Aug. 9, 1932. G. V. LEWIS 1,870,634

WELL TESTING DEVICE

Filed May 6, 1927

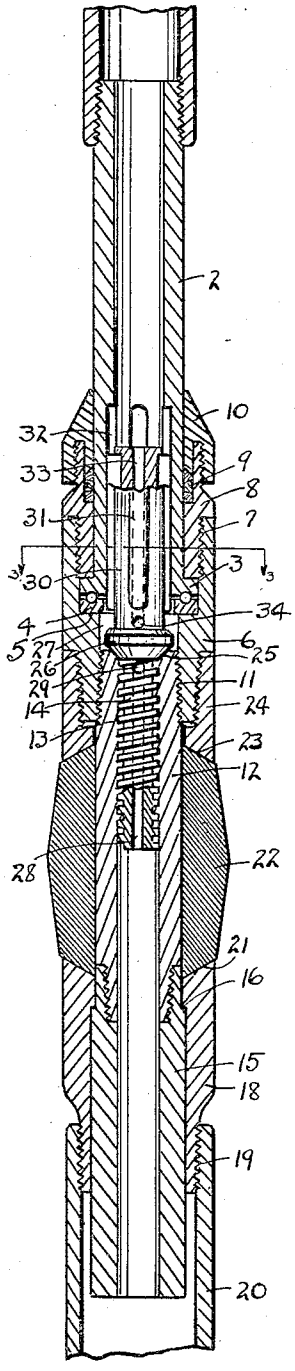


Fig. 1.

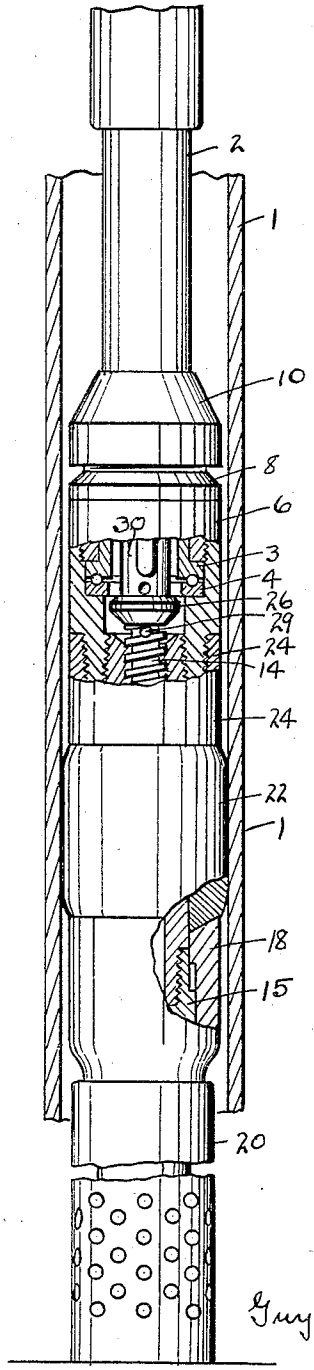


Fig. 2.

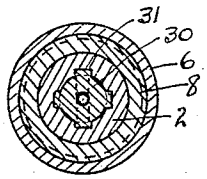


Fig. 3.

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UNITED STATES PATENT OFFICE

GUY V. LEWIS, OF LAREDO, TEXAS

WELL TESTING DEVICE

Application filed May 6, 1927. Serial No. 189,294.

My invention relates to well testers for use in testing a well to ascertain whether a producing stratum has been reached.

The method now most commonly used in testing wells involves considerable labor and expense and may result in destroying the well. It includes the setting of casing and screen and may involve a costly job of cementing the well before a proper test can be made. The well is then washed and tested. If it is found that no producing formation has been reached, the liner, screen wash pipe and all other equipment may have to be removed and the well drilled further. It is a common experience to find the screen firmly anchored and if it can be withdrawn at all, it is usually found to be badly mutiliated.

It is an object of my invention to provide a device which can be quickly introduced into the well to make a test of the formation and then again easily withdraw with a minimum expenditure of time and money.

It is also desired to provide a testing device which is simple and not liable to get out of order or fail in use.

