March 17, 1942. J. W. MacCLATCHIE 2,277,002

WELL SWAB

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Fig. 1

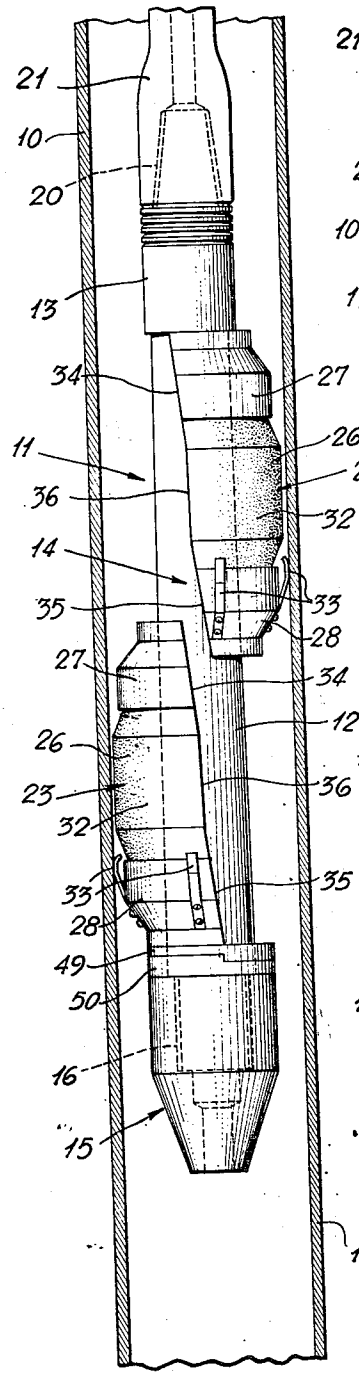


Fig. 2

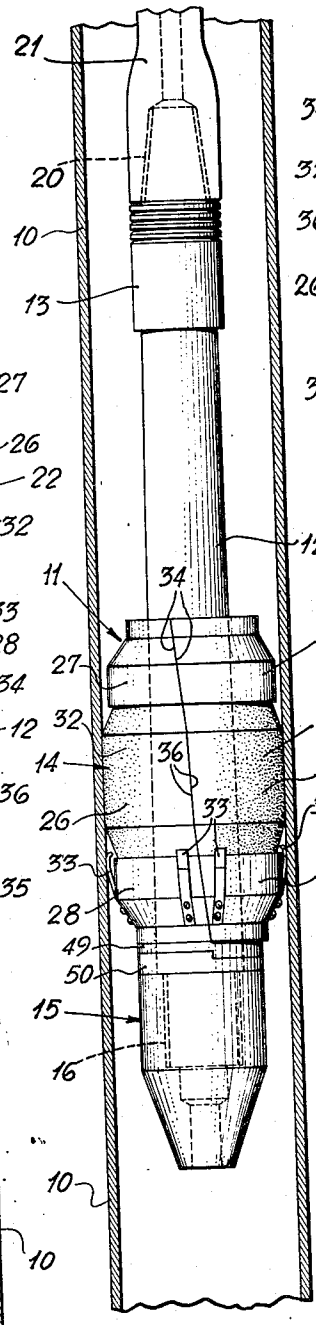


Fig. 6

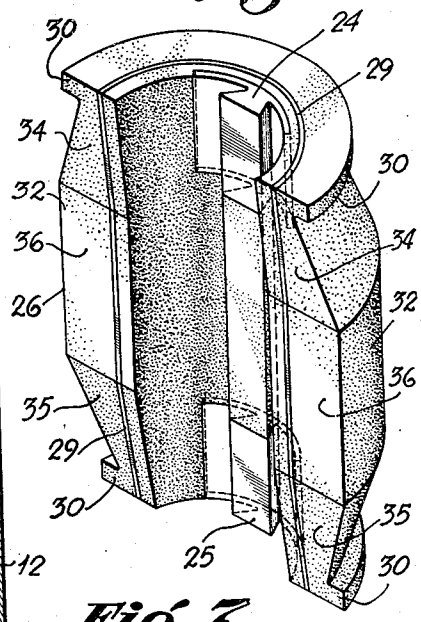
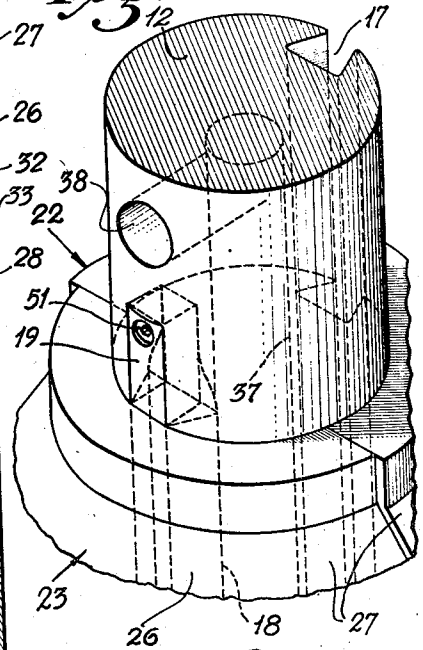


