Jan. 19 1932.

M. O. JOHNSTON

1,842,270

OIL WELL TESTING DEVICE

Filed June 19, 1931

2 Sheets-Sheet 1

Fig. 1.

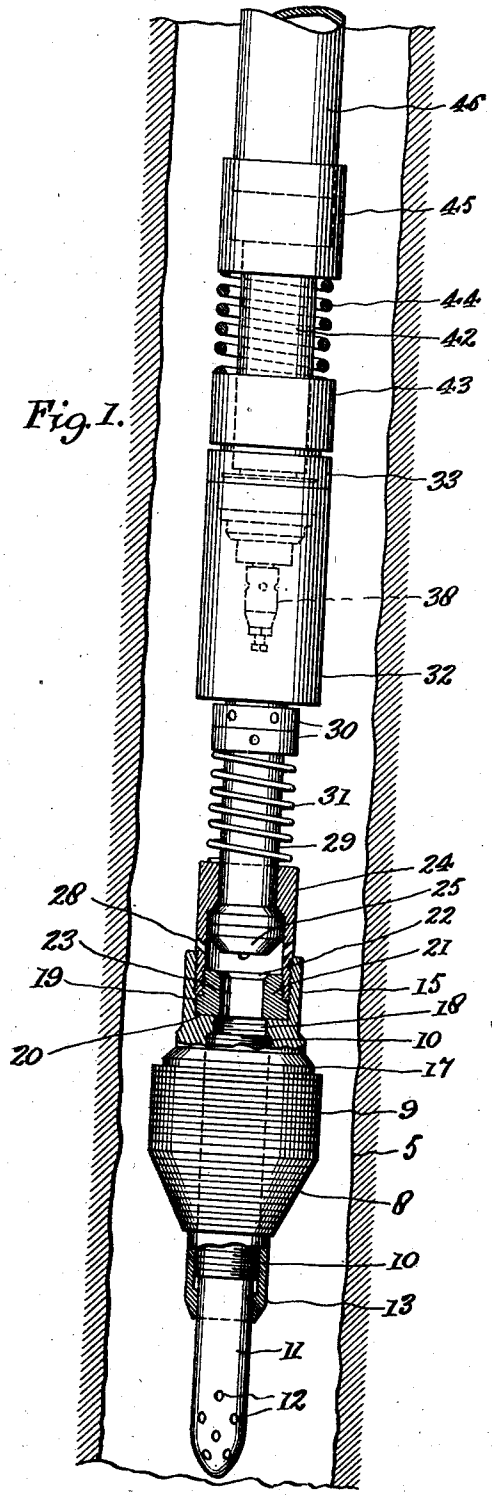
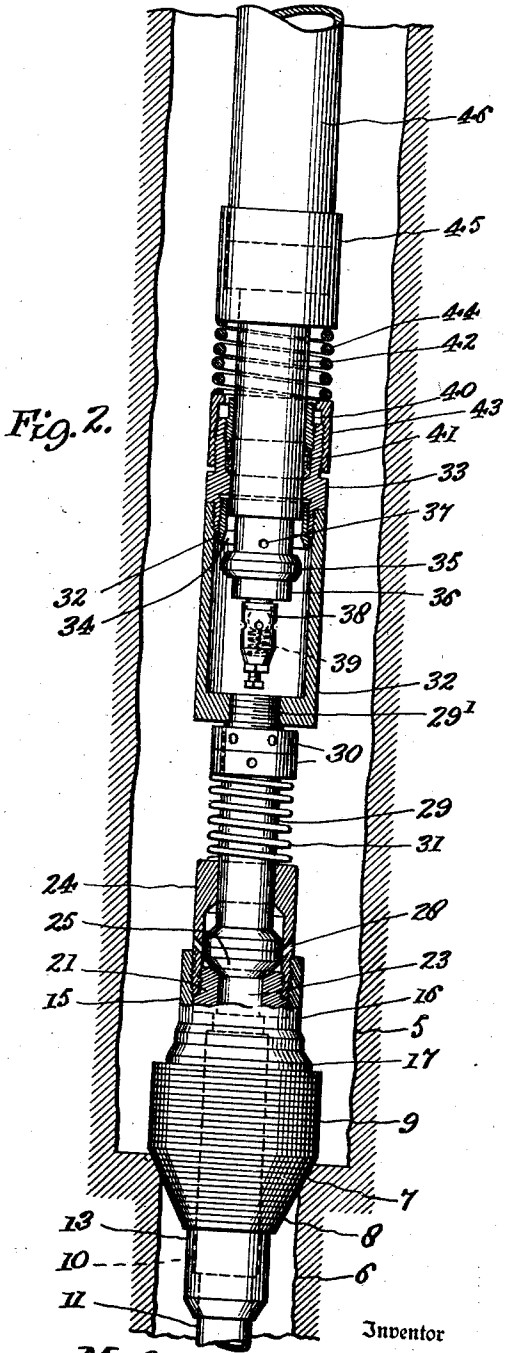


