Nov. 3, 1936. O. M. DAVIS 2,059,443

BACK PRESSURE VALVE MECHANISM

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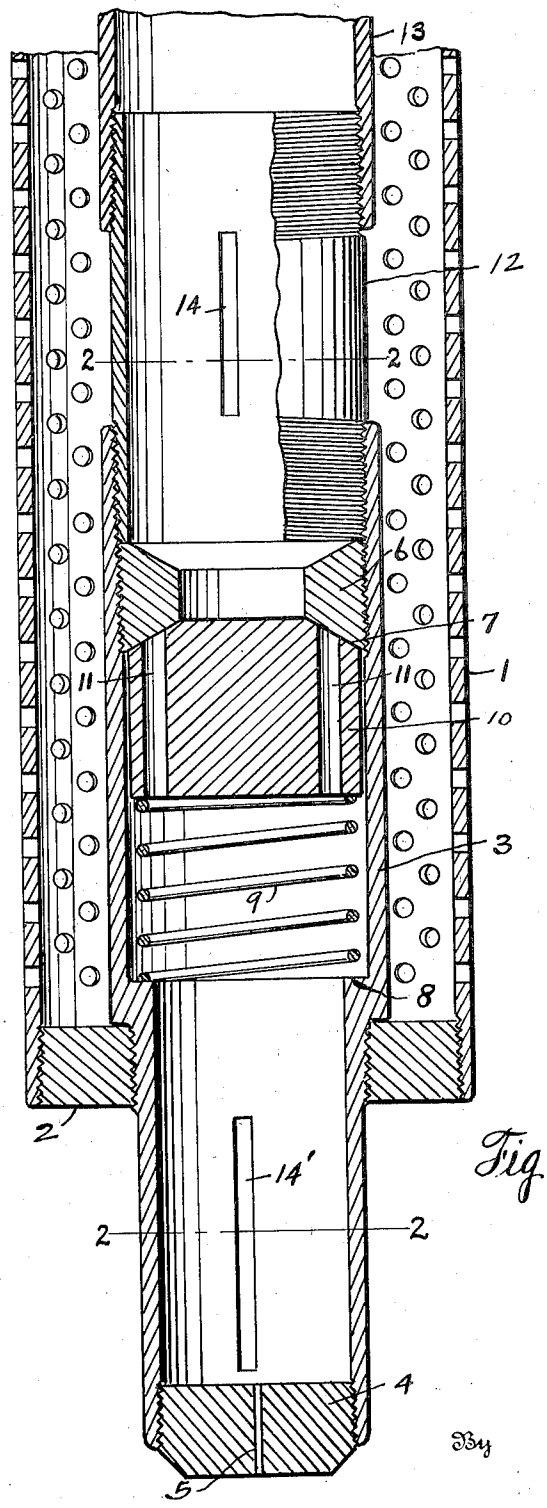


Fig. 1.

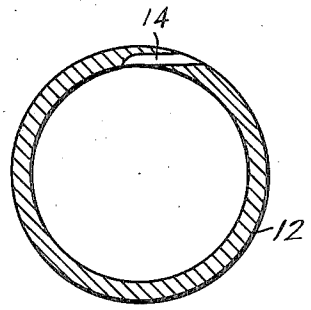


Fig. 2.

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BACK PRESSURE VALVE MECHANISM

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1 Claim. (Cl. 166—20)

This invention relates to a back-pressure valve mechanism especially designed for use in connection with a well screen, and the invention also comprehends the method of washing the screen.

An object of the invention is to provide a valve mechanism of the character described adapted to normally close the lower end of a well screen to prevent the inflow of fluid into the screen except through the screening surface, but which may be readily opened to permit the water to flow from the wash pipe down through the valve mechanism to be returned up about the screen for washing the same.

Another object of the invention is to provide an apparatus of the character described so constructed as to impart to the washing fluid a whirling motion whereby a cavity will be formed about the lower end of the screen into which the oil, of an oil well, may collect, and whereby an increased velocity will be imparted to the washing fluid flowing from said cavity up about, and through the perforations of, the screen, to the end that the sand and other detritus will be held in suspension, and eventually ejected from the well.

A still further object of the invention is to provide an apparatus of the character described whereby the screen may be washed from the inside, as well as from the outside, simultaneously.

