Nov. 1, 1938. W. J. CAMPBELL 2,135,167

SWAB DEVICE FOR WELLS

Filed May 27, 1937

Fig. 1.

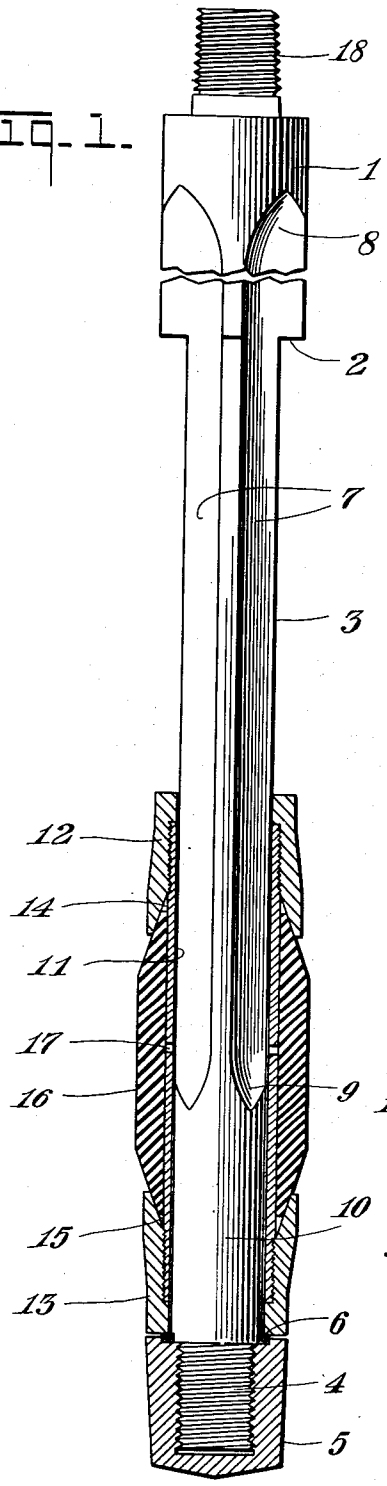


Fig. 2.

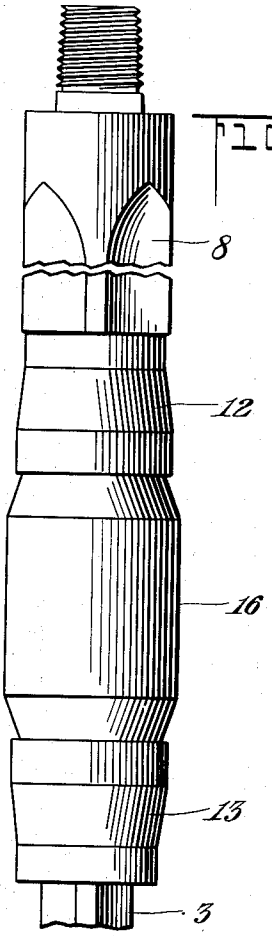


Fig. 3.

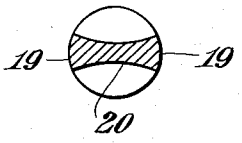


Fig. 4.

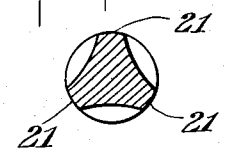
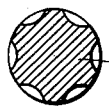


Fig. 5.



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SWAB DEVICE FOR WELLS

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3 Claims. (Cl. 103—225)

This invention relates to swabs, more particularly to swabs intended and adapted for use in the cleaning of wells, such as oil wells, brine wells, water wells, and the like.

In the drilling and operation of wells having casings therein, it is necessary at various times to clean the well from accumulations of muck, dirt, sand, gummy materials, and the like. For this purpose it has been customary to provide a swabbing device consisting of a swab with suitable ports, said swab being connected to a cable or the like and lowered into the well. In the downward movement, a valve or the like is opened allowing the fluid to rise above the swab, thereby allowing the swab to descend into the well. When the lower end of the well is reached, the motion is reversed, the valve closes and upon the raising of the swab, the fluid in the well is pulled out.

Various types of swab for this purpose have been used, but principally they are unsatisfactory from a number of standpoints. Especially in wells which are of considerable depth, the time consumed in lowering the swab is a substantial factor and none of the prior art swabs were capable of high speed operation. Many of the swabs were delicate in construction, had valves and springs which easily clogged or became stuck, and thus they were quite unsatisfactory. Most of the swabs were stationary, relying upon valves which were intended to open and close at certain points in the operation, but such valves corroded, became stuck, would not close and otherwise were unsatisfactory.

It is among the objects of the present invention to obviate the difficulties encountered with prior swabs and to provide a device which may be lowered into the bottom of a well at a high speed, which will offer a minimum of resistance to the flow of fluid through the same, which is sturdy and simple in construction, and which is self-cleaning.

In practicing the present invention, I provide a swab consisting essentially of a mandrel, said mandrel being fluted. Closely surrounding the mandrel is a swab element consisting of a sleeve with a rubber swab held thereon. The sleeve fits closely on the mandrel with sufficient clearance so as to allow the same to move readily up and down. When in the lower position, the sleeve seats upon a washer or the like to prevent the flow of fluid down through the same, and in addition, there is a substantial distance between the lower end of the swab and the point of termination of the flutes. When the swab is in the upper position on the mandrel, the flutes extend from a substantial distance below the bottom of the swab to a substantial distance above the top of the swab, thereby inducing a streamline unobstructed flow of the fluid under the swab and through the flutes.

The fluted portion is of a substantial length, being considerably longer than the swab and usually at least 50% longer. Thereby, there is exposed a considerable surface of the flutes so that any muck or dirt which may have become packed into the flutes, will become readily loosened and removed.