Fig. 2.



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2 Sheets-Sheet 2

Fig. 3.

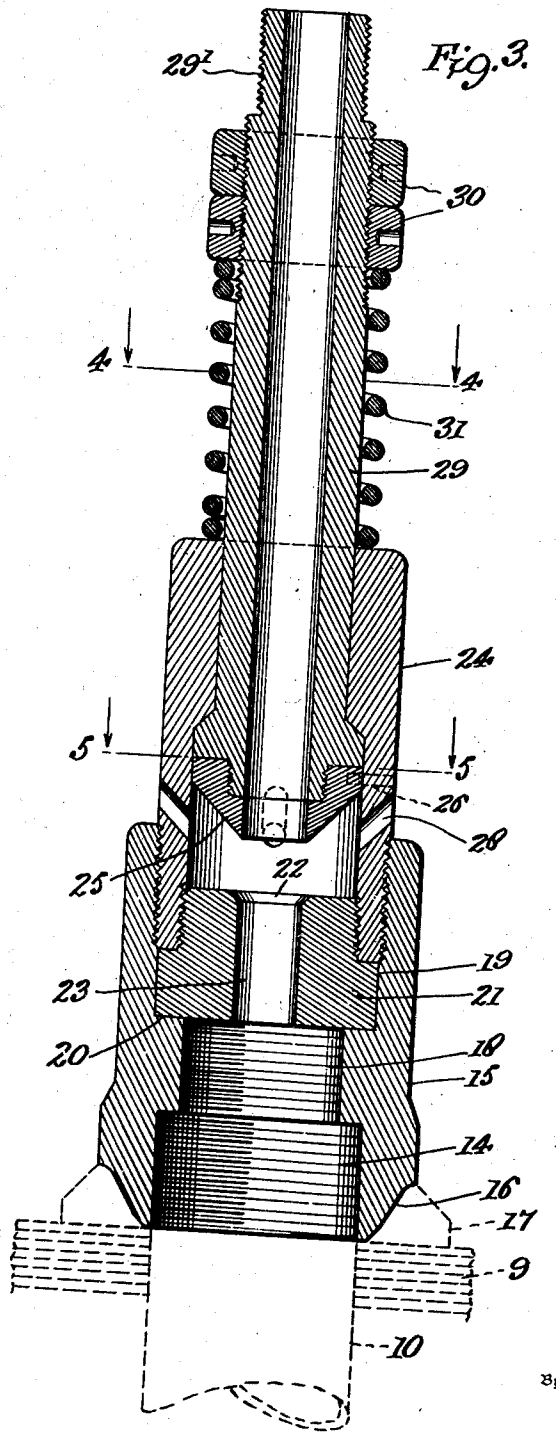


Fig. 4.

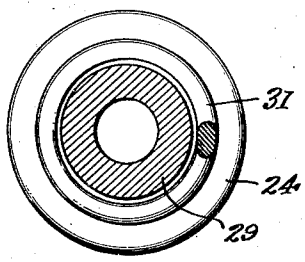


Fig. 5.