Referring to the drawing herewith, Fig. 1 is a central longitudinal section through a device embodying my invention. Fig. 2 is a side elevation thereof with certain parts broken away and illustrating the parts in different positions. Fig. 3 is a transverse section on the plane 3—3 of Fig. 1.

My device is adapted to be inserted downwardly into the well within the casing 1. The device is intended to be secured to the lower end of a drill stem 2 extending from the surface downwardly and acting to control and operate the testing device. The drill stem section 2 is formed with a radial flange 3 at its lower end. This flange has a groove on its lower face forming part of a ball race and co-operating with a ball retaining ring 4 fitting within a seat 5 in a valve housing 6. The said valve housing has its upper end threaded interiorly at 7 for engagement with a box 8 recessed at its upper end to receive packing rings 9. A gland 10 adapted to screw down over the upper end of the box 8 bears upon the packing and serves to compress the same to form a fluid-tight engagement with the outer surface of the drill stem.

The lower end of the housing 6 is threaded on its inner face at 11 to engage with a tubular mandrel 12. Said mandrel is of heavy construction, its outer face being cylindrical. Its inner face is threaded adjacent the upper end with a coarse thread 13 to engage with the lower valve extension 14. The lower end of the mandrel 12 is connected with a guide member 15 which is of slightly larger external diameter than the mandrel, thus providing a shoulder 16 adjacent the upper end thereof. The lower end of the guide 15 fits within a lower packing retainer sleeve 18, which is connected at 19 with the strainer or other pipe 20.

The packing retainer sleeve 18 is beveled inwardly at 21 at its upper end to provide a seat for a packing sleeve 22 of some flexible composition, such as rubber. It is understood that any desired form of packing material may be employed.

The packer sleeve 22 is shown as of largest diameter midway between its ends and tapered slightly toward each end. The upper end is tapered inwardly at 23 to fit against the lower end of an upper packer retaining sleeve 24 which is threaded on its upper end for connection with the valve housing member 6.

The upper end of the mandrel 12 has a valve seat 25 formed therein to receive a valve head 26. The head 26 is received within a chamber 27 within the housing 6 and free passage about the head is allowed within said chamber. The lower end of the head is formed with a valve extension 14 previously referred to, and said extension is formed with a central passage 28 leading from the lower end upwardly to a point immediately below the head 26 and there connecting with a radial passage 29 leading to the outer side of the extension. Above the valve is a valve stem 30 which projects upwardly into the lower end of the drill stem and is formed with radially extending keys 31 thereon which are adapted to fit within keyways 32 in the lower end of the drill stem. The valve stem is thus slidable vertically within the valve stem but is forced to rotate with said drill

stem. A central passage 33 extends downwardly through the valve stem from the upper end to a point adjacent the head and is then extended laterally at 34 to discharge into the valve chamber 27.

In the operation of my device, the valve stem is rotated to screw the valve down into its seat so that when the device is inserted into the well, the valve is tightly closed. No water or mud or other fluid can enter the drill stem while it is being inserted to the bottom of the hole.

It is contemplated that a sufficient length of perforated pipe 20 will be secured to the lower end of the device, spacing the same upwardly the desired distance to set the packer at the proper point. When the pipe 20 rests upon the bottom of the hole, the weight of the drill stem above the same will be exerted downwardly to force the mandrel 15 downwardly through the lower retaining sleeve 18 and compress the packer 22 longitudinally and force it outwardly against the casing to form a tight seal therewith. This will prevent fluid from above the packer flowing into the lower end of the well.

The drill stem will then be rotated in a left-hand direction to raise the valve head 26 from its seat. In performing this operation, the drill stem 2 will rotate freely relative to the testing device, due to its swivel connection therewith. The rotation of the drill stem will, however, cause the rotation of the valve so as to unscrew it from its seat. Any liquid or other fluid in the bottom of the hole may then pass upwardly through the passages 28 and 29 into the valve chamber 27 and from thence upwardly through the passages 34 and 33, respectively, to the interior of the drill stem and from thence to the surface. If a flowing well is encountered, the liquid may flow through the drill stem as long as is desired. If, however, it is thought best to equip the well in the usual manner, the drill stem may be rotated in the right-hand direction to screw the valve back into its seat and the device may be then withdrawn from the hole. It is obvious that when the weight of the drill stem has been lifted from the packet 22 it will contract so as to allow the device to be withdrawn without difficulty.

