

Feb. 8, 1938.

R. O. BEGGS

2,107,975

SHUT-OFF VALVE

Filed Nov. 17, 1936

3 Sheets-Sheet 1

Fig. 1.

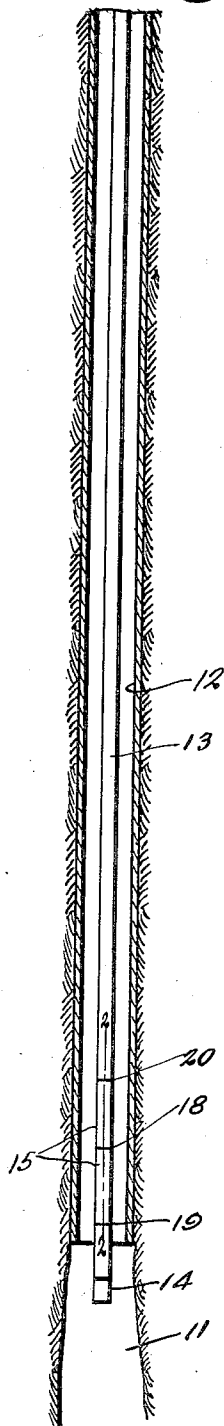


Fig. 10.

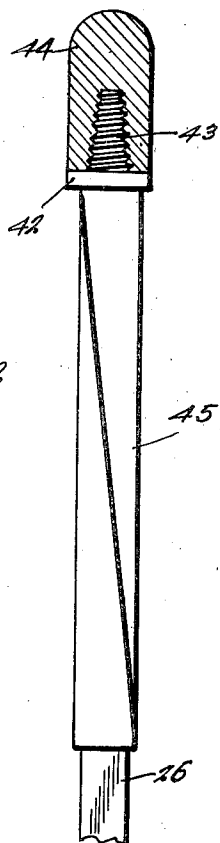
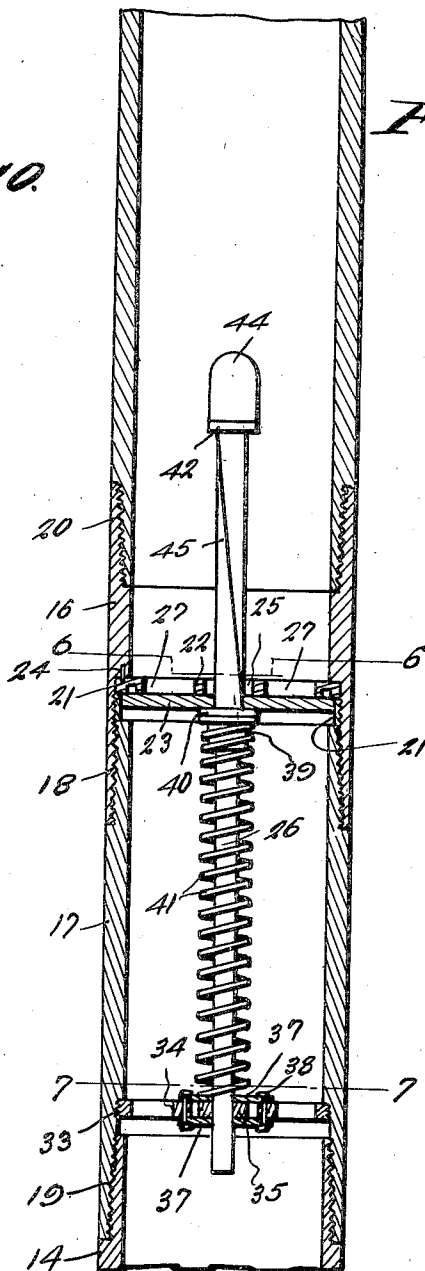


Fig. 2.



