Dec. 28, 1926. 1,612,168

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VALVE MECHANISM FOR WELLS

Filed Feb. 6, 1925

Fig. 1.

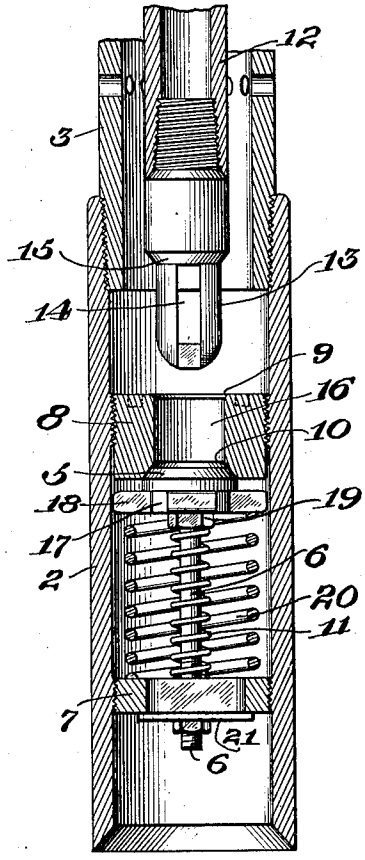


Fig. 2.

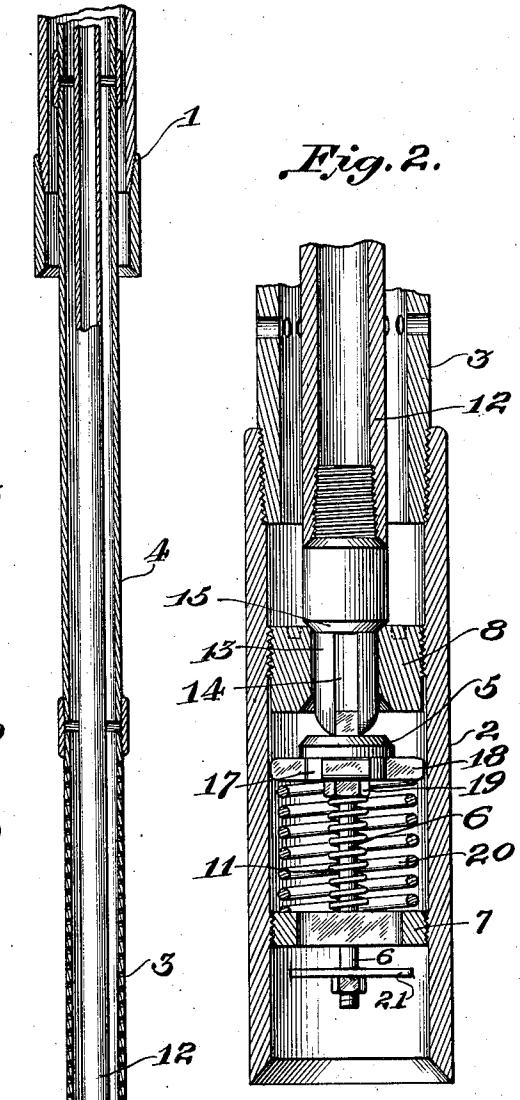


Fig. 3.

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Patented Dec. 28, 1926. 1,612,168

UNITED STATES PATENT OFFICE.

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VALVE MECHANISM FOR WELLS.

Application filed February 6, 1925. Serial No. 7,423.

The invention relates to valve mechanisms for wells and one of the objects of the invention is to provide a valve mechanism which will greatly facilitate the setting and washing of wells. Another object of the invention is to provide a valve mechanism of this character which will eliminate the necessity for equalizing the pressure above and below the back pressure valve, as is necessary in the use of back pressure valves previously known.

A further advantage of the invention resides in provision of a valve so constructed that it is impossible for it to be rendered inoperative by reason of encountering mud, sand, rocks, débris, etc., as commonly happens in the previous practice.

Another advantage of the invention resides in the provision of a bottom or lower valve, mounted on the stem of the back pressure valve, for the purpose of protecting the latter.

Another advantage of the invention resides in the provision of a valve so constructed that it is impossible for sand or other matter to become lodged between the valve and its seat, thereby preventing the proper seating of the valve.

Still another object of the invention is to provide a valve mechanism which may be employed to aid in pulling the screen.

