March 14, 1933. M. O. JOHNSTON 1,901,813

OIL WELL TESTING DEVICE

Filed Sept. 7, 1932 2 Sheets-Sheet 1

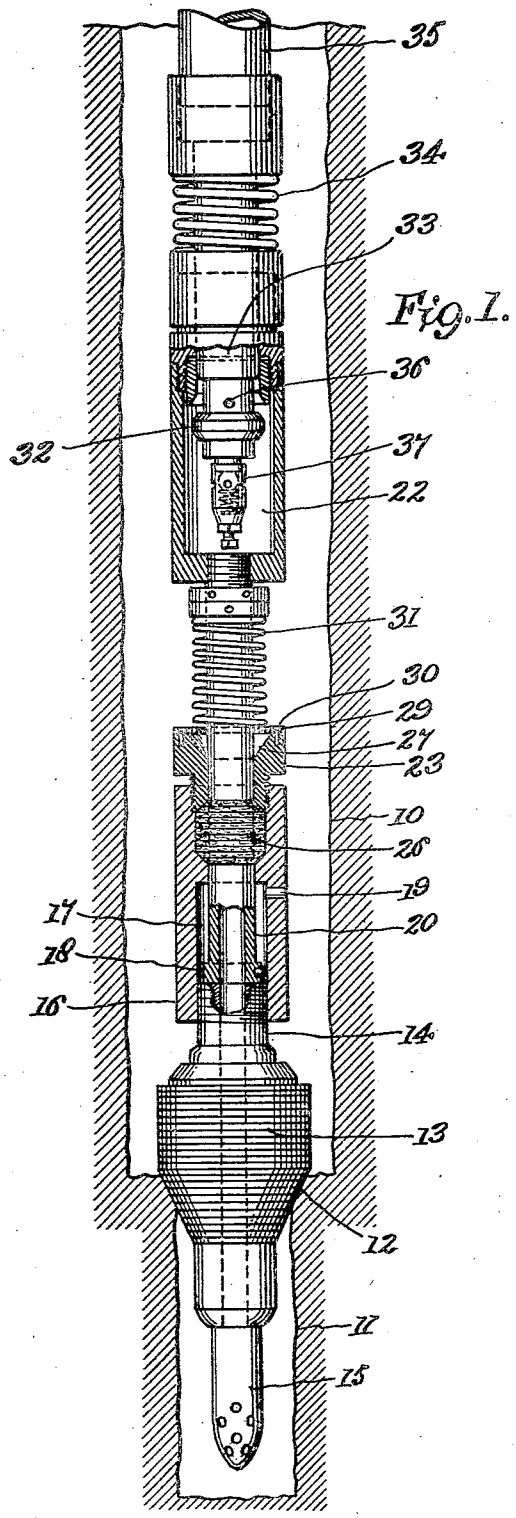


Fig. 1.