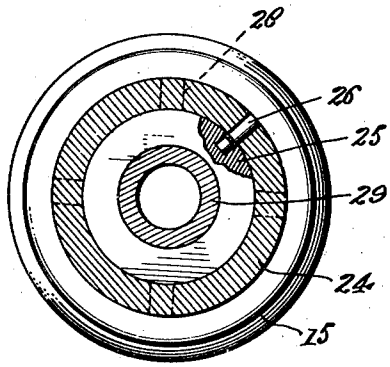
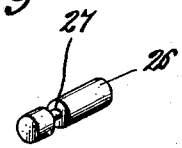


Fig. 6.



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UNITED STATES PATENT OFFICE

MORDICA O. JOHNSTON, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO JOHNSTON FORMATION TESTING CORPORATION, LTD., A CORPORATION OF CALIFORNIA

OIL WELL TESTING DEVICE

Application filed June 19, 1931. Serial No. 545,576.

The present invention relates to improvements in well testing devices, and has for an object to provide an improved testing device in which samples of oil, or other liquid, may be taken from the bottom of the well and brought up through the drill pipe.

It is an object of the present invention to provide a device that can be more readily released after the packer has reached the rathole, and the test completed without putting the lifting strain on the drill pipe by placing above the packer a valve that can be moved in its housing to expose ports and thus allow the free flow of mud from the well cavity above the packer through the ports into the device and out the bull plug whereby to equalize pressure.

Another object of the invention is to provide a device which can be easily inserted into a well cavity where the packer more nearly approaches the size of the hole by keeping the valve in raised position where it will allow the ports in the valve housing to remain open, and thus permit the fluid to more readily pass through the device from below the packer and thence out the ports above the same.

A further object of the invention resides in a device that will permit the packer to be washed free when the same may become stuck by allowing the valve to remain open and water pumped under pressure through the drill pipe past the valve and out the ports on to the top of the packer.

It is still a further object of the invention to provide a device where the valve parts can be made to produce a jarring action when desirable to loosen the packer from its seat.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings where like symbols refer to like or corresponding parts throughout the several views,

Figure 1 is a front elevational view with parts broken away of my well testing device with my improved valve in raised position.

Figure 2 is a similar view showing my improved valve in lowered position.

Figure 3 is an enlarged central vertical sectional view of my improved valve in raised position.

Figure 4 is a horizontal section taken along the line 4—4 in Figure 3.

Figure 5 is a horizontal section taken along the line 5—5 in Figure 3, and

Figure 6 is a perspective view of one form of shearing pin to hold the valve in raised position.

Referring more particularly to the drawings, the numeral 5 indicates the well generally, and 6 is a conventional showing of a rathole in the bottom of the well, resulting in the shoulder 7 against which the lower bevel portion 8 of the packer 9 is adapted to engage. The packer extends exteriorly of the packer mandrel 10, the lower end of which carries the bull plug 11 provided with the perforations 12 through which the liquid can pass. The lower portion of the packer mandrel is screw threaded to receive the retaining nut 13 which extends up against the lower portion of the packer whereby to hold these parts in fixed relation. The upper portion of the packer mandrel projects beyond the top of the packer and is screw threaded along its upper outside portion to engage corresponding threads cut in the lower inside opening 14 of the head 15 whereby these members are held firmly together in alignment.

The head 15 comprises substantially a hollow cylinder of outside uniform diameter over its greater length with a lower enlarged portion cut inwardly at an angle 16 to seat and hold the ring 17 cut at a corresponding angle to engage the lower portion of the head and also provide a flat base to rest upon the top ring of the packer whereby the packer rings can be properly clamped together when the retaining nut 13 is screwed tight. The head is provided with a smaller screw threaded opening 18 in alignment with the screw threaded opening 14 and terminating at a point preferably midway of the inside of the head to allow for the insertion of tools of a lesser diameter.