In the accompanying drawing, constituting a part hereof and in which like reference characters indicate like parts,

Fig. 1 is an elevational view of a swab made in accordance with the present invention, some parts being shown in section, the swab being shown in the lower position;

Fig. 2 is a fragmentary view similar to Fig. 1, showing the swab in its upper position; and

Figs. 3, 4 and 5 are cross-sectional views of the mandrel showing various forms of flutings which may be used.

With reference to the drawing, the head 1 of the mandrel is formed with a reduced portion 2 constituting a shoulder and a dependent mandrel 3. The lower end of the mandrel is formed with a threaded portion 4 and a nut 5 fits thereover, said nut having a seat for the reception of a washer 6. The mandrel is formed with a series of flutes 7 extending from a point 8 in the head 1 and terminating at a point 9 which is a substantial distance above the end of the mandrel, and leaving a portion 10 of circular cross-section without any flutes.

The swab itself fits fairly closely to the mandrel 3 and consists of a sleeve 11, usually of steel or the like, having both ends threaded and having nuts 12 and 13 thereon. Said nuts have reentrant portions 14 and 15, respectively for the reception of the ends of the rubber or other swab 16. A series of openings 17 in the sleeve allow for equalization of pressures on both sides of the swab.

The upper end of the head 1 is provided with a threaded portion, whereby the swab device may be suitably secured into a fitting or other member, as is well known, for the usual manipulation.

In the operation of the device, the swab is lowered into a hole and displacement of the fluid therein causes the swab to move upwardly into the position shown in Fig. 2, with the nut 12 abutting against shoulder 2. Since the flutes ex-

tend from below the swab to a point above the swab, a flow of fluid is induced between the flutes 7 in a practically straight line, parallel to the line of motion of the swab and thereby the fluid flows in a streamline and without obstruction or hindrance. This is of extreme importance, especially in deep wells, as it allows the quick lowering of the swab into position.

Upon the upward movement, the swab takes the position shown in Fig. 1, with the nut 13 in engagement with the washer 6, sealing off the portion above the swab from that below, and insuring that the column of fluid above the swab will be raised. If, however, the sealing is not perfect by reason of the accumulation of material, there is a further seal due to the unfluted portion 10 of the mandrel 3 and the close fitting of the sleeve to the mandrel, whereby the section between the end 9 of the fluted portion and the bottom of the swab acts as a secondary seal. While in the lower position, the upper portion of the mandrel 3 is exposed to the fluid so that any dirt that has accumulated within the flutes will be cleared away. Similarly, when the swab is in the position shown in Fig. 2, the lower ends of the flutes are exposed and are similarly automatically cleaned.

In Fig. 3 I have shown a slight modification of the mandrel, which consists of two portions 19 between which there is a reentrant curvature 20, thereby forming two flutes of very substantial cross-sectional area, allowing a relatively large stream of fluid to pass over the same. In Fig. 4 there is shown still another modification in which three extensions 21 are formed with reentrant portions forming the desired passageways. In Fig. 5, there is shown a mandrel 22 having six such flutes for the same purpose.

Although I have described my invention setting forth a few embodiments thereof, said embodiments are intended to illustrate the many variations which are possible in the physical construction of the device. The head of the mandrel need not be formed as shown in the drawing and the threaded portion 18 may be omitted and in place of the same, other means for securing the mandrel to the operating mechanism may be provided. Various numbers and shapes of flutes may be provided other than those herein specifically described. One of the nuts 12 and 13 may be made as a unit with the sleeve and other means than shown in the drawing may be used for securing the rubber swab to the sleeve. The swab itself may be made of other materials than rubber, although the latter material is preferred. The holes 17 in the sleeve may be omitted and the washer 6 may be made of various materials, such as fibre, rubber, leather, tin, lead and the like. The washer may be omitted and a ground steel seat may be substituted therefor. The spacing between the mandrel and the sleeve may be varied within wide limits.

It is essential for operation where a small diameter tube is used, to have the swab 16 in close contact with the sleeve 11 to take up a minimum of space and to allow a maximum size of mandrel 3. This gives great strength, but still allows the ready use of the device in wells of small diameter, while at the same time providing large openings for the ready flow of the fluid.

These and other changes in the details of my invention may be made within the spirit thereof, and the scope of the invention is not to be limited except by the character of the claims appended hereto.

What I claim is:

1. A swab device for wells comprising a fluted mandrel, an enlarged head at the upper end thereof, a swab fitted on said mandrel to allow relative movement thereof on said mandrel, said swab having an inner sleeve of substantial length fitting closely around said mandrel, a stop member to limit the downward movement of said swab, said mandrel being free from fluting for a substantial length above said stop member and cooperating with the lower inner portion of said sleeve to provide a seal.

2. A swab device for wells comprising a fluted mandrel, an enlarged head at the upper end thereof, a swab fitted on said mandrel to allow relative movement thereof on said mandrel, said swab having an inner sleeve of substantial length fitting closely around said mandrel, a stop member to limit the downward movement of said swab, said head limiting the upward movement thereof, the fluting extending into said head, the fluting terminating short of the lower end of said mandrel so as to provide a seal between said lower end and said sleeve for a substantial height.

3. A swab device for wells comprising a fluted mandrel, an enlarged head at the upper end thereof, a swab fitted on said mandrel to allow relative movement thereof on said mandrel, said swab having an inner sleeve of substantial length fitting closely around said mandrel, a stop member to limit the downward movement of said swab, said head limiting the upward movement thereof, the fluting extending into said head, the fluting terminating short of the lower end of said mandrel so as to provide a seal between said lower end and said sleeve for a substantial height greater than the diameter of said mandrel.

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