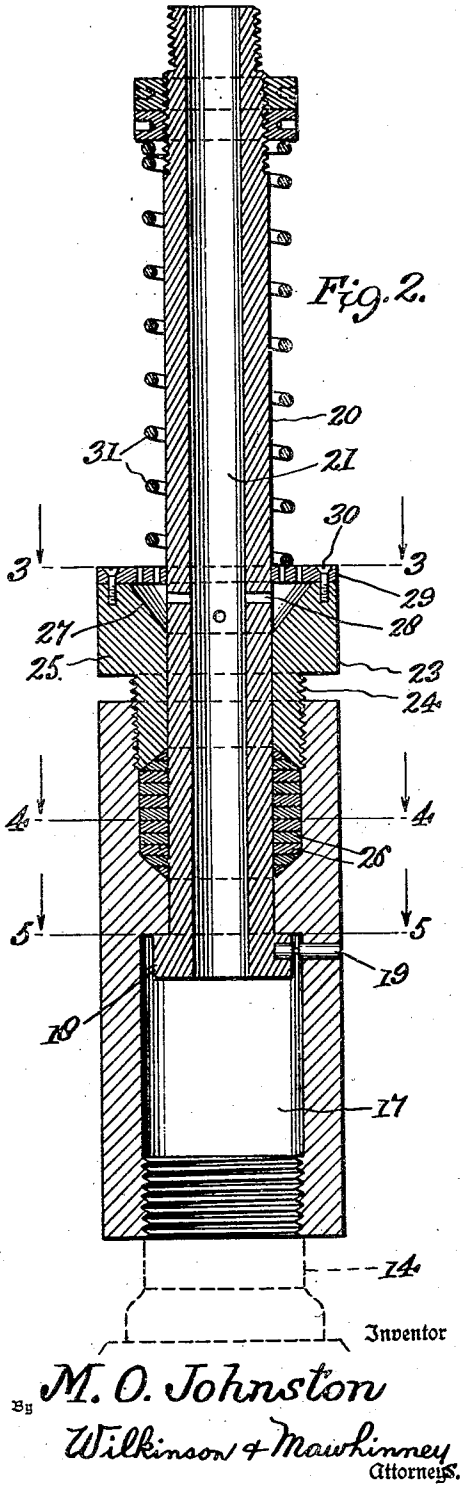


Fig. 2.

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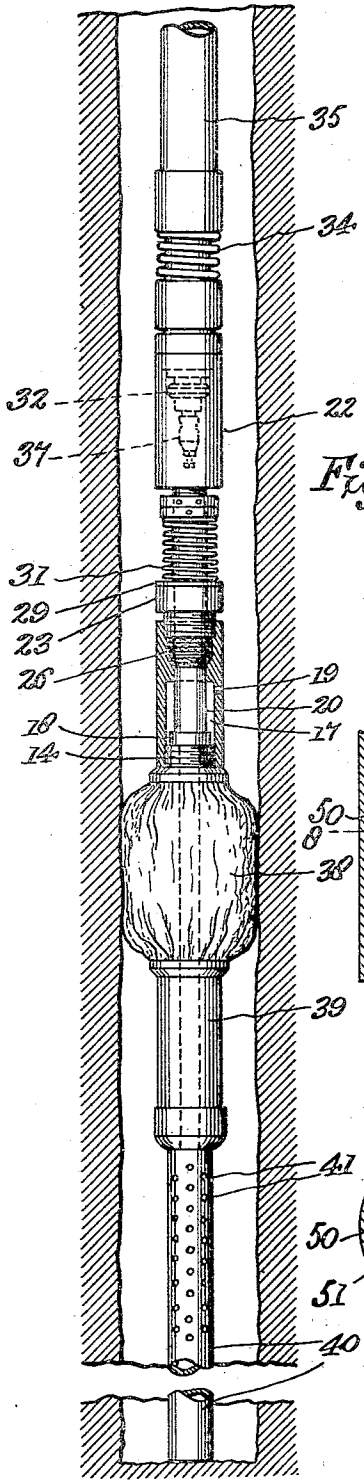


Fig. 6.

Fig. 3.

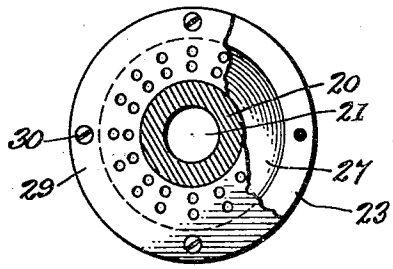


Fig. 4.

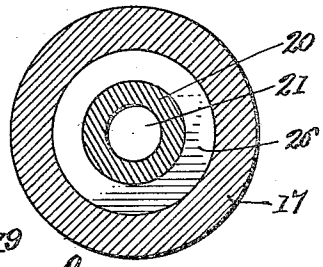


Fig. 7.

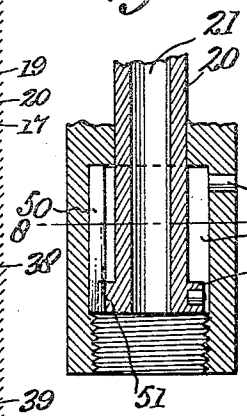


Fig. 5.