Fig. 7



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Fig. 3

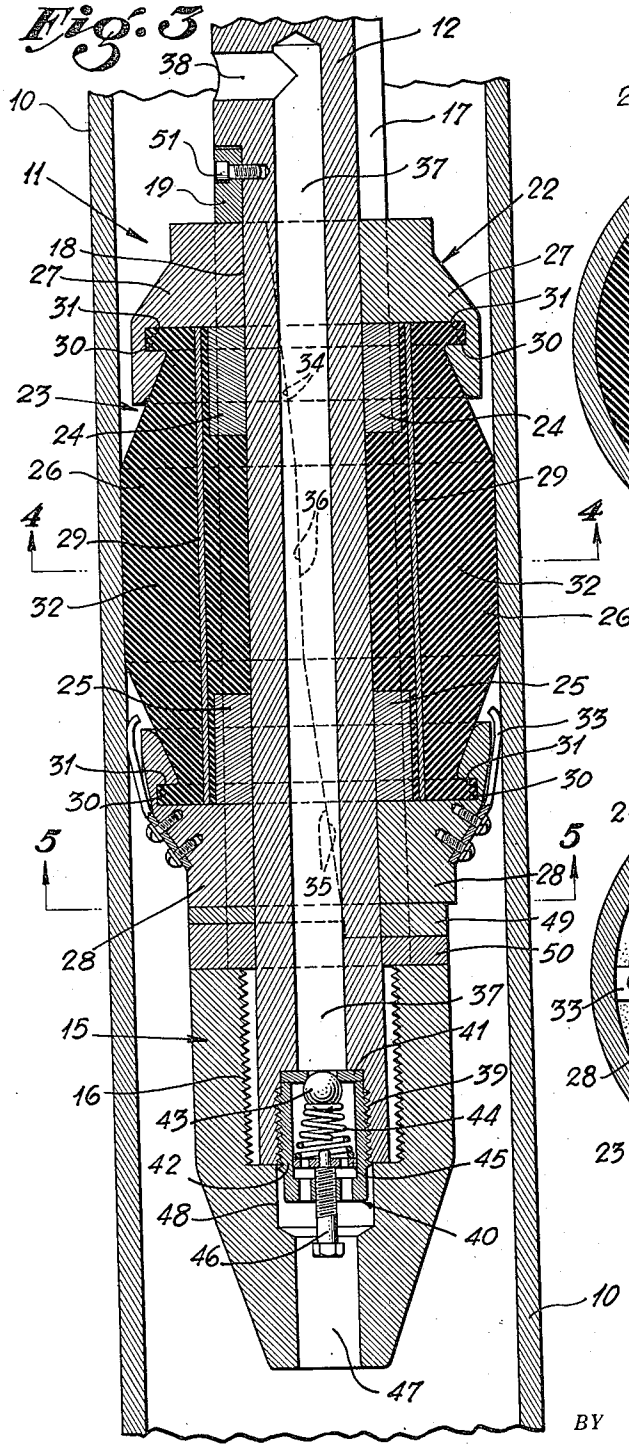


Fig. 4

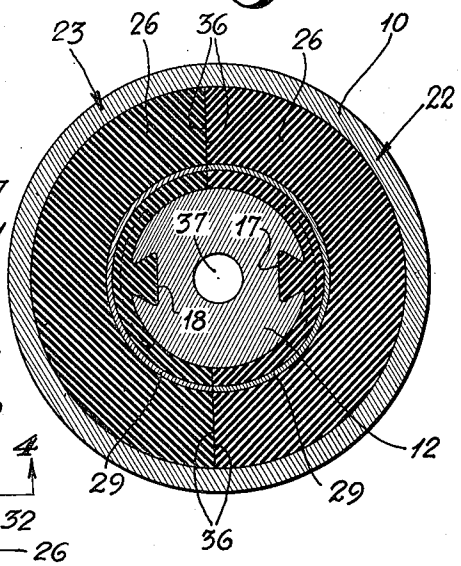
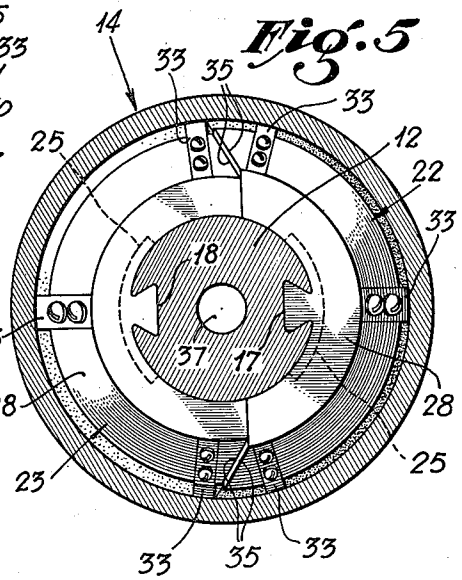


Fig. 5



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UNITED STATES PATENT OFFICE

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WELL SWAB

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Application August 19, 1938, Serial No. 225,781

1 Claim. (Cl. 103—225)

This invention relates to an oil tool, and particularly to well swabs.

The efficiency of a well swab depends upon the maintenance of a tight fit between the swab and the casing at all times when the swab is in operative position. An object of my invention is to provide a well swab which is adapted to maintain a close fit with the well casing at all times when the swab is in operative position, even though the swab has been considerably worn.

Another object of my invention is to provide a well swab which may be lowered into a well casing with a minimum of time and with a minimum of resistance.

Another object of my invention is to provide a well swab in which the packing member is made in sections, one of which sections is longitudinally movable with respect to the other of said sections, in order to provide a liquid passageway between said sections as said swab is lowered into a well casing.

Another object of my invention is to provide a well swab in which the packing member is made in sections and in which the abutting faces of the packing sections are tapered in order to provide a wedge fit between said sections and between said packing member and the well casing.

Another object of my invention is to provide a well swab with an adjustable means which is adapted to operate automatically in order to prevent the swab from becoming damaged from excessive loading.

My invention has many other objects, advantages, and features, some of which, with the foregoing, will be set forth at length in the following description where I shall outline a form of the invention, which I have selected for illustration in the drawings accompanying and forming a part of the present specification. In said drawings, I have shown one form of my invention, but it is to be understood that I do not limit myself to such form since the invention, as expressed in the claim, may be embodied in a large plurality of forms.

Referring to the drawings:

Fig. 1 is a side view showing the swab in position as it is lowered in a well casing.

Fig. 2 is a side view showing the swab in operative position in the well casing as it is withdrawn from a well casing.

Fig. 3 is an enlarged sectional view of the lower end of the swab in operative position.

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 3.

Fig. 5 is a transverse section taken on the line 5—5 of Fig. 3.

Fig. 6 is an isometric view of the movable packing section with the retaining collars removed.

