

Nov. 11, 1941.

R. Q. SEALE

2,262,655

FORMATION TESTER

Filed Jan. 19, 1940

2 Sheets-Sheet 1

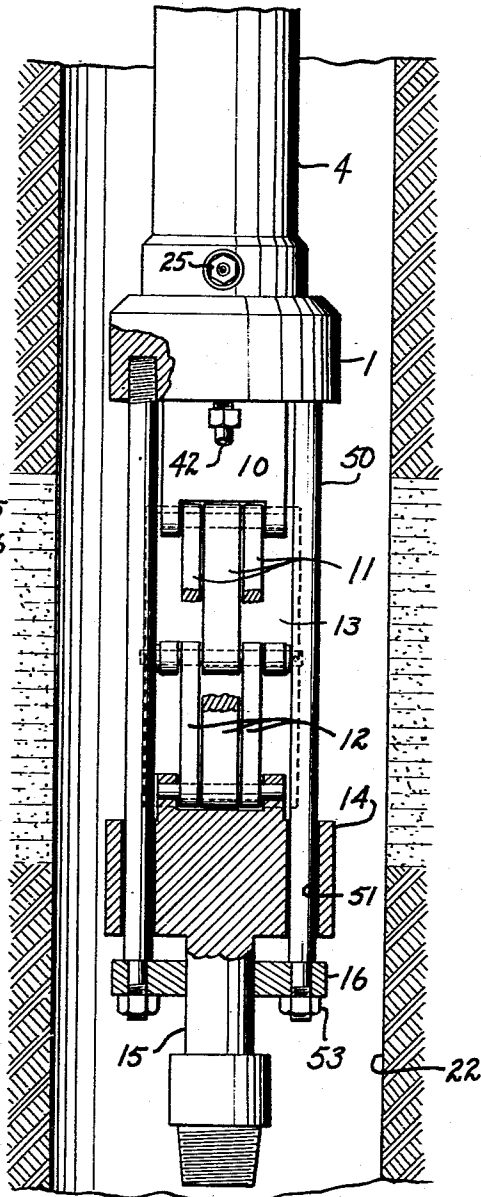
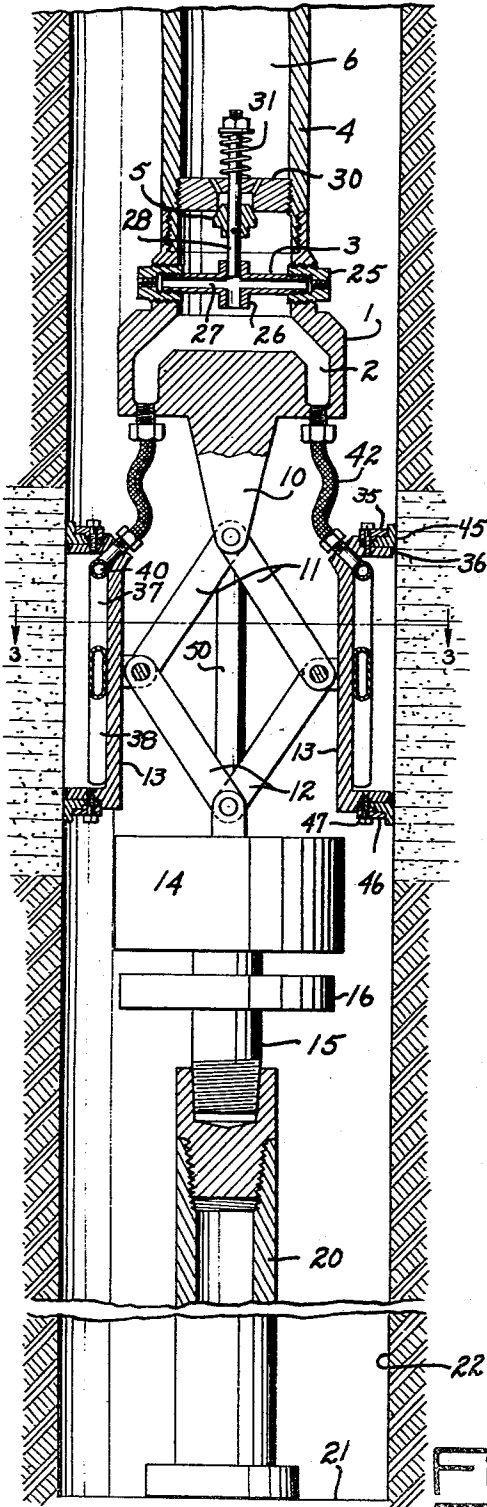