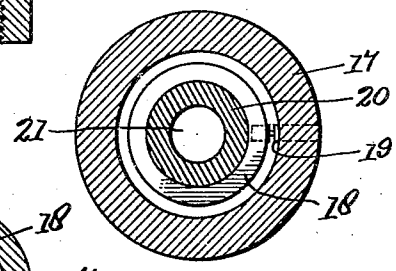
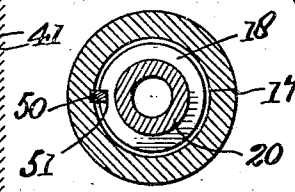


Fig. 8.



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Patented Mar. 14, 1933 1,901,813

UNITED STATES PATENT OFFICE

MORDICA O. JOHNSTON, OF GLENDALE, CALIFORNIA, ASSIGNOR OF ONE-THIRD TO GILSON M. JONES AND ONE-THIRD TO FRANCIS C. VAN DEINSE, BOTH OF LOS ANGELES, CALIFORNIA

OIL WELL TESTING DEVICE

Application filed September 7, 1932. Serial No. 632,048.

The present invention relates to improvements in oil well testing devices, and has for an object to provide an improved testing device which may be used in all methods of testing, whether below the casing in rat holes, straight holes or inside the casing itself at various depths where it is desirous to determine the oil or other liquid encountered, and bring the same through the drill pipe. Furthermore it is intended for use to determine the effectiveness of a cement job on water shut off.

My invention is especially intended to provide certain improvements on the construction shown in my Patent No. 1,842,270, granted January 19, 1932, and entitled Oil well testing device.

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 claim 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 showing a rat hole in the bottom of the well with my improved valve in lowered position and the other associated parts connected thereto.

Figure 2 is an enlarged central vertical section showing my improved valve in raised position.

Figure 3 is a horizontal section taken along the line 3—3 in Figure 2.

Figure 4 is a horizontal section taken along the line 4—4 in Figure 2.

Figure 5 is a horizontal section taken along the line 5—5 in Figure 2.

Figure 6 is a view showing my improved valve applicable for use with straight hole testing devices.

Figure 7 is a fragmentary central vertical section showing my improved valve in lowered position and engaging a key guideway affixed to the housing, and

Figure 8 is a horizontal section taken along the line 8—8 in Figure 7.

Referring more particularly to the drawings, I have shown in Figure 1 by the numeral 10 the walls of the well bore, and having a conventional illustration of a rat hole 11 in the bottom of the well. The upper edge of the rat hole 11 is preferably shouldered at 12 to provide a seat for the packer 13 which has its lower portion tapered to project downwardly into the rat hole 11. The packer 13 has the hollow mandrel 14 alined centrally and vertically therethrough to register with the bull plug 15 at its lower end, and to connect with the valve housing 16 at its upper end.

The valve housing 16 has its lower portion cut internally to form an elongated cylindrical chamber 17 to receive the piston head 18, and allow the same to slide freely therein. Referring more particularly to Figure 2, the head 18 is shown held in the upper portion of the chamber 17 by a shear pin 19, which engages the head 18 and is passed through the housing 16. The head 18 presents a flat upper surface to engage the top wall of the chamber 17 and likewise a flat lower surface to seat upon the mandrel 14 when the parts are operated as disclosed in Figure 1. The elongated sleeve 20 projecting upwardly from the head 18 and slidable therewith may be made integral or attached to the same. A central passageway 21 extending therethrough provides direct communication between the chamber 17 and the upper valve chamber 22.

