

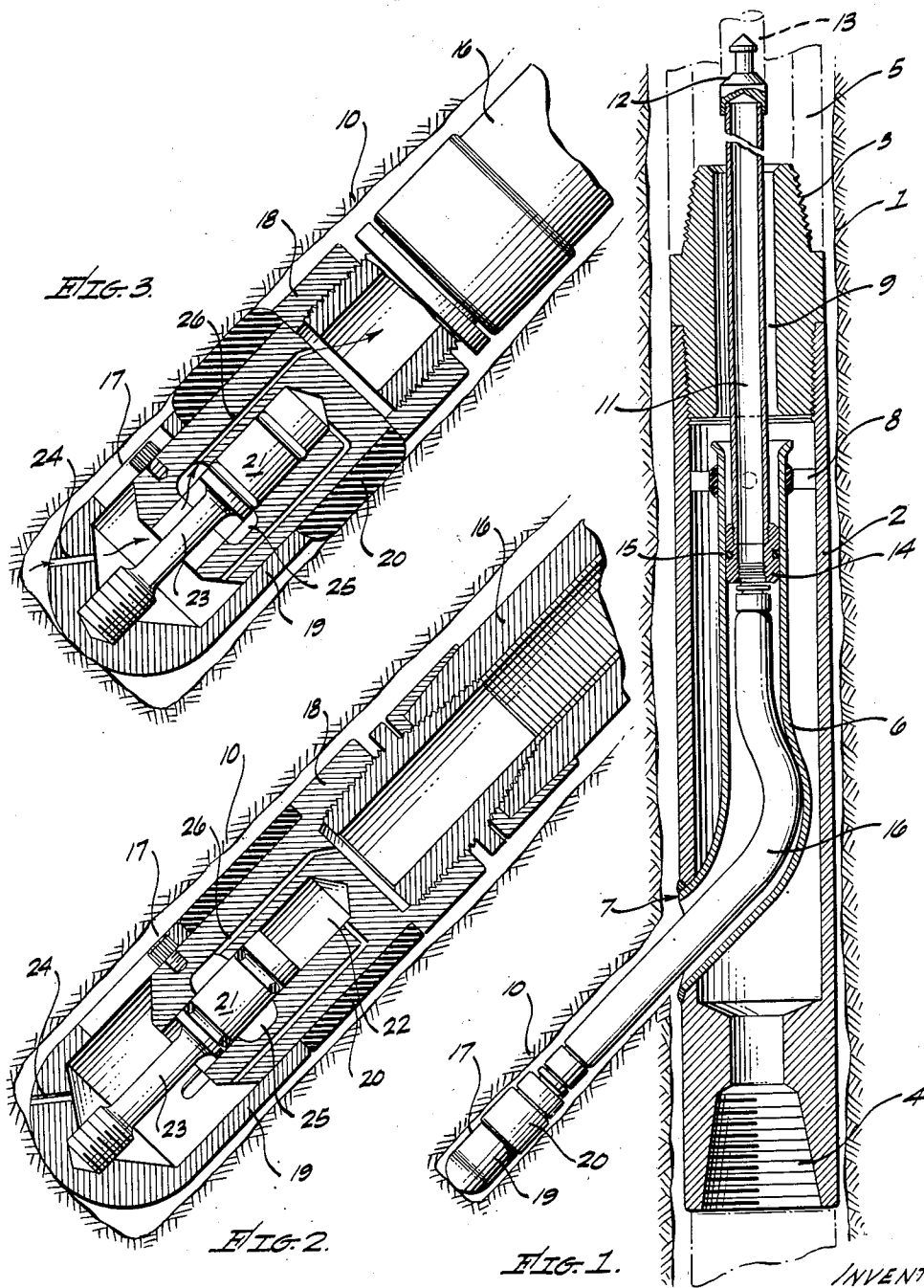
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SIDE OR LATERAL HOLE FORMATION TESTER

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SIDE OR LATERAL HOLE FORMATION TESTER

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2 Claims. (Cl. 166—152)

This invention relates to a means and method of testing an oil formation, particularly by inserting a testing apparatus into a laterally extending hole, which is sometimes termed a side hole, thus sampling or testing the formation at a point some distance from the main vertical bore of the well.

An object of my invention is to provide a means of testing formations by means of a side wall hole which has been drilled prior to the test, or which may be drilled simultaneously with the testing of the formation.

Another object of my invention is to provide a novel formation tester of the character stated, in which the formation may be tested with the drilling string or pipe full of fluid.

Still another object of my invention is to provide a novel formation tester in which it is unnecessary to remove the drilling string or pipe from the hole, either before or after the formation is tested.

Still another object of my invention is to provide a novel formation tester which can be lowered into the well and retrieved therefrom by either dropping the formation tester into the drill pipe or it may be lowered into the well on a line, sucker rods or tubing.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a longitudinal sectional view of my formation tester in position to test the formation.

Figure 2 is a fragmentary longitudinal sectional view of the outer end of the formation tester with the ports in closed position.

Figure 3 is a view similar to Figure 2 but showing the ports in open position.