Fig. 2.

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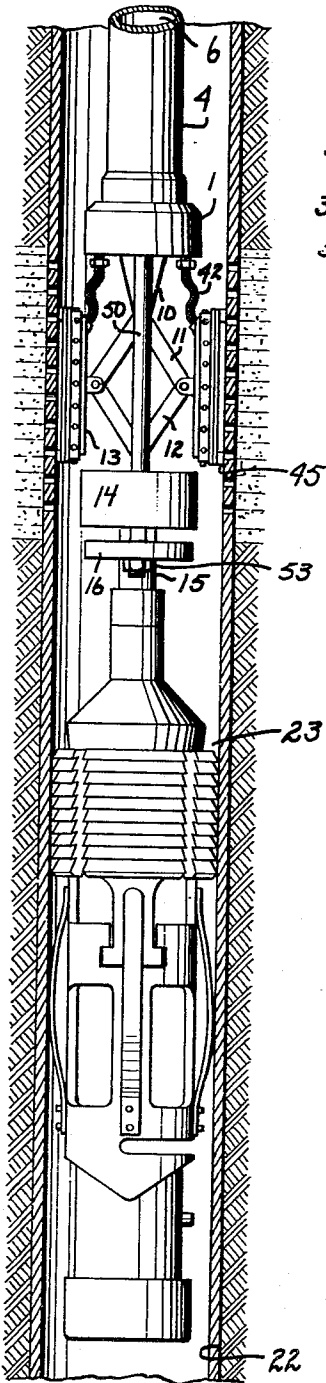


Fig. 5.

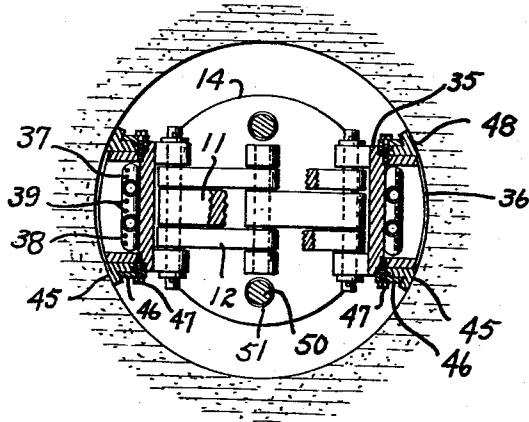


Fig. 3.

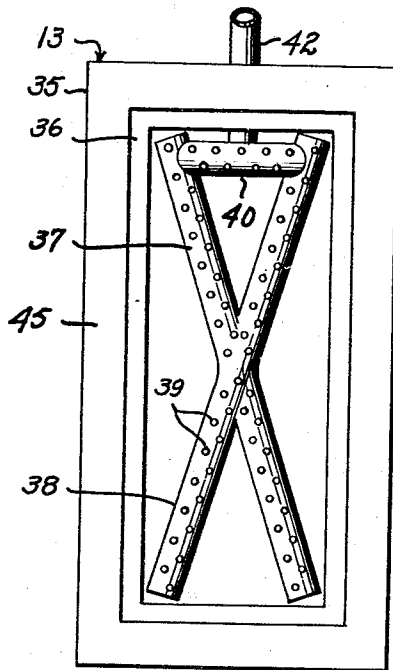


Fig. 4.