The elongated sleeve 20 is held in proper alinement with the housing 16, and permits sliding movement of the same by the stuffing box 23, which comprises the lower reduced portion or neck 24, and the upper enlarged head portion 25. The neck 24 is screw threaded exteriorly to engage the threaded opening in the top of the housing 16, and compress the packing rings 26 below the same tightly around the sleeve 20. The head 25 is cut downwardly about the central portion of its top surface in an angular direction to form a circular recess as shown by the numeral 27. This provides a space to register with the ports 28, which are cut transversely through the sleeve 20 into and connect with the central passageway 21 when the piston head is in raised position. The

perforated plate 29 is readily secured on the top of the head 25, which forms a part of the stuffing box gland 23, by screws or other fastening means 30, and allows the sleeve 20 to slide freely therethrough.

The perforations in this plate 29 permit communication between the recess 27 and the well bore 10. It is obvious when the ports 28 are in raised position as shown in Figure 2, the perforated plate 29 will always allow the fluid or other liquids to pass therethrough in a straight vertical path with the line of well boring 10. This perforated plate 29 also acts to exclude particles of dirt which might enter and tend to clog the ports 28 in the operation of the device.

A suitable coil spring 31 is properly adjusted between the plate 29 and the nuts 32 for normally holding the valve 18 and the elongated sleeve 20 in raised position. The chamber 22 as shown houses the trap valve 32 secured to the hollow stem 33 for vertical sliding movement, and as explained in my Patent No. 1,842,270 granted January 19, 1932, the trap valve is initially held seated in closed position by the coil spring 34 when the parts are attached to the well pipe 35 and the same are lowered into the well bore 10. The port holes 36 formed in the hollow stem 33 above the trap valve 32 are normally closed when the same is seated and are likewise opened with the valve 32 to give communication through the chamber 22 to the well pipe 35. Upon the lower end of the stem 33 is advantageously placed a circulating ball or other form of valve 37 that may be operated from the surface to force water through the pipe 35 to cleanse the interior parts in case mud or other foreign matter should cause these parts to become choked.

In Figure 6 I have shown my improved valve applicable where it is desirous to use the same with a device for straight hole testing. The numeral 38 represents a rubber sleeve expanding packer which can pass freely down the well bore 10 along with the other parts, but may be readily forced outwardly against the walls of the bore 10 when the desired depth is reached under the overhead weight of the well pipe 35.

This causes the lower portion of the well bore 10 below the packer 38 to be shut off and sealed from the upper portion. In order to make the test at the desired depth below the packer, a hollow sleeve 39 is attached to the lower portion of the projecting hollow mandrel 14 carried by the packer. The hollow sleeve 39 has secured thereto the elongated pipe or anchor 40 which is preferably of a reduced size in cross section, and extends to the bottom of the well bore 10. Suitable perforations 41 are made in the pipe 40 at the desired distance from the bottom of the well bore where it is desirous of making the test. The construction and arrangement of the parts above the packer are similar to those placed in the same position already described in Figure 1.

In the operation of the device and referring more particularly to Figures 1 to 5, the parts are readily attached to the well pipe 35, and then lowered into the well bore 10. The improved valve 19 during this initial step will be held in raised position as shown in Figure 2 and the trap valve 32 will be seated or in closed position. With the parts in this position the mud and fluid encountered will cause very little back pressure, since the same can readily enter the perforated bull plug 15 and pass in a straight upward path through the valve and elongated sleeve 20.

The ports 28 provide outlets to the space directly beneath the plate 29, and the liquid is then passed upwardly through the perforations provided therein, to the well bore 10. It is readily appreciated the plate 29 with its small outlet perforations is advantageously placed to give protection to the ports 28 and prevent the same from becoming clogged from foreign matter that is encountered in well cavities.

When the device reaches the bottom of the well the parts will then assume the position for operation shown in Figure 1. Upon the entrance of the bull plug 15 into the rat hole 11, the packer 13 will rest or seat firmly upon the shoulder 12, at which time the weight of the well pipe 35 will compress spring 34 and force the trap valve 32 downwardly to open position. These parts will continue to move downwardly in this position, and because of their weight will break the shear pin 19 and release the piston head 18 whereby the same will be forced downwardly to seat on the hollow mandrel 14. Since the ports 28 are also moved downwardly they will become masked or closed by the packing 26. The fluid or other liquid contents in the rat hole 11 upon entering the perforated bull plug 15 will be allowed to flow in a direct and vertical path into the chamber 22, and thence past the valve 32 through the port holes 36 into the well pipe 35.

