

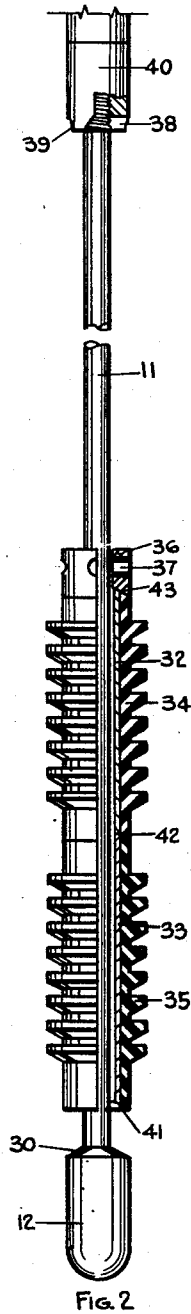
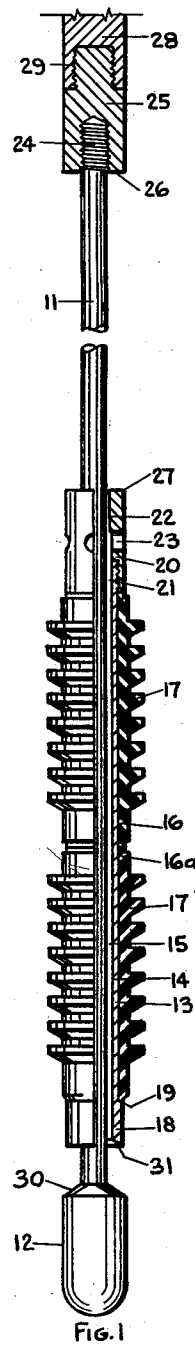
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WELL SWAB

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WELL SWAB

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1 Claim. (Cl. 103—225)

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This invention relates to an oil-well tool and pertains more particularly to an improved well-swab assembly for removing fluid and/or paraffin, etc. from the bore of a well casing or production tubing.

When the reservoir pressure surrounding an oil well decreases to such an extent that natural flow is not sustained, the well "dies." A number of other things can cause the well to "die" such as production of water, reduction in gas-oil ratio, a leak in surface connections which bleeds off solution gas in well bore, etc. Under favorable conditions, it is usually possible to induce flow and continue production for some time without the necessity of pumping. This may be accomplished by the agitation of the fluid in the well bore by a swabbing action. Generally, in carrying out the swabbing operation, a valved swab is dropped to the bottom of the well tubing on a wire line. As the swab is lowered through the liquid in the well tubing, its valve opens, allowing the liquid to pass upwardly therethrough. On withdrawing the swab from the well, the valve automatically closes and all liquid above the swab is lifted thereby up the tubing and out of the well. By removing part of the fluid column in the well bore the bottom hole pressure is reduced and more oil and gas will flow rapidly into the bore from the surrounding well cavity, thus creating upward momentum to the entire column of fluid. The suction effects developed the swab also causes the gas in solution in the oil to be released, thus reducing the average density of the column of fluid and further permitting flow. Once flow is started in this way it will often continue for some time without additional artificial assistance.

In many oil fields, the oil produced contains considerable quantities of paraffin which collects in the bore of the well casing or tubing to restrict the flow therethrough so that the well is not produced at the optimum rate. In such cases, it is often possible to restore production by a swabbing operation. A swab, carrying one or more resilient cups or packing elements, is lowered through said well tubing and subsequently withdrawn therefrom, during which operation the paraffin is scraped from the inner wall of said tubing.

Another common use of a well swab is for removing liquids, for example, drilling fluids from a well bore upon completion of drilling operations and before bringing a well into production. In many cases, fluids cannot be readily circulated from the borehole, but instead may be removed from the well by a swabbing operation.

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At times during a swabbing operation, the swab may become stuck or lodged in the well tubing, resulting in the loss of considerable operating time before it is eventually freed. It is therefore an object of the present invention to provide a swabbing apparatus which may readily be freed when it becomes lodged in a well tubing.

It is also an object of this invention to provide a swabbing apparatus which may be referred to as valveless, in the sense that it does not comprise any valve structure specifically designed as such and operating solely for that purpose, the functions of a valve being performed in the present apparatus by the cooperation of structural elements having other primary functions.