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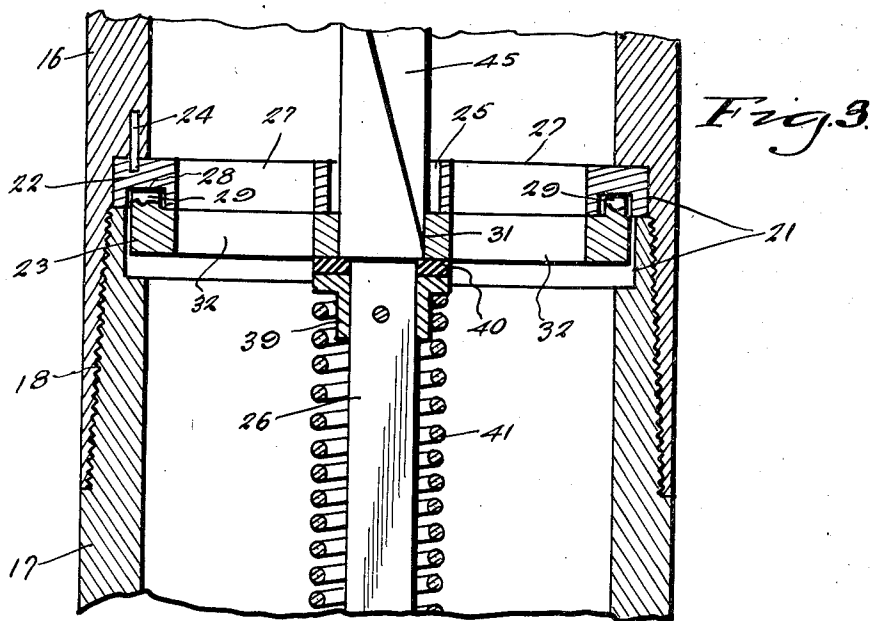
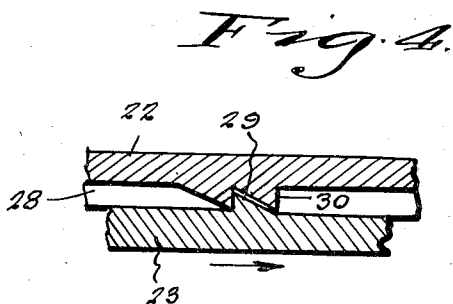
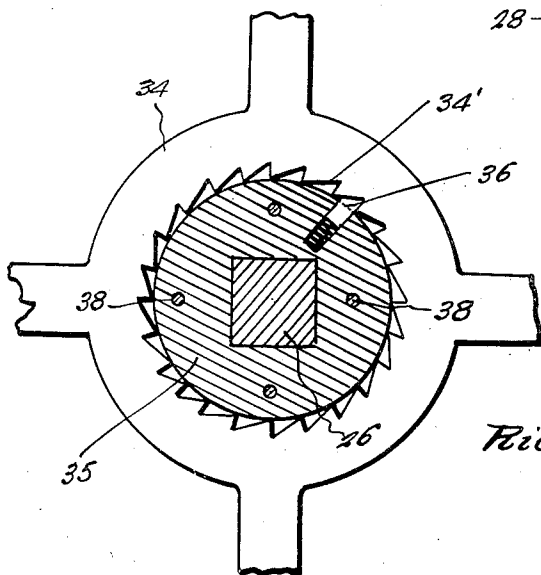


Fig. 5.



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Fig. 6.

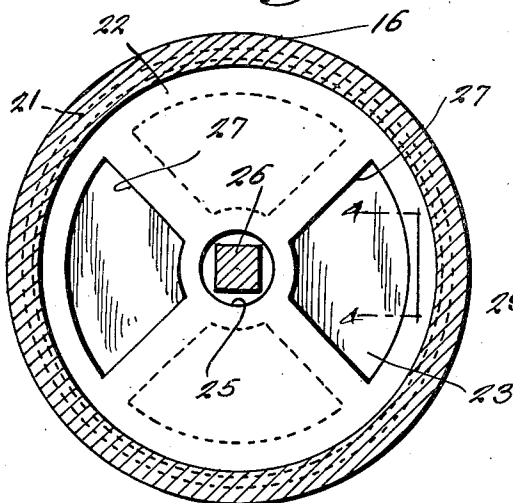


Fig. 8.

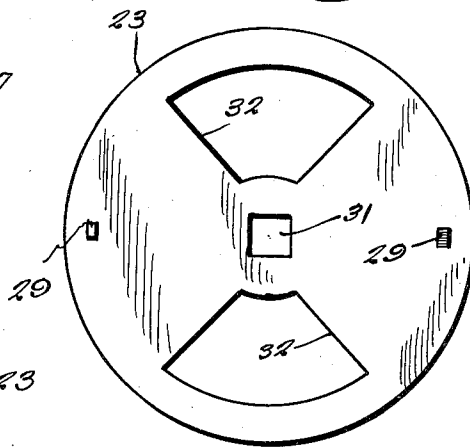


Fig. 9.

