April 8, 1941. C. C. MYRACLE 2,237,612

APPARATUS FOR WASHING PERFORATIONS

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Fig. 1.

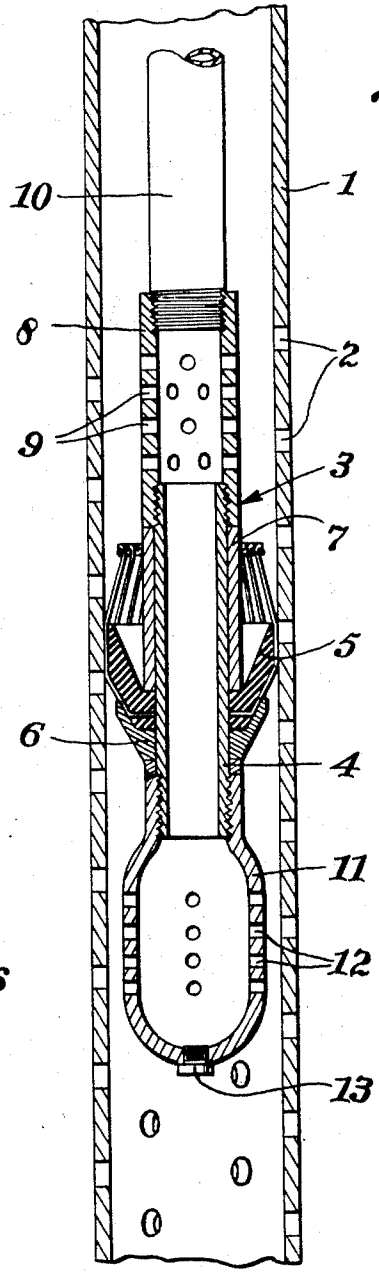
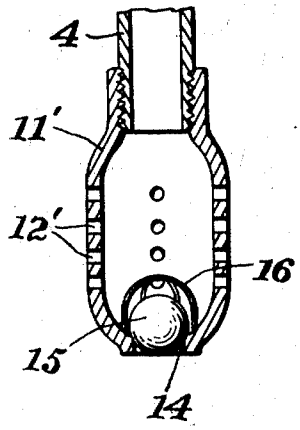


Fig. 2.



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APPARATUS FOR WASHING PERFORATIONS

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12 Claims. (Cl. 166—20)

This invention relates to method and apparatus for washing the perforations of well casings or screens. A main object of the invention is the simplification of the procedure and equipment and the attainment of a very effective cleaning action. To this end, I provide an easily handled washer characterized by extreme simplicity as compared with other devices now in use.

The washer, which includes a packer, is lowered to the perforated zone of the casing by any suitable means and then elevated, thereby causing a suction condition beneath the packer which directly effects a cleaning action on the perforations and which is further utilized to accelerate lateral cleansing jets of well fluid derived from above the packer. By observing the force required to elevate the washer, an indication is available as to the condition of the perforations. The washer is lifted comparatively easily where the perforations are open as compared to where they are plugged.

A practical embodiment of the new washer is shown by way of example in Figure 1 of the accompanying drawing in longitudinal section, a section of casing being similarly shown.

Figure 2 shows a modified form of washer in longitudinal section.

In the drawing, Figure 1, reference numeral 1 designates a section of well casing provided with perforations 2.

The washer comprises a tubular body generally designated by the reference character 3, which body is conveniently made up as follows:

Reference numeral 4 designates a hollow cylindrical mandrel in the form of a section of pipe externally threaded at its ends. A packer 5 is mounted on the mandrel 4 between a cup 6 and a sleeve 7 and a neck portion 8 is threaded on the upper end of the mandrel into abutment with the sleeve 7. The neck 8, as here shown, is provided with lateral perforations 9 which constitute an inlet and have a total area at least equal to the internal cross-sectional area of the mandrel 4. The upper end of neck portion 8 is internally threaded for engagement with suitable lowering and lifting means, such as the lower end 10 of a sand line, preferably with sinker bar and jars above to give weight. Threaded on the lower end of the mandrel is the neck of a bowl portion 11, this bowl portion having cylindrical side walls with perforations 12 and a bottom wall provided, as here shown, with a threaded aperture normally closed by a cleaning plug 13. The total area of apertures 12 is less than the internal cross-sectional area of the mandrel. The bowl portion is laterally expanded as compared to the mandrel so that its side walls are adjacent the walls of the casing when positioned in the latter.