Upon raising the pipe 35, it is obvious the trap valve 32 will be closed and prevent the escape of any fluid that has been entrapped above the same and may be brought to the surface as a sample for testing. Since the valve 18 will be lifted into raised position, the liquid in the well can readily enter the perforated plate 28 and escape through the bull plug, thus tending to ease the lifting of the device.

The placing of the ports 28 in the elongated sleeve 20 as shown, where they are not directly exposed at any time with the foreign matter encountered in wells and tending to clog or choke the same has provided greatly

to improved efficiency in a valve for making tests of this type.

Furthermore the present construction of valve housing provides for placing a packing 26 around the lower portion of the hollow sleeve 20, and thus gives a tight and more successful means of preventing the escape of the fluid passing therethrough or the intrusion of foreign matter from this point when the parts become slightly worn after operating a long time.

In Figure 6, where the parts are assembled for straight hole testing, an expanding packer 38 is used which initially will be of a size to slide freely down into the well bore 10. Assuming the trap valve 32 closed and the improved valve 18 in raised position, the packer 38 carrying the pipe or anchor 40 is attached to the well pipe 35, and lowered into the well bore 10.

The mud and fluid will be allowed to pass through the pipe 40, and out the perforations in the plate 29, and thus relieve or retard any backward pressure encountered. When the pipe or anchor 40 rests upon the bottom of the well, the weight of the well pipe 35 will force the opening of the trap valve, and then in turn close the valve 18. During this action the overhead weight pressing downwardly upon the packer 38 will necessarily cause the same to expand or bulge outwardly against the walls of the well, and thus seal the lower portion of the same. The fluid entrapped below the packer and at a height from the bottom of the well to register with the perforations 41 will thus be enabled to pass upwardly into the well pipe as previously described.

I have shown in Figures 7 and 8 means whereby I may facilitate the proper placing of the valve 18 for the ready insertion of the shear pin 19 when the valve is in raised position. This construction also permits the rotation of the entire tool, whenever desired. This always is necessary when using casing-packer method of testing inside casing that drill pipe may be turned to disengage slips that anchor packer to side walls of casing. It also often is necessary to rotate entire tool in our straight-hole and rat-hole methods of testing.

In accomplishing this feature a key 50 is affixed to the interior wall of the chamber 17 and forms a vertical guideway. The valve head 18 is provided with a notch or groove 51 to engage the key. Thus the valve head is restricted to move over the same path in either an upward or downward direction as may be desired in the proper positioning of the valve.

This valve construction can be readily applied to various types of testing tools now used and attain the satisfactory and highly efficient results as already described.

It will be noted that the device is useful not only in open-hole testing and in shoulder testing, but also in casing-packer testing.

What we wish to cover is the use of valve in all methods of testing whether below casing in rat-hole or straight-hole or inside the casing itself.

It is obvious that various changes in the construction, combination and arrangement of parts could 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 claim.

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

In a well testing device provided with a packer, adapted to be used in a well cavity, a valve housing rigidly attached above the packer, a valve comprising a piston head and an elongated sleeve having a central passageway therethrough mounted to slide in the housing, open ports cut through the elongated sleeve to connect with the central passageway, a packing carried in said housing to encase the lower portion of the elongated sleeve, and mask said ports when the piston head is moved downwardly, a compression gland secured to said housing whereby to compress the packing and permit movement of the elongated sleeve, the said gland having a recess cut therein to register with the ports when the piston head is moved upwardly, a perforated plate secured to the top of the gland whereby to permit communication between the recess and the well cavity and allow movement of the sleeve therethrough, and means for engaging the perforated plate and said elongated sleeve to return the piston head to raised position.

MORDICA O. JOHNSTON.