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4 Claims. (Cl. 166—1)

The invention relates to a new and useful device and method for testing any of the respective formations penetrated by a well bore.

The general object of the invention is to provide a device which may be lowered to any predetermined level within a well bore where it is manipulated to seal off a portion of the wall from fluids within the well bore and to take a sample of the fluids produced by the stratum at the level of setting.

Another object is to provide a device of the class described which is lowerable upon either a wire line or an empty drill pipe to obtain a fluid sample from a penetrated stratum.

Still another object is to provide a device which obviates the use of conventional packers for sealing off a portion of a well bore.

It is also an object to provide a device which may be used in conjunction with a drill stem testing tool at the bottom of a bore hole without the necessity of using a rat hole type of packer.

Still another object is to provide a device which will effectively test the potential productivity of thin formations.

With the foregoing objects as primary objects, other and further objects will be apparent from the following description considered in connection with the accompanying drawings in which:

Fig. 1 is a vertical sectional view of an illustrative embodiment of the device of the invention showing the relative position of parts when the device is positioned within a bore hole;

Fig. 2 is a view similar to that shown in Fig. 1 but taken at right angles thereto;

Fig. 3 is a sectional view taken on line 3—3 in Fig. 1;

Fig. 4 is an elevational view of one of the packers;

Fig. 5 is an assembly view illustrating the manner of using a hook wall anchor to affix the device within a well bore and at a desired level.

The illustrated embodiment comprises an upper body member 1 having a hollow interior 2 within which is provided a cross member 3. A sample receiving chamber 4 is attached to the upper end of the body member 1 and is provided with a valve 5 for admitting fluid to the interior 6 thereof. This chamber may be a tubular member of limited length when the device is lowered upon a wire line or may comprise a drill string, either of which would serve as a sample receiving chamber. The lower end of the body 1 is provided with a downward projection 10 for pivotal attachment to the upper end of bars 11 which are pivotally attached at their lower ends

to similar bars 12 to form toggle joints to which the packers 13 are pivotally attached. The lower ends of the members 12 are pivotally attached to a lower body member 14 having a reduced section 15 over which a disc 16 is slidable. A foot piece 20 is threadably attached to the lower end of the body member 14 and is of any desired length and adapted to engage the bottom 21 of the well bore 22 (Fig. 1) or to carry a hook wall anchor 23 (Fig. 5) so that the packers 13 may be brought into engagement with the walls of the well bore by continued lowering of the device after the foot piece has been arrested at the desired level.

The cross member 3 in the upper body member 1 is threadably connected to hollow plugs 25 which are in turn secured in the walls of the body. Hollow opposed bosses 26 extend axially of the body 1 and chamber 4 and the openings therein intersect the bore 27 in the cross member. This construction enables drilling mud to move freely thru the device while being lowered into the well bore, the depending stem 28 of the valve 5 being in the position shown in Fig. 1.

The valve 5 is normally held upon its seat on the seat ring 30 by compression spring 31 and the hydrostatic pressure acting thereon after the device has been immersed within the liquids in a well bore. This valve may be opened from above in any suitable manner as for example by means of a construction such as that shown in Halliburton Patent 2,092,062.

The packers 13 comprise box like structures or housings 35 of which the outer face 36 falls upon a cylindrical surface having the same radius of curvature as the bore hole within which the device is to be used. Mounted upon the interior of the housing 35 is an X-shaped rib which comprises crossed pipe segments 37 and 38 welded to the bottom of the structure and provided with perforations 39 to admit formation liquids to the interior thereof. These pipe segments serve a dual purpose in that they serve to rigidify the housing structure and also to admit fluid to the interior of an upper pipe segment 40 which communicates with a passageway in the packer housing to which a flexible non-collapsible conduit 42 is sealably connected. This conduit is also connected to the lower end of the upper body member 1 so that the fluids will be conducted thereto, as will more fully appear in the operation of the illustrative embodiment of the invention.