As the washer is lowered in the casing the well fluid passes into the bowl portion 11 through the perforations 12, through the mandrel 4, and out through the perforations 9. When the washer has been lowered to the required position, it is elevated, thus causing a suction condition below the packer. This condition in itself exerts an unclogging action on the casing perforations and at the same time the well fluid from above the packer is ejected out under pressure through the lateral perforations 12 in the bowl portion 11. These jetting streams of fluid act to wash the obstructing material from the casing perforations and the slight vacuum below the packer causes the material to come into the well and fall to the bottom of the hole from which it may later be bailed out. Due to the fact that the perforations 12 are preferably unable to pass the full capacity of the mandrel 4, being of restricted total area as compared to the cross-sectional area of the latter, a powerful jet action is secured.

Another substantial advantage is realized when the magnitude of the lifting force applied to the washer is gauged. By noting the resistance of the washer to elevation the operator has an indication as to whether the perforations below the packer are open or plugged, since obviously the washer will lift more easily under the first condition than under the latter.

In Figure 2 the bowl portion 11', provided with lateral perforations 12', has a bottom opening 14 normally closed by a check valve, here shown as a ball 15 gravity-seated on the upper edge of the opening. Unseating movement of the ball is limited by a cage 16. The capacity of opening 14 is preferably at least as great as that of mandrel 4. With this check valve provision, lowering of the washer is greatly facilitated, the ball moving from its seat to permit the well fluid to pass upwardly through opening 14 and unseating sufficiently to permit full capacity flow through the said opening. Any other suitable form of check valve may, of course, be utilized.

It will be understood that the washer is susceptible of variation as regards details of construction. Any suitable form of packer may be used, that shown in the drawing being entirely conventional, and more than one packer may be used, if desired. Furthermore, I do not limit myself as to means for lowering and lifting the washer. It could be run on the lower end of a bailer as the bailer would provide enough weight to force

it down through the fluid, or any other appropriate equipment may be utilized. I do not limit myself to specific form and arrangement of parts, except as in the following claims. In these claims, where the hollow body of the washer is stated to be "closed" at the bottom, it is meant that this condition is present at least during the washing operation, i. e. upon upward movement of the washer, and in speaking of the upper and lower portions of the washer, reference is, of course, had to its position in use and as shown in the drawing.

I claim:

1. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body being closed at the bottom and having an inlet above the packer for well fluid and lateral perforations below the packer, said inlet having an area at least equal to the inner cross-sectional area of said body and the total area of said perforations being less than said cross-sectional area, the upper end of said body being connectible to a lowering and lifting means, so that the washer can be lowered to the perforated zone of the casing and then pulled upwardly whereby to cause jets to flow from said lateral perforations.

2. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body including a neck portion above the packer connectible to a lowering and lifting means and having lateral perforations for admitting well fluid into said body, said body also including a bowl portion below said packer closed at the bottom and having lateral walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated.

3. A washer according to claim 2 wherein the total area of the bowl perforations is less than the total area of the neck perforations and the latter area is at least equal to the inner cross-sectional area of said body between the neck and bowl portions.

4. A perforation washer comprising a hollow cylindrical mandrel, a packer secured to said mandrel, a neck portion secured to the upper end of the mandrel and connectible with a lowering and lifting means, said neck having lateral perforations for admitting well fluid into said neck and mandrel, a bowl portion having a closed bottom secured to the lower end of said mandrel, said bowl portion having side walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated.

