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WELL TREATING DEVICE

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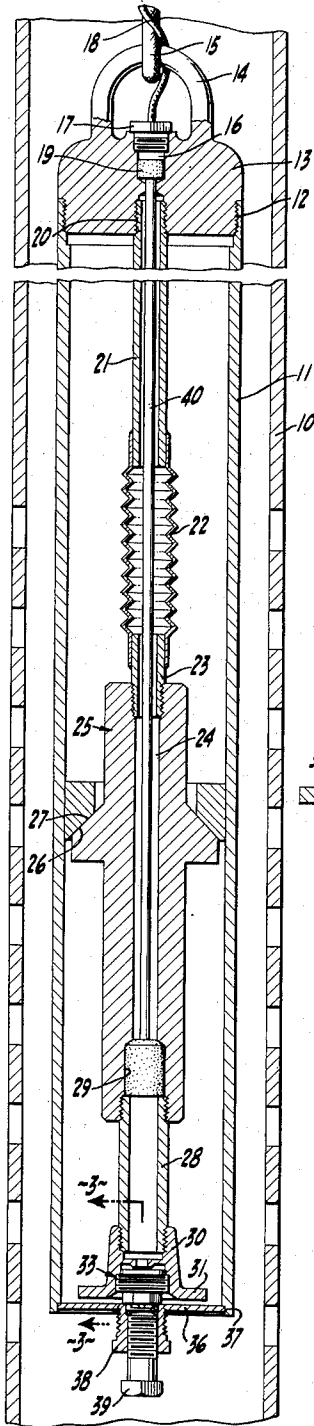


FIG. 1

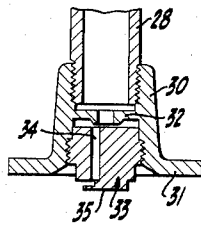


FIG. 3

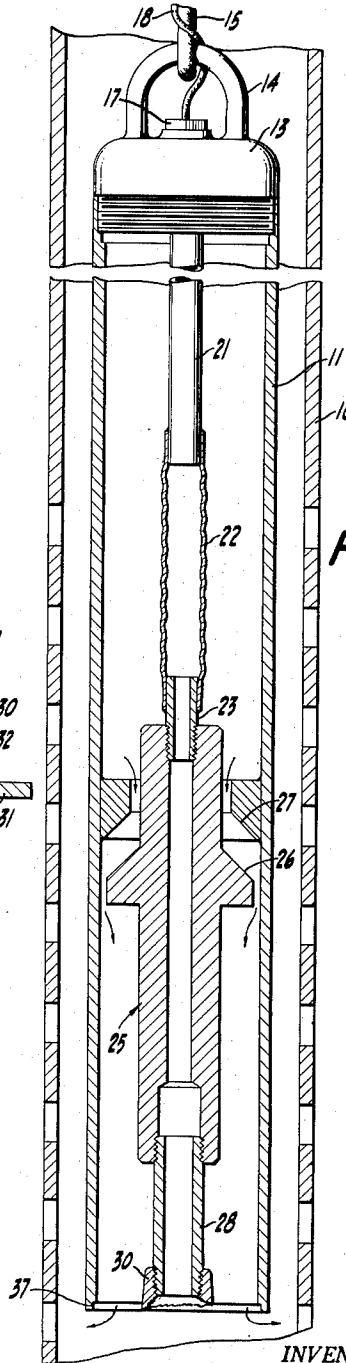


FIG. 2

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WELL TREATING DEVICE

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6 Claims. (Cl. 166—19)

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This invention relates to devices for treating oil wells by introduction of acid or other chemicals at a particular spot in the bore for the purpose of cleaning up deposits of asphalt, paraffine, etc. impeding the flow of oil in an open bore, or for use within the end of a drill pipe for the same purpose or to free a pipe that has become stuck during drilling so that circulation has been lost or impaired.

The main object of the invention is to provide a simple and efficient device for carrying a chemical charge or the like to any desired location in the bore of a well and there releasing the charge by remote control from the ground surface, with subsequent recovery of the device, in main part, for repeated use.

The foregoing and other objects and advantages of the invention are attained in the embodiment thereof hereinafter more specifically described and claimed and illustrated in the accompanying drawing, where

Figure 1 is a longitudinal sectional view, longitudinally contracted, of the device, showing its charge retaining means in closed, or charge retaining condition;

Figure 2 is a similar view showing the altered position of the charge retaining means after release thereof; and

Figure 3 is an enlarged sectional view on line 3—3 of Figure 1.

