A principal object of the present invention is to provide a paraffin cleaning or removing tool for use in a well tubing which is designed to move up and down therein continuously by the employment of the flowing liquid and gas in the well for elevating the implement and the action of gravity for returning it to the bottom of the well.

Another object of the invention is to provide an implement of the character stated which is raised in the well tube by the flowing oil and gas acting against a downwardly opening cup which follows the inside surface of the well tube, with means for contacting and housing the cup when the tool reaches the top of the well whereby the flow is permitted to pass around the tube and the tool returns to the bottom of the well by gravity.

Still another object of the invention is to provide a well tube cleaner of the character stated employing the liquid and gas flow for elevating the tool by imposing thrust against an expanded cup forming a part of the tool structure and engaging the inner surface of the well tube, with a trigger released spring actuated shield means which is of an outside diameter less than the inside diameter of the well tube and moves into cup covering and retracting position when the trigger strikes a closure member in the top of the well tube whereby the tool becomes free for return by gravity to the bottom of the well where the cup is uncovered for repetition of the upward travel by the shock of striking either the bottom of the well or a stop member fixed in the tube.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawings:

Figure 1 is a view of the paraffin cleaner of the present invention, in side elevation, with the cup uncovered ready for the upward travel of the tool, the inside diameter of the well tube being indicated in dotted outline.

Figure 2 is a view in side elevation of the tool turned 90° from the position shown in Figure 1 and with the parts in the position assumed after the tool has reached the top of the well tube and is ready for descent under the action of gravity, the closed top of the well above the lateral outlet pipe being shown with the well tube in dotted outline.

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Figures 3 and 3a show the tool in longitudinal section, the section being taken on the line 3—3 of Figure 1.

Figure 4 is a transverse section taken substantially on the line 4—4 of Figure 2.

Figure 5 is a longitudinal section taken in the middle portion of the tool substantially on the line 5—5 of Figure 2.

Figure 6 is a view in perspective of the cup shield and trigger carrying rod.

Figure 7 is a longitudinal section through the upper end of the rod showing the details of the trigger mechanism.

Referring now more particularly to the drawings the numeral 10 in Figures 1 and 2 designates the outline of the inside wall of a well tube in which the tool operates and Figure 2 in addition shows the top of the well with the lateral fluid lead-off designated 12 and a closure cap 14 overlying the top of the well and against which the trigger mechanism of the tool strikes as hereinafter described.

The paraffin cleaner tool comprises an elongate housing 16 which has a threaded socket 18 in its upper end and a threaded stem 20 at its lower end.

Secured to the top end of the housing 16 is the tubular head unit 22 which has a threaded stem 24 on its lower end for engagement in the socket 18. The bore 25 of the head is of slightly smaller diameter than the bore 26 of the tubular housing 16 whereby the lower end of the threaded coupling stem 24 provides a downwardly facing shoulder 27 at the top end of the housing 16 for the purpose about to be described.

The head unit 22 also functions as a carrier for the arcuate scraping blades 28 or paraffin knives which are welded or otherwise secured to the head unit and extend in a circumferential direction therearound.

The lower end of the housing 16 has cut therein the opposite longitudinally extending slots 29 which open through the lower end of the housing as shown in Figure 5 and detachably connected to the lower end of the housing by the threaded stem 20 is a tubular stop sleeve 30 which has the threaded socket 31 in its upper end to receive the stem 20 and which is also internally threaded at its lower end as indicated at 32 to receive the threaded upper end of a cup tube 33.

Encircling the cup tube 33 adjacent to the threaded upper end and slightly below the threads thereof, is a wedge ring 34 which is fixed to the tube 33 by welding or in any other suitable manner.

The numeral 35 designates a frusto-conical, hollow cup member which has the smaller upper end portion in tight encircling relation with the tube 33 as shown in Figure 3a, with the open base portion directed downwardly and with the tapered

inner surface resting upon the tapered outer surface of the wedge ring 34.

Encircling the upper end of the cup 35 and carried by the lower end of the stop sleeve 30 is a clamping ring 36 which firmly binds the top end of the cup to the tube 33 as illustrated.

The cup 35 is preferably formed of a suitable oil resistant rubber such as neoprene, or of any other suitable material which will have sufficient flexibility to follow all of the uneven contours of the inner surface of a well tube and at the same time be compressible so as to have the diameter of the base portion reduced in the manner hereinafter described to permit the free falling of the tool through the well tube to the bottom of the well after it has been raised to the top by the action of the flowing liquid and gases pressing into the cup 35 while the periphery of the latter is in tight sliding contact with the tube wall.