A still further object resides in a novel method of washing a well screen and well, as more specifically hereinafter disclosed.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation, and arrangement of parts, and to a novel method, an example of which will be described in the specification and illustrated in the accompanying drawing, wherein:—

Figure 1 shows a vertical sectional view of the apparatus as associated with the lower end of a well screen, and,

Figure 2 shows a cross-sectional view taken on the line 2—2 of Figure 1.

In the drawing, the numeral 1 designates a well screen of any conventional construction, the same, in the present instance, being illustrated as a perforated pipe.

A plug 2 may be screwed into the lower end of the screen, and an elongated tubular valve casing 3 is located partly within the screen and is screwed through and extended beneath said plug. The lower end of the valve casing is closed by a plug 4, having a vertical channel 5 therethrough.

Screwed into the upper end of the valve casing 3, there is the annular valve seat 6 having the upwardly and inwardly converging face 7. The valve casing has an inside annular shoulder 8 which supports a coil spring 9 on which the valve 10 is mounted. The upper end of the valve is tapered to conform to and to fit against the face 7 when the valve is closed, and the valve is normally held closed by said spring. The valve has the vertical channels 11 which are closed by the seat 6 when the valve is seated. A tubular coupling 12 is screwed into the upper end of the valve casing 3 by means of lefthand threads, and a wash pipe 13 is attached to the upper end of the coupling 12 by righthand threads. The coupling 12 has a vertical slot 14 cut therethrough, and a similar vertical slot 14' is cut through the extended lower end of the valve casing. These slots extend out approximately at a tangent to the inside surfaces of the coupling 12 and the casing 3 respectively. Washing fluid may be forced under pressure down through the wash pipe 13 and it will pass, partly, out through the slot 14 and, partly, down through the seat 6, unseating the valve 10, and flowing on down through the channels 11 and out through the slot 14', a portion of said washing fluid passing on down through the channel 5 and being ejected against the bottom of the bore. As the washing fluid is forced under pressure, through the slots 14, 14', and strikes against the inside wall of the screen and against the wall of the bore beneath the screen, a whirling movement will be imparted to it and it will be returned in spiralled fashion up through the screen and up around the screen, the fluid around the screen passing in through the screen perforations and merging with the fluid passing out through the slot 14, thus setting up a strong whirling motion to the washing fluid both about and within the screen, and thus effectively maintaining the detritus in the fluid in suspension so that same will be more effectively discharged from the well. The water ejected through the channel 5 will thoroughly wash out the bottom of the bore, and washing fluid ejected through the slot 14', will wash away the walls of the bore, forming an enlarged cavity for the collection of oil. As the water is forced in a spiralled course from said cavity up about the screen and into a more restricted space, its velocity will be increased and it will be very effective in washing the screen.

Preparatory to bringing in the well, it will sometimes be found advantageous to swab the wash pipe 13, that is, to lower a conventional swab into the wash pipe through the fluid therein, and then quickly elevate the swab to eject the fluid above the swab and to draw in fluid into the wash pipe beneath the swab, and this fluid drawn in through the slot 14, will have a whirling movement imparted to it so as to more effectively maintain the detritus in the fluid in suspension.

When the well has been washed, the valve 10 will securely close the lower end of the screen so as to force all of the inflowing fluid to pass through the screen perforations.

When the washing process has been completed, the wash pipe 13 and coupling 12 may be detached by turning the pipe to the right and thus unscrewing the coupling from the valve casing and the wash pipe and coupling may then be withdrawn.

In case the well has sufficient internal pressure to voluntarily flow, the wash pipe need not be detached, but may be left in the well to form a flow line for the oil.

The drawing and description discloses what is now considered to be a preferred form of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claim.

What I claim is:

The combination of a well screen whose lower end is closed, of a tubular valve casing within the screen and whose lower end is extended through said lower end of the screen and anchored thereto, said casing extending beneath the screen, an annular valve seat in the casing, a downwardly opening valve in the casing beneath the seat, a yieldable member on which the valve is supported and which normally holds the valve closed, a wash pipe within the screen and whose lower end is attached to the casing, said wash pipe and the extended lower end of the casing each having an elongated vertical slot cut therethrough, and extending laterally approximately tangentially with respect to the inside surface of the wash pipe and casing, respectively.

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