As best seen in Fig. 3 a packing or sealing member 45 extends about each of the housings 13 and is secured thereto by means of an angle

bar 46 and cap screws 47. This member may be made up of any suitable packing material such as rubber, synthetic rubber, rubber and fabric, etc., and provides an outwardly extending face 48 adapted to engage the walls of the well bore and form a seal therewith. Upper and lower body members 1 and 14 are relatively movable axially by means of structure which will now be described.

Rods 50 are secured to the lower end of the body member 1 and extend downwardly and pass thru openings 51 in the lower body member 14. The lower ends of these rods are reduced and pass thru openings in the disc 16 so that such disc may be secured thereto by means of the nuts 53. The lower body member is therefore guided in its axial movement whereby the packers 13 are moved radially, relative to the remainder of the assembly, by virtue of the movement of the pairs of toggle members 11 and 12.

The reduced lower end of the body 14 is provided with a coupling member which has a threaded pin end to threadably connect the body member to a device similar or identical to that just described, to the foot piece 20 as shown in Fig. 1 or to the hook wall anchor 23 as shown in Fig. 5.

In the operation of the device above described the mechanism is lowered within a well bore until the foot piece 20 engages the bottom of the well or, if a hook wall anchor is used, until such anchor is set within the well at the desired level. Further lowering of the sample receiving chamber will cause the toggle members 11 and 12 to move the packers 13 outwardly into engagement with the walls of the well bore so that the sealing member 45 will sealably engage the walls about areas formed by penetration of the stratum from which a sample is desired. The valve 5 is then moved downwardly to open a passage into the sample receiving chamber. At the same time the depending stem 28 on the valve 5 closes the passage thru the cross member 3 so that only fluid entering thru the packers 13 may pass upwardly into a sample receiving chamber. After the desired sample has been entrapped within the sample receiving chamber the device is withdrawn from the well bore.

While a specific construction has been described as comprising an illustrative embodiment of the invention, it is to be understood that the invention is not confined to such construction but broadly comprehends means and method for obtaining samples of fluid from the side walls of well bores formed by the penetration of subsurface geological strata.

What is claimed is:

1. A well testing device comprising, an empty

string of pipe adapted to be lowered into the well bore, a hollow packer member carried by the pipe, said packer member comprising a housing opening outwardly toward the wall of the well bore and terminating in an outer peripheral face lying generally in a cylindrical surface having substantially the same radius of curvature as the bore hole, means for moving the packer member radially of the well bore to seat against the wall of the well bore and form a chamber, and means for admitting fluids from said chamber to the interior of the string of pipe.

2. A well testing device comprising, an empty string of pipe adapted to be lowered into the well bore, a hollow packer member carried by the pipe, said packer member comprising a housing opening outwardly toward the wall of the well bore and terminating in an outer peripheral face lying generally in a cylindrical surface having substantially the same radius of curvature as the bore hole, means for moving the packer member radially of the well bore to seat against the wall of the well bore and form a chamber, means for admitting fluids from said chamber to the interior of the string of pipe, and valve means in said pipe for entrapping therein the admitted fluids.

3. A formation testing device comprising spaced body members, interconnected toggle members pivotally attached to said body members, hollow packers connected to the inner ends of the toggle members and adapted to be moved outwardly into engagement with the wall of a well bore to form a chamber for receiving fluids from within the wall formation, and means for arresting movement of one of the body members so that continued movement of the other body member moves the packer into sealing engagement with the wall of the well bore.

4. A formation testing device comprising a sample receiving chamber, interconnected pairs of toggle members pivotally attached to the lower end thereof, hollow packers connected to the inner ends of the toggle members, said packers having outwardly facing surfaces adapted to engage the wall of a well bore and form a seal about an exposed area thereof, a body member, a pivot connection between said body and the lower end of each pair of toggle members, means for arresting the downward movement of said body member as the device is lowered into a well, whereby the packers are forced outwardly by continued downward movement of the sample receiving chamber, and means for admitting fluids from within the packers to the interior of the sample receiving chamber.

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