For purposes of illustration, the apparatus embodying the invention is shown within a perforated well casing 10 although it will be apparent that it can be used in an open bore with equal efficiency.

In its present embodiment the charge carrying device consists of a cylindrical metal shell or body 11 having threaded connection at 12 with a head 13 formed with a bail 14 for attachment of the hoisting rope 15. The head 13 is axially bored to form an upper enlarged primer cap chamber 16 having a threaded closure, or plug 17 transmitting the end of an insulated electric wire 18 to a primer cap 19 in chamber 16. Chamber 16 is in communication with a threaded socket 20 receiving the threaded end of a fuse tube 21 extending axially of the cylindrical body 11. The lower end of this tube is cemented, or otherwise firmly secured, to the upper end of a flexible bellows or hose 22 forming a continuation of tube 21 and similarly secured at its lower end to a threaded tubular nipple 23. The nipple 23 is screwed into the axial bore 24 of a fluid discharge valve 25 which is of relatively heavy nature and formed with a tapered valve head 26.

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This valve is designed to be capable of a limited range of movement vertically, or longitudinally of body 11, to carry the valve head 26 to and from the complemental tapered valve seat ring 27 which is secured to the inner surface of body 11. The cylinder 11 above the valve seat constitutes a fluid storage chamber, while the cylinder below the valve seat serves as a housing for the control means for the valve. The extended end of valve 25 below the head 26 has a terminal enlarged chamber 29 forming a continuation of the axial bore 24, this chamber being designed to contain an explosive charge. The lower end of this chamber has a threaded connection with a nipple 28 which is in turn threaded at its lower end for connection to a terminal sleeve 30 formed at its lower edge with a radially extending circumferential flange 31 located adjacent the lower end of the valve control housing portion of cylinder 11. Intermediate its ends the sleeve 30 is formed with a centrally apertured diaphragm 32, best seen in Figure 3, and the lower end of sleeve 30 is threaded to receive a closure plug 33 formed with a vent or conduit 34 which terminates in the periphery of a circular boss 35 forming the lower end of plug 33. As shown in Figure 3 the inlet for vent 34 is offset from the central aperture in diaphragm 32 and its outlet is presented laterally, for reasons to be explained.

The sleeve 30 and plug 33 together constitute diffusing or equalizing means for controlling application of the force, or blast, generated by explosion of the charge in chamber 29. The end of cylindrical shell 11 adjacent the equalizing means is normally closed by a blow-out closure or disk 36 which has a tight press fit in the counter-bored end 37 of said member, said disk serving as a reaction or support member to maintain the valve 25 in closed position. Disk 36 is formed with a central threaded opening in which is received an internally threaded nipple 38 receiving a set screw 39, the inner end of which is normally in engagement with the boss 35 of plug 33. The channel leading from the chamber 16 in head 13 down to chamber 29 in the lower end of the fluid valve 25 is designed to contain a powder fuse line, indicated at 40, leading from the primer cap 19 to an explosive charge in chamber 29.

In preparation for use, an electric primer cap is placed in chamber 16, under plug 17 and the explosive cartridge or charge and fuse are inserted in chamber 29 and the central channel leading from the cap to the cartridge. The chemical

charge is then poured into the body of cylinder 11 while valve 25 is held open following which the valve is closed and blow-out disk 36 is pressed into its seat. The set screw 39 is then adjusted to cause pressure on plug 33 and the connecting elements with valve 25 thereby effecting tight closing thereof.

The device can then be lowered to any desired location in a well bore and the cartridge fired by electrical impulse transmitted through cable 18 to the primer cap and fuse train. The explosive blast will be directed through nipple 28 to the aperture in diaphragm 32 and conduit 34 in plug 33 and its force diffused and controlled thereby in a manner to blow out the disk 36 as a whole rather than through a central blown out hole in the disk as might occur if the explosive force were centrally directed on the disk. This control and diffusion result from the provision of the restricted opening in diaphragm 32, its offset relation to the inlet of channel 34 and the lateral direction of its outlet thus causing the explosive thrust to be gradually applied to the disk 36 as a whole.

Upon blow-out of the disk 36 the valve 25 will drop by gravity to the position of Figure 2 and the fluid contained released in the manner indicated by the arrows in said figure. The device may then be withdrawn and re-used by recharging same and replacing the blow-out disk and set screw, which are the only parts lost in use.

It will be evident from the above disclosure that a simple, inexpensive and efficient device for "spotting" or treating oil wells as may be required has been provided by this invention as well as one which may be repeatedly used by mere replacement of a blown out closure.

