July 21, 1942. A. PARMESON 2,290,351

SWAB

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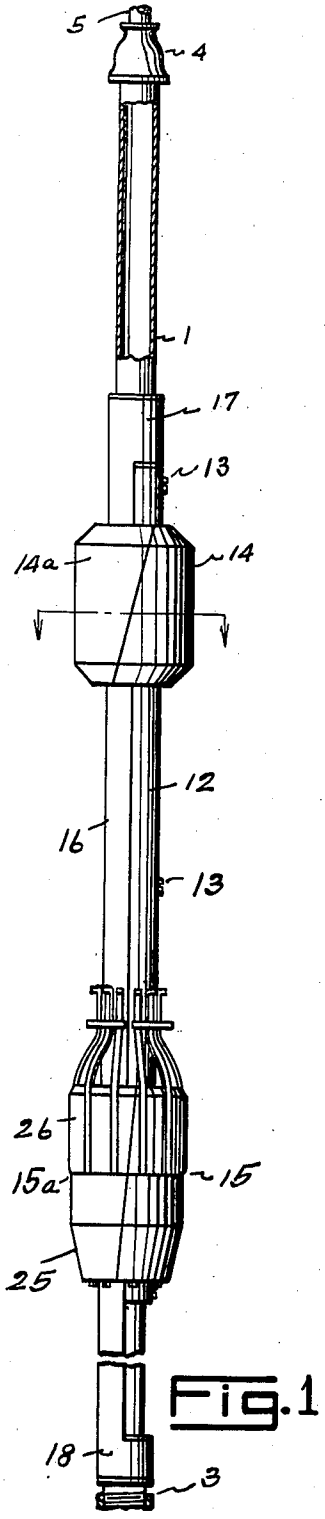


Fig. 1

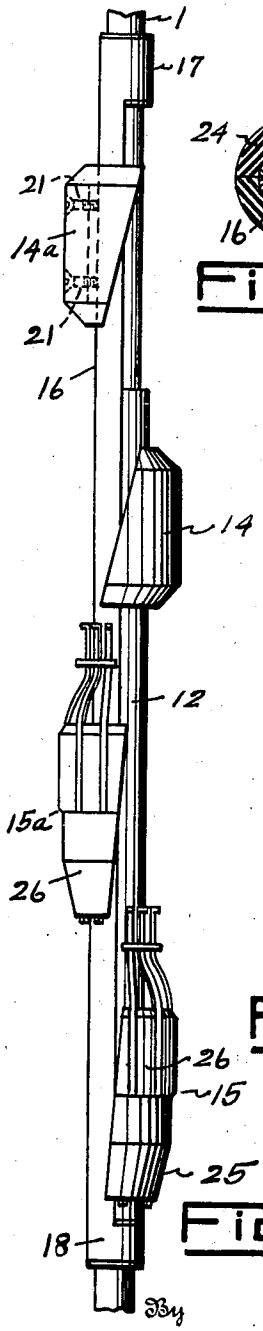


Fig. 2.

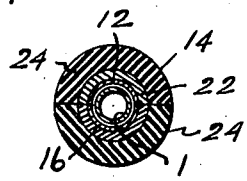


Fig. 4.

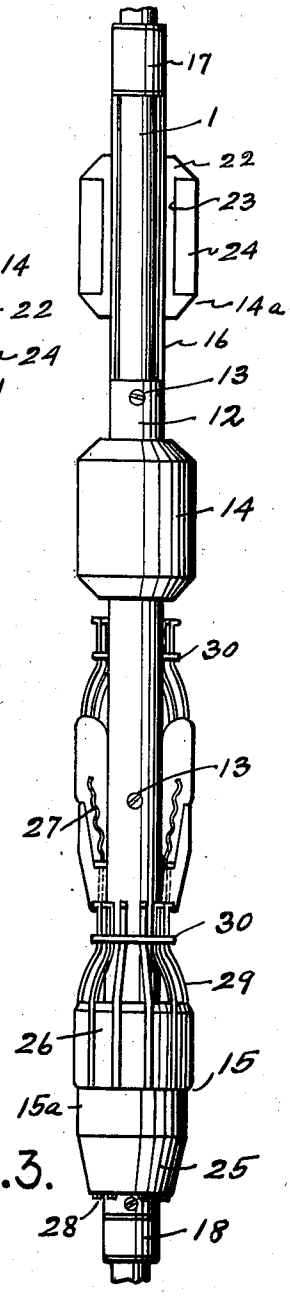


Fig. 3.