Referring more particularly to the drawing, the numeral 1 indicates the usual vertical bore or hole of the well which is drilled in the usual manner, however, above the drilling bit I provide a drill collar or fitting 2 which is described and claimed in Patent No. 2,594,292, date April 29, 1952. This drill collar consists of a tubular member with a threaded pin 3 at the upper end and a threaded box 4 at the lower end. The bit, of usual construction, is mounted in the threaded box 4 and drills the hole on rotation of the drill string or pipe 5 which is attached to the pin 3. The drill collar 2 also includes a tubular conduit 6 which is fixedly mounted within the collar 2 and extends out through the side of the collar, as shown at 7. The tube 6 is mounted at its upper end in a spider 8, whereby this tube is fixedly mounted within the collar 2 and is in alignment with the bore 9 in the upper part of the collar 2. This laterally extending tube 6 is not used during the normal drilling operation of the well. However, when the production area of the well is reached it is sometimes desirable to drill lateral or side holes to increase the productive area of the well. The side hole 10 is drilled with a bit in the manner disclosed in the patent above defined, and either during

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this drilling operation or subsequent thereto, the formation can be tested in the following manner:

The drill pipe 5 and the collar 2 remains stationary in the bore 1. This means that the opening 7 of the tube 6 will be in alignment with the side hole 10. My testing apparatus can, therefore, be dropped or lowered into the well and the lower position of this testing apparatus will be guided into the side hole 10. The testing apparatus consists of an upper rigid pipe 11 on the upper end of which a releasable fitting or latch 12 is mounted, and to which the lowering apparatus 13 is secured. The lowering apparatus may consist of sinker rods, cable or tubing. On the lower end of the pipe 11 I provide a packing head 14 on which is mounted a packing ring 15 which thus seals off the tube 6 and prevents fluid from passing downwardly through this tube and around the formation tested. Flexible tubing or pipe 16 is attached at one end to the head 14 and this flexible tubing then extends downwardly through the tube 6 and into the side hole 10. The flexible tubing 16 is of a usual commercial type, consisting of laminated fabric and rubber, and metal reinforcing, if desired, or it may be flexible metallic tubing. This tubing is of a type which, while it will bend or move laterally as it is guided by the tube 6, it will still sustain a considerable weight and transmit compression forces to the testing shoe 17. The testing shoe 17 is threaded or otherwise attached to the lower end of the tubing 16 and embodies the following structure:

A block 18 is threaded onto the lower end of the flexible tubing 16, a sleeve 19 slidably mounted on the lower end of the block 18, and a packing ring or rubber 20 is also mounted on the block 18 and is engaged by the upper end of the sleeve 19. A slide valve 21 is slidably mounted in the bore 22 within the block 18. A valve stem 23 depends from the valve 21 and is threaded into the sleeve 19. An intake port 24 extends through the sleeve 19 and permits fluid to flow into this sleeve. The bore 22 in the block 18 is enlarged, as shown at 25, and a duct 26 extends from the enlargement 25 upwardly through the block 18 and opens into the flexible tubing 16. Thus, when the valve 21 is moved upwardly to the position shown in Figure 3, fluid can flow through the intake port 24, thence into the enlargement 25 of the bore 22, and thence through the duct 26 into the flexible tubing 16, where the sample is retained, if desired, or if there is sufficient fluid that can also pass upwardly into the pipe 11 to fill, or partially fill, this pipe.

In operation the drilling string 5 is held stationary within the well, and a side hole 10 is then drilled with a supplementary drill. Either during this supplementary drilling, or subsequent thereto, the formation can be tested in the side hole 10 in the following manner: The testing apparatus is lowered into the well and the flexible tubing 16 permits the testing shoe 17 to move laterally out of the main bore 1 and into the side hole 10. The head 14 seals off the tube 6 and prevents any fluid from passing out through the tube 6, and also blocks off the static head of fluid which may be within the drill pipe 5. A downward or compressive force is now exerted on the pipe 11, either by pushing downwardly on the upper end of this pipe, or by permitting a weight (called a sinker bar) to rest on top of the pipe. This compressive force is conducted through the flexible tubing 16 and causes the sleeve 19 to be telescoped on the block 18. This telescopic action of the sleeve 19 also compresses and expands the packing 20 which seals off the bore 10 above the port 24. Fluid from the formation can now flow through the port 24, thence into the enlarged bore 25, thence through the duct 26 and can fill or partially fill the flexible tubing 16. After a sample or test has been made, the formation tester is pulled upwardly by the

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rods, cable or tubing attached thereto, and the packing 20 will immediately expand to its normal position, thus pushing the sleeve 19 downwardly to cause the valve 21 to close the duct 26 by sealing off the enlargement of the bore 25 and thus retaining the sample within the tubing 16.

Having described my invention, I claim:

1. A side hole formation tester for holes extending laterally from a main vertical bore, comprising a testing shoe, flexible tubing attached to said shoe, means secured to the flexible tubing to lower said tubing into the main bore and thence into a bore extending laterally therefrom, a curved tube in the main bore, means mounting the curved tube in alignment with the laterally extending bore to deflect the shoe into the laterally extending bore and bend the flexible tubing, said testing shoe including a block mounted on the lower end of said flexible tubing, a sleeve slidably mounted on the lower end of said block, and a packing ring formed of a flexible material mounted on said block, the upper end of said sleeve engaging the packing ring to expand the same on sliding movement of said sleeve, said block having a bore therein, a slide valve slidably mounted in the bore, means securing the valve at one end thereof to said sleeve, said block having ducts therein, said ducts being controlled by the slide valve to admit fluid into the flexible tubing.

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2. A side hole formation tester for holes extending laterally from a main vertical bore, comprising a testing shoe, flexible tubing attached to said shoe, means secured to the flexible tubing to lower said tubing into the main bore and thence into a bore extending laterally therefrom, a curved tube in the main bore, means mounting the curved tube in alignment with the laterally extending bore to deflect the shoe into the laterally extending bore and bend the flexible tubing, said testing shoe including a block mounted on the lower end of said flexible tubing, a sleeve slidably mounted on the lower end of said block, said block having a bore therein, a slide valve slidably mounted in the bore, said slide valve being secured at one end to said sleeve, said block having a duct extending there-through and communicating with the flexible tubing, said slide valve opening or closing the duct as the valve is moved in the bore.

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