5. A perforation washer comprising a hollow cylindrical mandrel, a packer secured to said mandrel, a neck portion secured to the upper end of the mandrel and connectible with a lowering and lifting means, said neck having lateral perforations for admitting well fluid into said neck and mandrel, a bowl portion having a closed bottom secured to the lower end of said mandrel, said bowl portion having side walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated, the total area of the bowl perforations being less than the total area of the neck perforations and the latter area being at least equal to the inner cross-sectional area of said mandrel.

6. A perforation washer comprising a hollow cylindrical mandrel, a packer secured to said mandrel, a neck portion secured to the upper end of the mandrel and connectible with a lowering and lifting means, said neck having lateral perforations for admitting well fluid into said neck and mandrel, a bowl portion having a closed bottom secured to the lower end of said mandrel, said bowl portion having side walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated, said bowl portion being laterally expanded as compared to the mandrel so that when the washer is in operative disposition the side walls of the bowl portion are adjacent the casing walls.

7. A perforation washer comprising a hollow cylindrical mandrel, a packer secured to said mandrel, a neck portion secured to the upper end of the mandrel and connectible with a lowering and lifting means, said neck having lateral perforations for admitting well fluid into said neck and mandrel, a bowl portion having a closed bottom secured to the lower end of said mandrel, said bowl portion having side walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated, said bowl portion being laterally expanded as compared to the mandrel so that when the washer is in operative disposition the side walls of the bowl portions are adjacent the casing walls, the total area of the bowl perforations being less than the total area of the neck perforations and the latter area being at least equal to the inner cross-sectional area of said mandrel.

8. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body having an inlet above the packer for well fluid and lateral perforations below the packer, said inlet having an area at least equal to the inner cross-sectional area of said body and the total area of said perforations being less than said cross-sectional area, said bottom having an opening, and an upwardly opening check valve normally closing said opening, the upper end of said body being connectible to a lowering and lifting means so that the washer can be lowered to the perforated zone of the casing and then pulled upwardly whereby to cause jets to flow from said lateral perforations.

9. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body having an inlet above the packer for well fluid and lateral perforations below the packer, said inlet having an area at least equal to the inner cross-sectional area of said body and the total area of said perforations being less than said cross-sectional area, said bottom having an opening, said opening having a cross-sectional area at least as great as the inner cross-sectional area of said body, and an upwardly opening check valve normally closing said opening, the upper end of said body being connectible to a lowering and lifting means so that the washer can be lowered to the perforated zone of the casing and then pulled upwardly whereby to cause jets to flow from said lateral perforations.

10. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body including a neck portion above the packer connectible to a lowering and lifting means and having lateral perforations for admitting well fluid into said body, said body also including a bowl portion below said packer, said bowl portion having a bottom opening, and an upwardly opening check valve normally closing said opening, said bowl having lateral walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated.

11. A perforation washer comprising a tubular body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body including a neck portion above the packer connectible to a lowering and lifting means and having lateral perforations for admitting well fluid into said body, said body also including a bowl portion below said packer, said bowl portion having a bottom opening, said opening having a cross-sectional area at least equal to the inner cross-sectional area of said body between the neck and bowl portions, and an upwardly opening check valve normally closing said opening, said bowl having lateral walls provided with perforations through which cleansing jets of the well fluid issue when after being lowered to the perforated zone of the casing the washer is elevated.

12. A perforation washer comprising a hollow body introducible into a well casing, a packer fixed on said body intermediate the ends of the latter, said body being closed at the bottom and having an inlet above the packer for well fluid and having lateral perforations below the packer, said body being connectible to a lowering and lifting means so that the washer can be lowered to the perforated zone of the casing and then pulled upwardly whereby to cause jets to flow from said lateral perforations.

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