What is claimed as new is:

1. A well treating device of the class described comprising a closed top cylindrical shell adapted for lowering into a well bore, a valve seat ring within said shell forming the lower end of a fluid storage chamber, a closure valve for said valve seat ring carried in the shell for movement vertically, a fluid discharge outlet in said shell located below said valve, a blow-out closure for said discharge outlet, said closure supporting said valve in closed position against said valve seat ring, an explosion chamber carried within said shell between said valve and blow-out closure, and electric control means for firing an explosive in said explosion chamber to blow out the closure and permit the valve to fall to bring said fluid storage chamber into communication with the fluid discharge outlet in said shell.

2. A well treating device of the class described comprising a closed top cylindrical shell adapted for lowering into a well bore, a valve seat ring within said shell forming the lower end of a fluid storage chamber, a closure valve for said valve seat ring carried in the shell for movement vertically, a fluid discharge outlet in said shell located below said valve, a blow-out closure for said discharge outlet, said closure supporting said valve in closed position against said valve seat ring, an explosion chamber carried within said shell between said valve and blow-out closure, electric control means for firing an explosive in said explosion chamber to blow out the closure and permit the valve to fall to bring said fluid storage chamber into communication with the fluid discharge outlet in said shell, and means carried within said shell for limiting the downward movement of the valve.

3. A well treating device of the class described

comprising a cylindrical shell open at its lower end, means forming a fluid-tight closure for the top thereof, a valve seat ring carried within said shell above the lower end thereof and defining with said shell and said top closure a fluid storage chamber, a valve engageable with the underside of said ring to seal fluid within said chamber, a blow-out closure in the lower end of said shell below said valve, a tubular prolongation on said valve in engagement with said blow-out closure to support said valve in sealing engagement with said ring, an explosion chamber within said prolongation, electric control means for firing an explosive in said explosion chamber to blow out the bottom closure and permit the valve to fall to bring said storage chamber into communication with the lower or fluid discharge end of said shell, and means carried within said shell for limiting the downward movement of the valve.

4. A well treating device of the class described comprising a cylindrical shell open at its lower end and provided with a fluid-tight closure at the top, a valve seat ring carried within said shell above the lower end thereof and defining with said shell and said top closure a fluid storage chamber, a valve engageable with the underside of said ring to seal fluid within said chamber, a blow-out disk closing the lower or fluid discharge end of the shell, a tubular prolongation on said valve including therein an explosion chamber and terminating in blast controlling and diffusing elements in engagement with said disk to thereby support said valve in engagement with said ring, electric control means for firing an explosive in said explosion chamber to blow out the disk and permit the valve to fall to bring said storage chamber into communication with the lower or fluid discharge end of said shell, and means carried within said shell for limiting the downward movement of the valve.

5. A well treating device of the class described comprising a cylindrical shell open at its lower end and provided with a fluid-tight closure at the top, a valve seat ring carried within said shell above the lower end thereof and defining with said shell and said top closure a fluid storage chamber, a valve engageable with the underside of said ring to seal fluid within said chamber, a blow-out disk closing the lower or fluid discharge end of the shell, a tubular prolongation on said valve including therein an explosion chamber, a terminal sleeve on the prolongation having a horizontal flange lying above the blow-out disk, a closure plug in the terminal sleeve in contact with said disk, whereby said valve is supported in engagement with said ring, said sleeve and plug being formed with restricted conduits discharging below the flange, electric control means for firing an explosive in said explosion chamber to cause controlled release of the blast through said conduit to blow out the disk and permit the valve to fall to bring said storage chamber into communication with the lower or fluid discharge end of said shell, and means carried within said shell for limiting the downward movement of the valve.

6. A well treating device of the class described comprising a cylindrical shell fluid-tight at its top, a fluid storage chamber in the upper end thereof having its lower end defined by a ring having a valve seat in its lower face, a fluid outlet opening in said shell below said ring, a valve between said ring and fluid outlet opening engageable with said seat to close off said chamber from said outlet opening, a blow-out closure for

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said outlet opening supporting said valve in engagement with said seat, an explosion chamber within said shell between said valve and said closure, firing means extending from said explosion chamber axially through said valve, storage chamber and shell top to remotely located electrical control means therefor, and a hollow extensible cable enclosing said firing means within said storage chamber and forming a connection between said shell top and valve, said cable being operable to allow said valve to drop a limited distance upon the blowing out of said closure upon firing of an explosion within said explosion chamber.

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