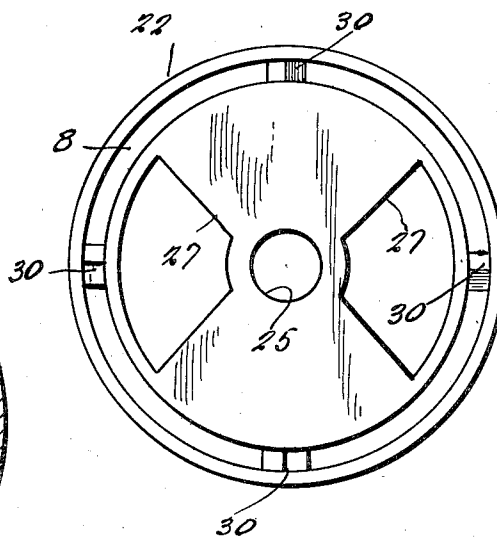
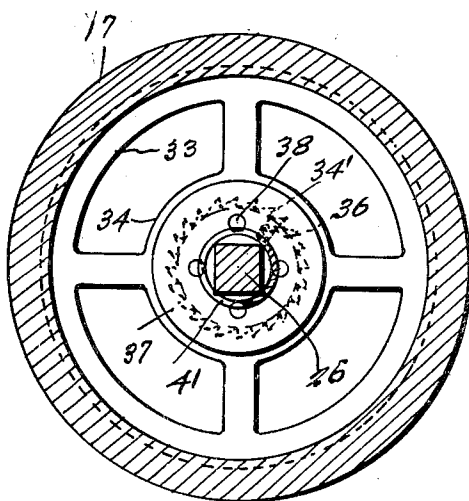


Fig. 7.



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UNITED STATES PATENT OFFICE

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SHUT-OFF VALVE

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Application November 17, 1936, Serial No. 111,315

3 Claims. (Cl. 103—202)

This invention relates to improvement in a shut-off valve for oil well tubing and the primary object of the improvement is to provide satisfactory means of shutting off the fluid flow in a string of tubing in an oil well when it is desired to change cups on the travelling valves of the well pumping apparatus or otherwise to work on the well.

A further object of the invention is to provide a leak proof shut-off valve of a novel and improved construction assuring complete shut off of the fluid flow whereby the well apparatus can be worked on without danger of oil flowing out or possibility of fire or injury to men working thereon.

An additional object of the invention is to provide a device of the character above described which is capable of many and varied uses in connection with well apparatus.

The above objects are obtained by the means and mechanism hereinafter fully described with reference to the accompanying drawings wherein:

Figure 1 is a vertical sectional view of an oil well and well working apparatus, the string of tubing embodying the invention being shown in elevation.

Figure 2 is a longitudinal sectional view on line 2—2 of Fig. 1.

Figure 3 is a sectional fragmentary view on an enlarged scale of the tubing valve inserts comprising the invention.

Figure 4 is a detail sectional view on line 4—4 of Fig. 6 illustrating the interlocking connection between the valve plate of the invention.

Figure 5 is a detail view of a ratchet mechanism.

Figures 6 and 7 are transverse sections on line 6—6 and 7—7 respectively of Fig. 2.

Figure 8 is a top view of the bottom valve plate.

Figure 9 is a bottom view of the top valve plate.

Figure 10 is a detail showing of the upper end of the valve actuating rod.

Referring more particularly to Fig. 1 of the drawings, 11 indicates a well hole having the usual downwardly extending well casing 12 within which is the string of tubing comprising the working valve barrel 13 which may have the usual working valve therein, and on the bottom of which, and between the latter and the foot valve unit 14 containing the usual foot valve is the tubing shut-off valve assembly 15 constituting the present invention. The working valve and foot valve are not shown because they may be any type in the prior art.

This shut-off valve assembly consists of a sectional valve casing composed of tubes 16 and 17 having a screw joint 18; the upper tube 16 having a screw joint 20 with the bottom end of the working valve barrel 13 and the lower tube 17 having a similar joint 19 with the foot valve unit 14. As shown in Fig. 3 the valve casing tubes are grooved out at 21 to receive the circular metal plates 22 and 23 of the valve assembly; the upper plate 22 having a tight fit in the grooved part of the tube 16 in which it is held stationary by dowel pins 24 and the lower plate 23 having a loose fit in the grooved part of the tube 17 in which it is axially movable as well as rotatable within the limits of the grooved part which is deeper than the width of the plate. Plate 22 rests upon the upper end of tube 17 and is held in place by the dowel pin and by pressure when the tubes 16 and 17 are secured together. At the center of the plate is a round hole 25 through which slides a rod or bar 26, and two sections of the plate are cut out on opposite sides of the center opening to provide valve ports 27 for the passage of fluid therethrough. The under side of the plate is machined smooth to fit the upper face of the lower plate 23 and has an annular recess or channel 28 cut out to receive two lugs or dogs 29 on the upper face of plate 23; these lugs being adapted in one direction of rotation of the plate 23 to ride over the inclined faces of four projections or stops 30 depending from quarter poits along the face of the channel to prevent reverse rotation of plate 23. There is a square hole 31 in the center of plate 23 which is machined to fit the rod 26 loose enough to allow for the passage therethrough of the rod 26 without binding, and valve ports 32 are provided on diametrically opposite sides of the square hole for registration with the valve ports in the upper valve plate 22. Projections 30 are so located in the channel 28 that the dogs 29 abut the stop faces thereof only when the ports 27 of plate 22 and port 32 of plate 23 are fully aligned or fully disaligned.