Below the cup 35 the tube 33 carries a number of paraffin knives or scrapers 37 which are of the same form or construction as the scrapers 28 and these scrapers are preferably of the same character as those disclosed and claimed in allowed application Serial No. 131,486, filed December 6, 1949, now Patent No. 2,583,044.

Extending through the entire body of the tool, which body includes the housing 16, the head unit 22, stop sleeve 30 and cup tube 33, is a rod 38, the length of which is materially greater than the stated body portion of the tool.

A substantial portion of the lower end of the rod 38 is screw threaded as indicated at 39 and threaded onto this portion is a plug collar 40 which is adapted to enter the lower end of the cup tube where it closes such tube during the time that the tool is being forced upwardly in the well tube.

Also threaded upon the lower end of the rod 38 is a foot member 41 which receives an upward blow by contact either with the bottom of the well or by a suitable stop member which may be fixed in the well tube at a desired elevation above the bottom.

In Figure 1 the transverse dotted line 42 designates either the top of stop member fixed in the well tube or the bottom or floor of the well hole which the foot 41 strikes when the tool drops freely in the well tube.

Carried by and encircling the rod 38 is the cylindrical cup shield 43 which is open top and bottom and which is attached to and maintained concentric with the rod by an elongate yoke 44 which comprises the two ear members 45 which are secured to the rod 38 and project diametrically from opposite sides thereof, and the legs 46, each of which is connected with the outer end of an ear and extends longitudinally of the rod, the other ends of the legs being attached to the edge of the cylindrical cup shield at the top end of the latter as shown in Figure 6.

As is clearly shown in Figures 1, 2 and 6 the yoke ears 45 lie each in a slot 29 of the housing 16 and the yoke legs 46 are positioned upon the outer side of the stop sleeve 30 to extend longitudinally thereof and support the cylindrical cup shield in encircling relation with and spaced from the stop sleeve when the cup is extended for use as in Figure 1 or around the cup 35 and compressing the same to a reduced diameter when the cup is in retracted position in the sleeve for the descent of the tool into the well as shown in Figure 2.

The overall diameter of the cylindrical cup shield 43 is less than the inside diameter of the well tube so that there is clearance at all times around the shield thereby allowing for the free flow of liquid past the shield when the tool is descending in the well.

Encircling the rod 38, within the housing 16 and held in contact with and between the yoke ears 45 at its bottom end and the shoulder 27 at its top end, is a spiral spring 48, the action of which will be hereinafter described.

The upper end of the rod 38 has formed therein from the end and opening through one side, a slot 49 in which is oscillatably supported on a transverse pin 50, a latch 51, the lower end of which is normally urged outwardly beyond the periphery of the rod 38 by a spring 52.

Slidably supported in the upper end of the slot 49 above the latch 51, is a trigger 53 which has limited longitudinal movement on a pin 54 extending transversely of the slot and passing through the short longitudinal hole 55.

The lower end of the trigger has an outwardly facing obliquely angled cam surface 56 which engages behind the upper end of the latch and the upper end of the trigger projects slightly above the upper end of the rod as shown in Figure 7. Accordingly it will be seen that when downward pressure is applied to the trigger 53 the cam 56 will cause the oscillation of the latch 51 to retract the lower end against the action of the spring 52, into the slot. This latch is adapted to extend beyond the top of the head unit 22 as shown in Figure 1 to hold the spring 48 compressed or under tension, at which time the rod 38 will be at the limit of its upward movement through the body portion of the tool so that the ears 45 will be in the upper end of the slots 29 and the cup will be below or out of the shield 43 as shown in Figure 1. This is the arrangement of the parts of the tool when the latter is being driven upwardly in the well tube by the force of rising fluid working against the cup, the periphery of the cup being in close sliding contact with the well tube wall.

When the tool reaches the top of the well tube the projecting end of the trigger 53 will strike the well tube cap 14 with sufficient force to effect the retraction of the latch 51 whereupon the compressed spring will project the rod 38 downwardly carrying with it the cup shield 43, the plug collar 40 and the foot 41. When the shield is thus projected downwardly it will force itself over and around the cup 35, compressing and completely housing the latter, thereby moving the edge of the cup away from or out of contact with the well tube as illustrated in Figure 2. At the same time the plug collar 40 which previously had been tightly fitted in the lower end of the cup tube 33, when the tool was passing upwardly in the hole, is shifted downwardly to the position shown in Figure 2 so that the lower end of the tube 33 is opened. The tool is now free to fall or drop freely through the well to the bottom.

When the tool in falling freely, reaches the bottom of the well or reaches the stop member which may be at the level indicated by the dotted line 42 the force of the heavy tool coming suddenly to a stop in its descent will first check the downward movement of the rod 38 but the body portion of the tool will continue to move downwardly by inertia to the limit permitted by the slots 29. The ears 45 will then strike the upper ends of the slots 29 and stop the downward movement of the body portion of the tool, the spring 48 in the meantime becoming compressed. Such continued downward movement of the

body portion of the tool will also bring the latch 51 above the top end of the head unit 22, permitting the latch spring 52 to project the latch so that the compressed spring cannot then react to return the body portion of the tool to its former position on the rod 38.