If the well does not flow the operation may be performed in the same manner and when the drill stem is withdrawn, the contents of the lower end of the drill stem will show whether any oil is coming into the well. It will thus be possible to make a test of the well quickly and accurately without any special equipment, and if it is found that no production has been reached, the well may be continued as desired without the usual difficulties encountered where the old process of testing the well is employed.

The advantages of the construction will be apparent to those skilled in the art.

What I claim as new and desire to protect by Letters Patent is:

1. In a device of the character described, a drill stem, a tubular mandrel, a valve housing forming a swivel connection between said drill stem and mandrel, a packer on said mandrel, a support for said packer slidable on said mandrel, a valve at the upper end of said mandrel, and means responsive to rotation of said drill stem to move said valve to and from its seat.

2. In a device of the character described, a drill stem, a tubular mandrel, a valve housing forming a swivel connection between said drill stem and mandrel, a packer on said mandrel, a support for said packer slidable on said mandrel, a valve at the upper end of said mandrel within said chamber, means on said valve co-operating with said drill stem whereby said valve may be rotated, and a threaded connection between said valve and mandrel whereby said valve may be raised or lowered relative to said seat when it is rotated.

3. In a device of the character described, a drill stem, a tubular mandrel, a valve housing forming a swivel connection between said drill stem and mandrel, means to close the space between said mandrel and the wall of the well at the point desired, a valve at the upper end of said mandrel, and means responsive to rotation of said drill stem to move said valve to and from its seat.

4. In a device of the character described, a drill stem, a tubular mandrel, a valve housing forming a swivel connection between said drill stem and mandrel, a packer on said mandrel, a support for said packer slidable on said mandrel, a valve at the upper end of said mandrel, and means actuated by said drill stem to control the position of said valve relative to its seat.

5. A device of the character described including a tubular mandrel, a packer thereon, a drill stem, a valve housing between said drill stem and said mandrel, a swivel joint between said drill stem and said valve housing, a valve in said housing adapted to close the upper end of said mandrel, and means to move said valve to and from its seat as desired.

6. A device of the character described including a tubular mandrel, a packer thereon, a drill stem, a valve housing between said drill stem and said mandrel, a swivel joint between said drill stem and said valve housing, a valve in said housing adapted to close the upper end of said mandrel, and means to move said valve to and from its seat as desired, said means being under the control of said drill stem, in the manner described.

7. A device for testing deep wells wherein

a pilot bore has been drilled, comprising a drill stem, a valve housing tapered on its outer face to fit within said pilot bore, said housing having a valve chamber, valve seats at the upper and lower ends of said chamber, a valve in said chamber adapted to fit within either of said seats, and means responsive to the rotation of said drill stem in one direction, to move said valve from one of said seats to the other.

8. A device for testing deep wells wherein a pilot bore has been drilled, comprising a drill stem, a valve housing tapered on its outer face to fit within said pilot bore, said housing having a valve chamber, valve seats at the upper and lower ends of said chamber, a valve in said chamber adapted to fit within either of said seats, means responsive to the rotation of said drill stem in one direction, to move said valve from one of said seats to the other, and means to guide said valve in its movement.

9. A well tester including a housing tapered downwardly on its outer surface and having a valve chamber therein, said chamber having valve seats at its upper and lower ends, a valve adapted to fit either of said seats, and manually controlled means to move said valve from one seat to the other, and retain it at any intermediate position.

10. A well tester including a drill stem, an eduction tube connected with the lower end thereof, a barrel enclosing the lower end of said tube and normally sealing off the entrance of fluid thereto, means to seal off the space between said barrel and the walls of a well bore, and means to raise said eduction tube upwardly relative to said barrel, whereby fluid is allowed to enter the lower end of said tube.

11. In a well tester, a drill stem, an eduction tube connected with the lower end thereof, a packer connected with said drill stem, a barrel within said packer about said tube, means in said barrel normally sealing the lower end of said tube, means to expand said packer and means to raise said tube in said barrel to open said seal and allow fluid to enter said tube.

In testimony whereof I hereunto affix my signature this 9th day of April, A. D. 1927.

GUY V. LEWIS.