Another, and very material feature of the present invention relates to an arrangement of springs in connection with the back pressure valve whereby the tension on the valve is increased and whereby the valve is necessarily retained in alignment with its seat, thereby eliminating the possibility of the valve being thrown out of alignment and thus preventing its seating and rendering the device inoperative. The present application is limited to improvements on my valve disclosed in Patent No. 1,505,850, August 19, 1924, in which patent the valve is claimed broadly.

In order that the advantages of the present invention may be more clearly understood, I will first briefly describe a few of the difficulties that are often encountered in the setting and washing of wells with the back pressure valves formerly in common use.

In setting a well, with the old standard back pressure valve in use, it is necessary as the screen and liner are lowered into the well a few hundred feet to fill the screen and liner with heavy mud in order that the pressure exerted by the mud in the hole will not force out the back pressure valve. In other words, the pressure against the back pressure valve must be equalized in order that it will not be forced out by coming into contact with, or passing through the mud in the hole. This must be done not only after the screen and liner have been lowered into the hole a few hundred feet, but also at about every one hundred feet in order to keep the pressure substantially equalized at all times.

Another disadvantage resulting from the use of the old standard back pressure valve is that when the screen and liner have been lowered to within a few feet of the bottom of the well, trouble is often encountered by reason of the mud, rocks, sand, and other residue that may lie in the bottom of the hole and force their way up through the nipple and against the back pressure valve preventing its operation entirely.

Another difficulty often encountered in the use of the old standard back pressure valve is that sand or other gritty substance lodges between the valve and the valve seat, thereby preventing the proper seating of the valve. Furthermore, it is often necessary to pull the screen that has been set in the well; and this frequently becomes impossible due to the packing of mud, sand, etc., about the screen. Obviously, if it were possible to pump water or oil around the outside of the screen the pressure on the screen would be relieved and it could be pulled; but it is impossible to do this with the old standard back pressure valve rendered inoperative from any one of numerous causes, a few of which have been outlined above.

The purpose of the present invention is to provide a valve mechanism which will overcome all of the above-mentioned difficulties and others well-known to those skilled in the art to which this invention appertains.

The invention will now be described in detail, reference being had to the accompanying drawings, in which:

Figure 1 is a vertical sectional view of the lower portion of a well;

Figure 2 is a vertical sectional view of my improved valve mechanism, the back pressure valve being in open position; and,

Figure 3 is a similar view through the apparatus, showing the back pressure valve in closed position, the wash pipe and nozzle being shown in elevation.

Referring to the drawings more in detail,

numeral 1 indicates the lower end of the usual well casing. Numeral 2 indicates the valve casing which is the equivalent of the ordinary mud nozzle and which is attached at its upper end to the lower end of the screen 3; the screen being connected to the liner 4 which extends up into the casing in the usual manner.

The valve is referred to by numeral 5 and it is provided with a valve stem 6 slidably mounted in the valve stem guide 7. A member 8 is also mounted in the valve casing and the upper side of this member is provided with a valve seat 9, while the lower side thereof is provided with a second valve seat 10.

The usual wash pipe is indicated by numeral 12 and mounted on the lower end thereof is a nozzle 13 having apertures 14 for the passage of water or oil; and also provided with a tapering shoulder 15 which is adapted to engage the upper valve seat 9. The member 8 is provided with a centrally arranged passage 16 to permit the nozzle 13 to pass therethrough and engage the valve 5 for a purpose to appear hereinafter.

Mounted on the valve stem 6 immediately below the valve 5 is a spider frame 17 having the outwardly extending lugs 18; the spider frame being secured in position against the valve by means of a nut 19. Obviously the spider frame could be eliminated and the same result obtained by forming outwardly extending lugs integral with the valve 5 if preferred. The valve stem 6 extends downwardly through the valve stem guide 7 which is preferably screw threadedly mounted in the valve casing 2 and which is, of course, provided with a suitable aperture to permit the movement of the valve stem therethrough, and with other apertures for the passage of oil or other liquid. Surrounding the valve stem 6 is a coil spring 11 arranged between the valve stem guide and the valve, so that the valve is normally forced upward into engagement with its seat 10. A spring of this character does not always put a sufficient tension on the valve and further, because of the central arrangement of the spring, it is possible that the valve might be thrown out of alignment with its valve seat, thereby rendering the device inoperative. Accordingly I have placed a relatively heavy spring 20 engaging at its lower end with the valve stem guide and at its upper end with the outwardly extending lug 18 of the spider frame 17. It will be noted that the diameter of this relatively heavy coil spring is almost equal to the diameter of the casing and because of its vertical pressure against the valve, at points distant from the center line thereof, it is obvious that the valve must always remain in proper alignment with its seat.