Fig. 7 is an isometric view of a portion of the swab showing a part of the mandrel and the locking means for the stationary packing section.

Referring to the drawings, the numeral 10 indicates a well casing in which my improved well swab 11 is adapted to operate. The well swab 11 consists of a mandrel 12 having a shoulder 13, and a packing member 14 and a cap 15 mounted on said mandrel.

The lower end of the mandrel 12 is threaded as indicated at 16 so that the cap 15 may be threaded thereon. The mandrel 12 is preferably tapered, having its largest diameter just above the threaded end, and is provided with longitudinal dovetail sockets 17 and 18 which extend from the lower end of the mandrel. The dovetail socket 17 extends to the lower part of the shoulder 13 whereas the dovetail socket 18 extends only a portion of said distance. A locking means 19 is provided for use in connection with the socket 18, the purpose of which locking means will be made evident hereinafter.

The upper end of the shoulder 13 is threaded as indicated at 20 so that it may be threaded into the cable socket 21 of a cable (not shown), or other suitable suspending means.

The packing member 14 consists of a movable packing section 22 and a stationary packing section 23. The packing sections 22 and 23 may consist of metallic dovetail reinforcing guides 24, 25, oil-resisting rubber composition members 26, and metallic retaining collars 27 and 28, all of which are dovetailed as clearly shown in the drawings. The reinforcing guides 24, 25, and a ring of fibrous material 29 may be molded to the composition members 26 for reinforcement purposes. The ends of the members 26 are flanged as indicated at 30, said flanges being adapted to be placed in the grooves 31 of the retaining collars 27 and 28, thereby securely positioning the members 26 in said collars.

The intermediate portions 32 of the members 26 are enlarged and in operative position are adapted to form a tight fit with the sides of the well casing 10.

The lower collars 28 are provided with guide springs 33 which are designed to position the swab in the casing and to prevent the members 26 from contacting the well casing at all times other than when said members are in operative position.

The inner faces of the packing sections 22 and 23 are provided with complementary tapered faces which are adapted to abut when the swab is in operative position, as shown in Figure 2. The upper 34 and lower 35 portions of the tapered faces are preferably, but not necessarily, at a greater angle to the axis of the swab than the center portion 36. This construction insures a tight fit between the packing sections 22 and 23 and between the packing member 14 and the casing 10 when the swab is in operative position.

The well swab may also be provided with an automatic means for preventing it from becoming overloaded. As an instance of this arrangement, the lower part of the mandrel 12 is provided with a longitudinal bore 37 which communicates with a radial bore 38 through the mandrel, which may be at a point just above the locking means 19. The lower part of the bore 37 is enlarged as at 39 and threaded, and a safety valve 40 is adapted to be positioned in said enlargement. As an instance of this arrangement, a valve seat 41 is inserted in the enlarged bore 39. A valve housing 42 provided with a suitable ball 43, a compression spring 44, a washer 45, and an adjustment screw 46 is then threaded into said enlarged bore 39. An open passageway is provided through the safety valve 40 when said valve is in open position. The cap 15 is provided with a bore 47 the inner end of which is counterbored as indicated at 48 and which communicates with the bore 37 and the passageway through the safety valve 40 when said valve is in open position.

Mounted on the mandrel 12 just above the cap 15 is adjustment ring 49 which is provided for a purpose which will be made evident hereinafter, and packing ring 50.

In assembling the well swab, the safety valve 40 is mounted in the enlarged bore 39 and is adjusted to maintain any predetermined desired pressure by means of the adjustment screw 46.

The moveable packing section 22 is then mounted on the mandrel 12 by inserting the dovetail portion in the dovetail socket 17. The packing section 22 is thus adapted for longtudinal movement on said mandrel. The locking means 19 is then securely positioned in the upper end of the dovetail groove 18 by means of screw 51. The stationary packing section 23 is then mounted on the mandrel by inserting the dovetail portion in the dovetail socket 18. The adjustment ring 49, and the packing ring 50 are then mounted on the mandrel, after which the cap 15 is threaded onto the lower end of said mandrel. The stationary packing section 23 is thereby securely positioned on said mandrel and secured against all movement.