It is also an object of this invention to provide a device for swabbing wells which does not employ any delicate valve mechanism which may be easily stuck open or closed by an accumulation of paraffin or by a hard foreign object that becomes lodged therein.

Another object of the present invention is to provide a swabbing apparatus incorporating a jarring mechanism adapted to be lowered into a well tubing on a wire line, whereby the flow of fluid through the swabbing apparatus may be controlled, and said jarring mechanism may be actuated by vertical movement of said wire line.

A further object of this invention is to provide a swabbing apparatus incorporating a jarring mechanism adapted to be actuated simultaneously with the opening and/or closing of the device to fluid flow.

These and other objects of this invention will be understood from the following description of the invention as shown in the accompanying drawing, wherein:

Figures 1 and 2 are views partly in elevation and partly in cross section of two slightly different embodiments of the present swabbing assembly.

Referring to Figure 1 of the drawing, the present swabbing apparatus comprises an elongated bar member or body mandrel 11 having an enlarged lower end 12 of greater diameter than the rest of the bar member. Slidably mounted on said bar member 11 is an elongated tubular barrel, mandrel or sleeve 13 having a bore 14 through its entire length, said bore 14 having a diameter slightly greater than the diameter of the bar member 11 whereby an annular fluid passageway 15 is formed between the bar member 11 and the barrel 13.

Carried on the outer surface of the tubular barrel 13 in a fixed manner are one or more

swab rubbers or packing elements 16 and 16a having an outside diameter equal to or slightly greater than the well casing (not shown) in which the swabbing apparatus is to be used. The swab rubbers may be of any desired size and design and may be formed as, or consist of a plurality of swab cups 17, as shown. The swab rubbers 16 are normally made of a resilient material such as rubber, synthetic rubber, etc., and are fitted or formed on the tubular barrel 13 which imparts rigidity to the entire swab structure.

The lower end 18 of the tubular barrel may be enlarged, as shown, to form a shoulder 19 against which one end of the swab rubbers 16 may rest. A short tubular collar 20 may be threadedly secured to the upper end of the tubular barrel 13 to act as means for retaining the swab rubbers 16 in position on the barrel 13. The collar 20 is also provided with a longitudinal bore therethrough of a diameter slightly greater than the bar member 11 whereby an annular fluid passageway 21 is formed between said bar member 11 and the inner surface 22 of said collar 20.

In addition to the axial fluid passageway 21, the collar 20 is also provided with one or more horizontal or radial fluid outlet ports 23 through the wall thereof. The bar member 11 is preferably cylindrical in shape but may have a cross section that is square, hexagonal, octagonal, etc. The length of said bar member 11 is substantially greater than the length of the tubular barrel 13 and the swab rubbers 16 carried thereon. Preferably, the bar member 11 is at least twice as long as the swab rubbers 16 whereby there may be substantial movement of the rubbers 16 along the bar member 11.

The upper end 24 of the bar member 11 is threaded to engage a coupling or tool joint 25, preferably a tool joint having considerable weight. The lower face 26 of the tool joint 25 forms a shoulder on the bar member 11 which is preferably of an area substantially equal to the upper face 27 of the collar 20. Other pieces of related equipment such as a wire-line coupling or a weight bar 28 may be secured to the upper threaded end 29 of the tool joint 25 in order to facilitate the lowering of the present swabbing apparatus into a well tubing.

As shown in Figure 1, the shoulder 30 formed at the top of the enlarged lower end 12 of the bar member 11 may be beveled. In this case, the cooperating lower edge 31 of the tubular mandrel is also beveled so as to fit in substantially fluid-tight engagement against the shoulder 30.

In the embodiment shown in Figure 2, the tubular barrel 13 of Figure 1 consists of a plurality of tubular elements 32 and 33 having fixedly mounted on the outer surfaces thereof individual swab rubbers 34 and 35. A tubular collar 36 having radial fluid outlet ports 37 therein may be slidably mounted above the uppermost swab rubber 34 without being fixedly secured thereto. If desired, radial fluid ports 38 may be formed in the lower face 39 of the tool joint 40 instead of ports 37 in collar 36 for a purpose which will be described hereinafter.