The upper cylindrical portion of the head is bored to form an opening 19 of greater diameter than the opening 18 and extended down to a point to communicate with the smaller opening, thereby producing a shoulder 20 to engage and house the ring 21 formed with the valve seat 22 terminating in the central opening 23 and having an outer portion cut away and screw threaded to receive the lower inside screw threaded end of the valve housing 24.

The opening 19 in the head is also screw threaded to receive the screw threads on the lower outer portion of the valve housing and thereby hold these parts rigid. The valve housing is internally bored to provide a chamber wherein the valve 25 is normally held in the upper position shown in Figure 1 by a pin 26 with the weakened portion 27 being inserted through the wall of the valve housing and into a socket in the valve. It is to be understood any form of frangible pin may be used and I do not mean to limit myself to any particular design of such pins. The valve in this position is spaced from its valve seat 22 and also exposes the downwardly inclined outlets 28 in the valve housing, thereby allowing mud or fluid to pass from the well cavity through the outlets, down the central opening in the ring 21 and thence seek outlet through the perforated bull plug.

The valve 25 is bored centrally to provide a passageway and register with the elongated opening in the hollow valve stem 29 that has its lower end externally screw threaded to engage the internal screw threaded portion of the valve, thereby holding the valve and valve stem together. The valve stem passes through the valve housing and extends upward beyond the same and carries the adjusting nuts 30 to engage the screw threaded portion closely placed to the upper end of the valve stem. A coil spring 31 is mounted upon the valve stem with its lower end engaging the top of the valve housing, and with its upper end in contact with the adjusting nut 30, whereby to normally hold the spring in expanded position and the valve in raised position disclosed in Figure 1 and Figure 3.

The end 29′ of the valve stem is reduced slightly in size and screw threaded to firmly secure thereto the valve chamber 32 having its upper end internally threaded to engage the exterior threads on the stuffing box section 33. Within the stuffing box section is secured a section providing a trap valve seat 34 to engage the trap valve 35 secured to the hollow valve stem 36. The valve stem is provided with a series of radially extending ports 37 which lie above the valve and extend completely through the valve stem 36. Carried upon the lower end of the valve stem is a circulating ball or other form of valve 38 held against its seat upon the lower end of the valve stem by a spring 39.

The upper end of the stuffing box section 33 is interiorly screw threaded to receive the packing gland 40 to compress the gland 41 against the travelling stem 42. The lower end of the travelling stem carries the trap-valve stem 36. The stuffing box section is also exteriorly threaded to receive the tension collar 43 which receives the lower end of the main spring 44. The upper end of the main spring seats against the lower end of the reducing collar 45, which latter supports the upper end of the travelling stem 42, the upper end of the travelling stem being screw threaded into the collar 45 or otherwise held firmly.

The pipe line 46 is screwed or otherwise rigidly held in the collar 45.

In the operation of the device, the parts are assembled and lowered into the well cavity, as shown in Figure 1, with my improved valve in the raised position exposing the outlet openings 28 in the valve housing 24 and while so placed, the trap valve 35 and circulating valve 38 are closed. Where the well cavity closely approaches the size of the packer and mud or fluid are encountered, the lowering of the device will be greatly improved from back pressure caused by mud or fluid below the packer since they can pass into the perforated bull plug 11, through the mandrel 10 into the valve housing 24 and escape through the outlets 28 placed above the packer communicating with the well cavity 5.

When the device reaches the bottom of the well, the parts assume the position shown in Figure 2. The bull plug enters the rathole and the packer 9 will seat upon the shoulder 7, at which time the weight of the drill pipe 46 compresses the spring 44 and opens the trap valve 35 in the valve casing 32. These parts will continue to move downward in this position since their weight will cause the shearing of the pin 26, whereby to release the valve 25, compress the spring 31 and force the same down on its seat 22. In the lowered position, the valve 25 closes the outlets 28 communicating with the well cavity and with the parts so positioned the fluid to be sampled can enter the bull plug 11, and be carried past the valve 25 through the trap valve 35 and thence through the drill pipe.