Fitted into the lower end of tube 17 with which it has a screw threaded connection is a guide plate or spider 33 consisting of inner and outer concentric rings with connecting arms therebetween as in Fig. 7; the inner ring or hub 34 of which encircles a rotatable ratchet disk 35 having a spring pressed ratchet 36 engaging ratchet teeth 37 on the inner circumference of the spider hub. Disk 35 is confined between upper and lower bearing plate 37 to which it is attached by bolt 38, these plates being on opposite sides of the hub to

retain the disk therein. Disk 35 and plate 38 are apertured to provide a centrally located hole or bore of square cross section to receive the lower end of the rod 26. Rod 26 is of square cross section and of a length to extend from a point spaced above the valve plates 22 and 23 through and beyond said plates to a short distance below the guide plates 33. Pinned or otherwise fixed to the rod below the upper end thereof is a spring retainer body or flanged collar 39 on the top face of which is a gasket 40. The flange of the collar provides a rest plate for the upper end of the compression spring 41 circling the rod 26 and being supported at its lower end on the uppermost one of the bearing plates 37 of the spider ratchet disk. This spring is tensioned to hold plate 23 up against plate 22 with the gasket 40 providing a fluid seal at the opening 31, and the spring will compress under a predetermined pressure applied downwardly to the top end of rod 26. The rod is reduced at its upper end to provide a shoulder or seat for a stop ring 42 and a screw threaded tapered pin 43 to receive an anvil head or cap 44 (or an extension member if needed). The stop ring is adapted by its abutment with the top surface of the valve plate 22 to limit the downward movement of the rod 26. In order that the valve plate 23 will be given a quarter turn every time the rod is pressed downwardly, the square portion 43 of the latter between the sealing gasket 40 and the stop ring 42 is twisted through a quarter turn as shown in Figures 3 and 10; the part of the rod having the quarter turn being slightly larger in cross sectional dimension than the lower or spring encircled part.

In the operation of the device, assuming the parts to be positioned as shown in Fig. 3 with the valve ports 27 and 32 in line for the free flow of fluid therethrough and it being desired that such well be shut off temporarily for repairs, etc., the rod 26 is pressed downwardly by suitable means inserted in the top of the working valve barrel 13 such as the working valve on the extra long stroke, or any small rod or tube and contacting the anvil head 44. As the rod is forced down, the square twisted part 45 in passing through the square opening 31 in the movable plate 23 causes the latter to be rotated through a quarter turn which brings the imperforate portions of the plate over the port 27 of the upper plate 22, thereby closing said port to the flow of fluid. Rod 26 is prevented from turning about its own longitudinal axis at this time by the ratchet mechanism of the lower guide plate 23, which mechanism works in opposition to the torsional tendency of the descending rod. When the pressure on the rod is removed and the lat-

ter is urged upwardly by the force of the spring 41, it is necessarily rotated a quarter turn when passing through the square opening in the previously rotated plate 23 which is now held against reversed rotation by the stops 30. Since the spider ratchet is free to turn in the direction in which the upwardly moving rod tends to rotate, the rod is permitted the necessary rotation while moving upwardly through the stationary plate 23. The rod in its next descent causes plate 23 to be moved a quarter turn for disaligning ports 27 and 32 to thereby open the passage of the pipe to fluid flow therethrough.

It will be obvious from the foregoing that the device provides an efficient satisfactory valve means capable of use in connection with the various operations of an oil well wherever it is desirable to obtain a cut off of fluid flow.

What is claimed is:

1. The combination with an oil well apparatus including a working barrel, and a foot valve, of a shut-off valve at the bottom of said working barrel and interposed between the latter and the said foot valve and operable to shut off fluid flow through said working barrel.

2. The combination with an oil well apparatus including a working barrel, and a foot valve, of a coupling tube between the said working barrel and the said foot valve, and a shut-off valve in said coupling tube operable to shut off fluid flow into said valve.

3. A shut-off valve for oil well tubing comprising a tubular casing adapted for insertion in the oil well tubing, a fixed transversely disposed plate in said casing having fluid flow port radially of a round opening at the center of the plate, a rotatable transversely extending plate disposed against the fixed plate and having flow port radially of a center square opening and circumferentially spaced to register with the ports of the fixed plate on ultimate quarter turns of the rotatable plate, a slide rod of square cross section extending through the said openings in the said plate and being provided with a quarter turned portion fitting the square opening in the rotatable plate, ratchet means for holding said rod against rotation when the latter under predetermined pressure applied thereto is moved in one direction through the said plate whereby the rotatable plate is given a quarter turn, means for reversing the direction of movement of the said rod automatically when the applied pressure decreases below the predetermined amount, and means preventing reverse rotation of said rotatable plate when the direction of movement of the said rod is reversed.

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