As will be readily apparent when the above described action takes place the cup 35 will pass downwardly out of the shield 43 and into contact with the surface of the well tube and the plug collar 40 will be moved upwardly with the rod 38 to close the lower end of the cup tube 38 so that the well liquid and gases cannot pass upwardly through the tube 33 and escape above the cup 35 through the openings or slots 29. The tool will then be elevated by the action of the flowing well and any accumulated paraffin on the surface of the tube will be removed by the knives or scrapers 26 and 37.

It will be seen from the foregoing that there is provided by the present invention an efficient paraffin scraper tool which operates entirely automatically to be elevated by no other force than the flowing well and returned to the bottom of the well by no other force than the force of gravity. Consequently the tool after being put into the well tube will rise and fall repeatedly without attention as long as the well flows.

We claim:

1. A paraffin cleaner for flowing wells, comprising an elongate tubular housing, a rod extending therethrough and having a foot end and a head end, a cup of resilient material encircling and carried by the housing adjacent to the foot end of the rod, the cup opening downward and being of a diameter to fit the wall of the well pipe in which the cleaner is used, paraffin scrapers carried by the housing above and below the cup, a cup shield carried by the rod and encircling the housing adjacent to the cup, said rod being adapted to have longitudinal movement in the housing between a lower position relative to the housing in which said shield encloses and compresses the cup to a reduced diameter and an upper position relative to the housing in which the shield releases the cup for expansion of the cup to its full diameter, a spring means operatively connected between the housing and the cup shield, said spring being under compression when the shield is in said upper position, and a latching mechanism for coaction between the rod and housing and including a movable element for coupling the rod and housing when the rod is in said upper position to maintain the spring under compression and a releasing trigger which when struck moves the element to uncouple the rod and housing to permit the spring to shift the shield to its lower position.

2. A gas and liquid actuated paraffin cleaner for flowing oil wells, comprising an elongate body, a cup carried thereby and adapted to partition a well pipe in which it is positioned to receive thrust from the well flow to raise the body, means encircling the body and movable in one direction relative thereto to encircle and reduce the diameter of the cup and effect its separation from an enclosing well wall to permit the flow to pass the cup and permit the free falling of the cleaner in the well, scrapers carried by the body, means including a well bottom engaging element for effecting the shifting of the cup encircling means to cup release position when the descent of the free falling cleaner is checked by engagement of said element with the well bottom, and means for effecting the reverse shifting of the cup encircling means to said cup encircling position by forcible contact of a part of the top end of the cleaner with a top part of the enclosing well casing.

3. The invention as set forth in claim 2, wherein said body is tubular and said cup reducing means comprises a cylindrical shield encircling the body, said cup shifting means comprising a rod extending through and having limited free longitudinal movement in the body, the body having opposite longitudinal slots therein, elements carried by the rod extending through the slots and coupling the rod and shield together, said reverse shifting means comprising a coil spring within the body around said rod and compressed between the body and said elements and urging movement of the shield to cup encircling position, and a latch means for releasably coupling the upper end of the rod and the body to hold the spring under compression.

4. A paraffin cleaner for an oil well including a body comprising an elongated tubular housing and a tubular head unit coupled to the top end thereof, the housing having opposite longitudinal slots therein opening through its bottom end, a stop tube coupled to the bottom end of the housing and closing the ends of the slots, a resilient and compressible cup encircling and carried by the stop tube, scrapers carried by the body at the top and bottom ends, a rod passing freely through the body and projecting beyond the top and bottom ends thereof, a cup encircling cylindrical shield encircling the body, means coupling the rod and shield together through said slots and limiting the up and down movement of the rod in the body, said shield when the rod is at the limit of its down movement enclosing and constricting the cup and being free of the cup when the rod is at the limit of its up movement, spring means within the housing and compressed between said coupling means and the tubular head of the housing and urging the rod downward through the body, and a latch mechanism carried by the top end of the rod and comprising a latch pivoted to the rod for engagement with the head unit to hold the rod at the upward limit of its movement with the spring compressed and a release trigger slidably carried by the rod and projecting beyond the top end of the rod and adapted when shifted downwardly to actuate the latch to disengaged position.

5. The invention as set forth in claim 4, with a closure plug carried upon the lower end of the rod which enters and closes the bottom end of the body when the rod is moved to the limit of its upward movement.

6. The invention according to claim 5, with a foot member secured to the bottom end of the rod.

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