The valve 25 and its housing 24 having outlets 28 are located above the packer 9 and below the valve chamber 32 in which is housed the trap valve 35 and circulating valve 38. The location of the parts in this position aids in the lowering of the improved device into a well cavity since the mud and fluid below the packer that cause back pressure upon the same can readily pass into the bull plug 11, below the packer, and thence through the outlets 28 above the

packer into the well cavity and thus afford a means of equalizing the pressure.

It will allow the valve 25, when the device has reached the bottom of the well and the packer 9 has seated, to close the outlets 28 and open the trap valve 35 whereby the fluid sealed in the rathole 6 can be carried up through the trap valve without interference from the fluid or mud contained in the well cavity 5.

A feature of the invention is that the valve 25 when in the raised position to expose the outlets 28 and the packer becomes stuck, it will allow water under pressure to be forced down the drill pipe 46 through the circulating valve 38 and thence through the outlets 28 on to the top of the packer, whereby to wash the same free and allow free movement.

A further feature of the invention is the location of the spring 31 upon the valve stem 29 above the valve housing 24 to return the valve 25 immediately to raised position when the weight of the drill pipe has been removed in lifting. This action closes the trap valve 35 to retain the sample fluid carried up past the same and also opens the outlets 28, thereby allowing the mud to pass therethrough and out the bull plug into the rathole and thus prevent lifting strain to be put upon the device.

With the valve 25 and the other parts of the device arranged as shown, it will be possible to jar the packer loose when struck by a slight raising and releasing of the drill pipe.

While I have shown the lower end of the valve housing 24 adapted to screw inside of the head 15, it may be preferable to reverse this form of connecting these parts and permit the valve head 24 to screw outside the head 15. It is also to be noted that while I have shown my improved valve as applied to but a single type of well testing devices, it is obvious I may readily attach and use the same with any type of testing devices.

It is obvious that various changes in the construction, combination and arrangement of parts conld be made, which could be used without departing from the spirit of my invention, and I do not mean to limit the invention to such details, except as particularly pointed out in the claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States is:—

1. In a well testing device provided with a packer adapted to be used in a well cavity, a valve housing rigidly mounted above the packer with outlets communicating with the well cavity, and a movable valve carried in the housing whereby to open and close said outlets.

2. In a well testing device provided with a packer adapted to be used in a well cavity, a valve housing rigidly mounted above the packer with outlets communicating with the well cavity, a valve normally held in the housing to expose the outlets therein to communicate with the well cavity, and means for releasing said valve to move and close said outlets.

3. In a well testing device provided with a packer adapted to be used in a well cavity, a valve housing rigidly mounted above the packer with outlets communicating with the well cavity, a valve seat provided with an opening fixed in the lower end of the housing to form a central passageway, a valve normally held spaced from the valve seat to expose the central passageway and the outlets communicating with the well cavity, and means for releasing said valve whereby to move and close said outlets.

4. In a well testing device provided with a packer to be used in a well cavity, a valve housing rigidly mounted above the packer with outlets communicating with the well cavity, a valve seat with a central opening fixed in the housing, a valve provided with a travelling stem, normally held spaced from the valve seat to expose the outlets communicating with the well cavity, means for releasing the valve and travelling stem whereby to close the communicating outlets, and a spring carried by the travelling stem positioned to be compressed when the valve is closed and to restore the parts to normal position when the release means are removed.

5. In a well testing device provided with a packer to be used in a well cavity, a mandrel to support the packer, a valve housing above the packer having a valve seat mounted therein and provided with outlets to the well cavity, a substantially cylindrical head for engaging the mandrel and the valve housing whereby to hold these parts in fixed relation a valve seat fixed in the housing, a valve with a travelling stem normally held spaced from the valve seat to expose the outlets communicating with the well cavity, a second valve housing carried by the drill pipe and attached to the travelling stem, the valve and travelling stem positioned to receive the weight of the drill pipe and close the communicating outlets, and a spring carried on the travelling stem positioned to be compressed when the valve is closed and for returning the valve to normal position when the drill pipe is raised.

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