The well swab is then ready to be inserted into the well casing 10 by means of the usual cable or other conventional suspending means.

As the well swab is lowered in the well casing and liquid is encountered, the moveable packing section 22 is forced upward into its uppermost position as shown in Figure 1. This separation of the packing sections 22 and 23 provides a free passageway for the liquid past the well swab as the swab is lowered into the well and enables the swab to be lowered to the desired position in the well casing with a minimum of resistance and in a minimum of time.

The guide springs 33 prevent the packing sections 22, 23, from engagement with the sides of the well casing while said packing sections are in inoperative position and thereby prevent unnecessary wear on said sections.

As the well swab is raised in the well casing, the pressure on the upper side of the moveable packing section 22 forces said packing section downward into operative position, as shown in Figure 2. As previously stated, the tapered mandrel and the tapered abutment faces of the packing sections 22 and 23 insure a tight fit between said faces and between the intermediate periphery 32 of said packing member 14 and the inside of the well casing 10.

Liquid in the well above the swab is adapted to enter the radial bore 38 and the longitudinal bore 37 but is ordinarily prevented from further passage through the well swab by reason of the safety valve 40 and is therefore raised in the well with the swab. In the event that the pressure of the liquid above the safety valve 40 exceeds the predetermined pressure which said safety valve has been adjusted to maintain, said valve is adapted to open and allow the liquid to pass through the well swab until the pressure of the liquid above the valve no longer exceeds the pressure which the valve has been adjusted to maintain. The safety valve thus provides a means for preventing the well swab from becoming damaged due to excessive overloading.

Means are provided to insure a tight fit between the packing member 14 and the casing 10 when said swab is in operative position, even though the packing sections 22, 23, have been worn away to a considerable degree.

As an instance of this arrangement, the moveable packing section 22 is adapted to be forced into a lower position on the tapered mandrel 12 than the stationary packing section 23. The cap 15, adjustment ring 49, packing ring 50, and stationary packing section 23 are removed from the mandrel 12. The locking means 19 may be replaced by a somewhat similar locking means which extends further downward into the dovetail socket 18 by an amount equal to the width of the adjustment ring 49 at its narrower side, or the same locking means 19 may be used and a shim of the desired width inserted in said dovetail socket 18.

The stationary packing section 23, the packing ring 50 and the cap 15 are then again mounted on the tapered mandrel 12. This enables the moveable packing section 22 to be forced into a position below the stationary packing section 23 and thus expand said packing sections to a greater degree due to the construction of the tapered mandrel and of the inner tapered faces of said packing sections.

Although I have illustrated a well swab having a packing member consisting of two packing sections of equal proportions, the packing member may consist of any desired number of sections, and said sections need not necessarily be of equal proportions. One or more of said sections may be adapted for longitudinal movement on said mandrel.

From the foregoing description taken in connection with the accompanying drawings, the method of operation and the uses and advantages of my invention will be readily understood by those skilled in the art to which it appertains.

While I have described the principle of operation, together with the form of my invention which I now consider to be the best embodiment thereof, I desire to have it understood that the articles shown are merely illustrative and that the invention is not to be limited to the de-

tails disclosed herein, but is to be accorded the full scope of the appended claim.

I claim:

A well swab including a tapered mandrel, a cylindrical resilient packing member divided into at least two sections, the abutting faces of said sections being tapered, the upper and lower portions of said tapered abutting faces being at a greater angle to the axis of the swab that the center portions of said tapered abutting faces, at least one of said sections being slidably mounted on said mandrel, said slidable section being adapted to be longitudinally displaced in one direction to form a water passageway between said tapered faces when said well swab is lowered in a well casing and to be longitudinally displaced in the opposite direction to form a water-tight fit between said tapered faces and between said packing member and said well casing when said swab is raised in said well casing.

JOHN W. MacCLATCHIE.