Arranged on the lower end of the stem 6 is a bottom or lower valve indicated by the numeral 21. The valve 21 seats against the member 7, as clearly shown in Figure 3, and the function of this valve is to close the apertures in the member 7, and thereby prevent sand, water, oil, etc. from entering the space between the valve 5 and the member 7. The bottom valve 7 thus acts as a protector for the valve 5 and associated parts. As valve 5 and valve 21 are both mounted on the same valve stem 6 it is apparent that they will operate together, so that when valve 5 is open valve 21 is also open, and when valve 5 is closed valve 21 is also closed.

In the operation of setting a well with the apparatus described herein, the liner, screen and wash pipe are run into the well in the usual manner, but the wash pipe which carries the nozzle 13 is so positioned that the nozzle extends through the central bore of the member 8, engages the valve 5 and forces it and valve 21 to open position, as clearly shown in Figure 2. It is thus apparent that as the parts are lowered into the well the back pressure valve is opened and the mud is free to pass through the opening 16 into the wash pipe, thus equalizing the pressure on the valve, and eliminating the necessity of filling the screen and liner with mud, as in the prior practice. In my construction the back pressure valve is maintained in open position by the nozzle of the wash pipe after the parts are lowered into the hole, thus permitting a thorough washing of the well, when the nozzle is in its operative position, as shown in Figure 2, the inclined shoulder 15 of the nozzle engages the upper valve seat 9 thereby avoiding any loss of pressure in washing the well, due to water from the wash pipe backing up into the liner.

After the well has been washed the wash pipe is raised, as shown in Figure 3, whereupon the valves 5 and 21 automatically close by means of the coil spring 11 assisted by the heavy coil spring 20 which, as hereinbefore stated, is of large diameter to insure the proper alignment of the valve and valve stem.

It is to be noted that my valve mechanism cannot be rendered inoperative by reason of encountering mud, sand, stones, etc., at the bottom of the well; for the valve is positively held open when the parts are lowered into the hole and when the wash pipe is withdrawn the valve will merely move upwardly into the space previously occupied by the nozzle of the wash pipe and at the same time the valve 21 will close, and thus there is nothing to prevent the proper functioning of the back pressure valve. It is also to be noted that the present mechanism presents a ready means for assisting in the pulling of screens. If, with the present device, the operator makes a test and wishes to pull his

screen, he can lower the nozzle and wash pipe into the well, allowing the nozzle to seat down on the valve and force it and the bottom valve open, thus allowing water or oil to be forced down the well and out around the screen thereby relieving it of all pressure and permitting its withdrawal. And by the improvements disclosed herein over my prior Patent No. 1,505,850 there is always present sufficient pressure to close the back pressure valve and the novel arrangement of springs possesses the further function of always retaining the valve and its stem in proper alignment.

In accordance with the patent statutes I have described what I now believe to be the best embodiment of the invention, but I do not wish to be understood thereby as limiting myself or the scope of the invention, as many changes and modifications may be made without departing from the spirit of the invention; all such I aim to include in the scope of the appended claims.

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

1. In an apparatus for wells, a wash pipe, a back pressure valve, means attached to said wash pipe for opening the back pressure valve, a spring for normally closing said back pressure valve, and a second spring of greater diameter than the first mentioned spring and functioning to close the valve and to retain the same in proper alignment, a valve stem guide having an opening therein, and a valve carried by the back pressure valve stem and adapted to close said opening.

2. In an apparatus for wells, a wash pipe, a back pressure valve, means attached to said wash pipe for opening the back pressure valve, a valve seat arranged below the back pressure valve, and a valve cooperating with said valve seat, said second-mentioned valve being operatively connected with said back pressure valve.

3. In an apparatus for wells, a wash pipe, a back pressure valve, means attached to said wash pipe for opening the back pressure valve, a valve stem guide having an opening therein, and a valve carried by the back pressure valve stem and adapted to close said opening.

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