When individual swab elements 32-34 and 33-35 are slidably mounted on the bar member 11 together with collar 36, the upper and lower edges of said swab elements and the lower face of the collar 36 are preferably beveled as at 41, 42 and 43 in a manner similar to the beveled shoulder 30 whereby all the aforementioned elements temporarily register and interlock with

each other in substantially fluidtight engagement.

In carrying out a well-swabbing operation, the present swabbing apparatus is secured to the lower end of a weight bar 28 which in turn is suspended from the lower end of a wire line or cable (not shown) and lowered into the well casing (not shown) to be swabbed. In running the swabbing apparatus into the well, the outer edges of the swab cups 17 may frictionally engage the walls of the well casing causing the swab cups 17 and tubular barrel 13 to be moved upwardly on the bar member 11 so that the upper face 27 of the collar 20 engages the lower face 26 of the tool joint 25. As the swabbing apparatus is lowered in this position, any fluid in the well casing passes upwardly through the annular passageway 15 and out the fluid ports 23 in the collar 20.

When the swabbing apparatus is being withdrawn from the well, an upward force pulling on the cable (not shown) causes the bar member 11 to move upwardly with the swab rubbers 16 remaining stationary until the beveled shoulder 30 on the lower end of the bar member 11 engages the beveled seat 31 on the lower end of the tubular barrel 13 to close the lower end of the annular passageway 15 and prevent the escape of fluid downwardly therethrough. As the apparatus is pulled upwardly, the swab rubbers 16 frictionally engage the wall of the casing preventing any fluid from escaping. Thus, any fluid, mud, debris, or paraffin accumulation above the swab rubbers 16, is moved upwardly ahead of the swabbing apparatus to the surface of the well.

In the event that the swabbing apparatus becomes lodged in the well tubing as it is being drawn out of the well or as it is being run into the well, hoisting or lowering is stopped and tension on the cable is removed momentarily to allow the weight bar 28 and bar member 11 attached thereto to drop suddenly, causing the lower face 26 of the tool joint 25 to strike the upper face 27 of the collar 20 sharply. If this operation does not dislodge the swab cups in the well casing the operation may be repeated several times until the jarring action releases the apparatus.

While a small amount of fluid is normally lost through the apparatus during the jarring action, in some cases it may be found desirable to release the tension on the hoisting cable until all the fluid above the swab rubbers 16 has drained through fluid ports 23 and passageway 15 to the bottom of the well. With the weight of fluid removed from above the swabbing apparatus, the jarring action may be repeated, if necessary, in the manner previously described and the apparatus may then be withdrawn from the well or run into the well again. The swabbing operation may be repeated as many times as necessary in order to remove all the fluid or other material from the well.

It is to be noted that the present swabbing apparatus is provided with fluid passage means which is open when the apparatus is being run into a well, thus allowing its rapid descent to the bottom of the well. On removal of the apparatus from the well, this fluid passage means is automatically closed. At the same time, if the apparatus becomes lodged in the well, it may be readily jarred loose by manipulation of the wire line to which it is connected.

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I claim as my invention:

An apparatus adapted to be lowered on a wire line into a well for operation as a combination well swab and as a jar, said apparatus comprising an elongated bar member, radially extending stop shoulders formed at either end of said bar member, at least one tubular sleeve co-axially mounted for limited sliding action along said bar member between said stop shoulders, said bar member being at least twice as long as said tubular sleeve, the inside diameter of said tubular sleeve being greater than that of the bar member whereby an annular fluid passageway is formed between the inner wall of the sleeve and said bar member, resilient swab cup means carried outwardly on said tubular sleeve, said swab cup means being of a diameter to engage frictionally the inner wall of a well casing when the well-swabbing apparatus is moved therethrough, a collar mounted on said bar member above said sleeve and slidable with said sleeve, the upper

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face of said collar being substantially equal in area to that of the lower face of the upper stop shoulder, and weight bar means fixedly secured at all times to the top of the elongated bar member co-axially therewith whereby a sharp jarring action may be repeatedly applied to said tubular sleeve and swab cup means by reciprocation and impact of said weight bar means and said bar member against the top of said sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 16,348	Carpenter	May 11, 1926
61,209	Kelly	Jan. 15, 1867
1,108,313	Anderson	Aug. 25, 1914
1,983,523	Crowell	Dec. 11, 1934
2,135,167	Campbell	Nov. 1, 1938
2,224,916	McFarlane	Dec. 17, 1940