Inventor

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SWAB

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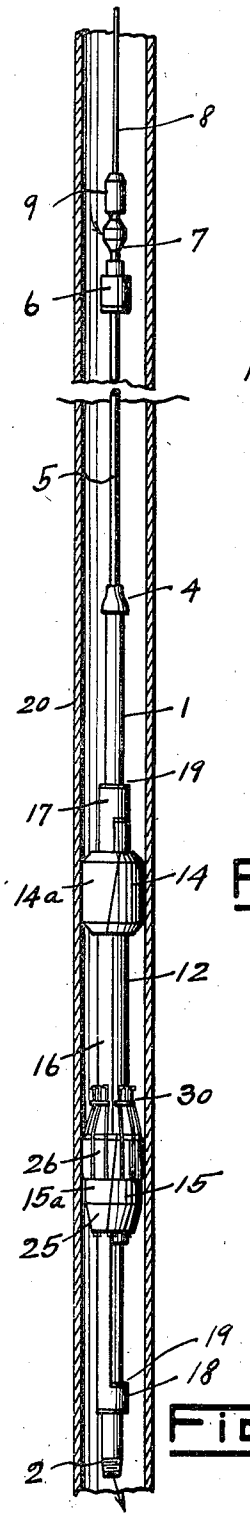


Fig. 9.

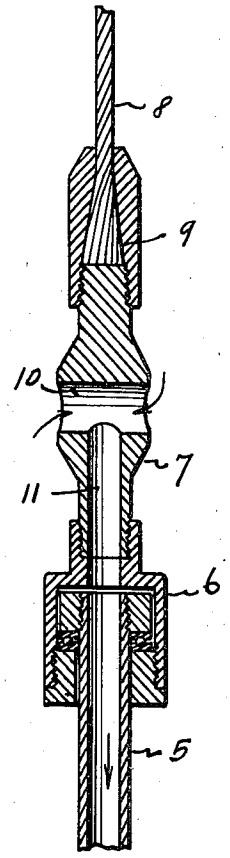


Fig. 5.

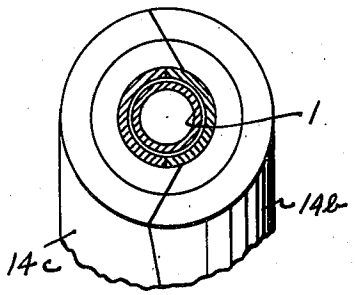


Fig. 8.

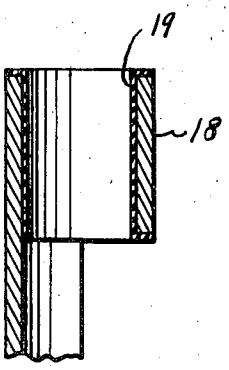


Fig. 6.

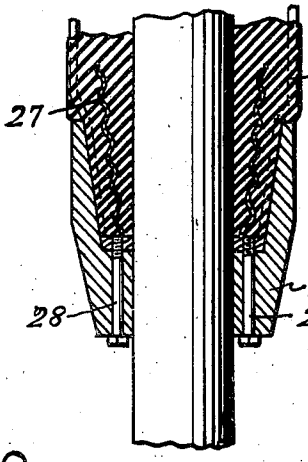


Fig. 7.

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UNITED STATES PATENT OFFICE

2,290,351

SWAB

Augustine Parmeson, Houston, Tex.

Application February 23, 1938, Serial No. 192,003

4 Claims. (Cl. 103—225)

This invention relates to a swab.

An object of the invention is to provide a swab of the character described specially designed for use in removing fluid, particularly the heavy drilling fluid, from a well, preparatory to bringing in the well.

It is another object of the invention to provide a swab of the character described that will readily move to open position as it moves downwardly through the fluid but which, upon upward movement of the swab will close to trap the fluid in the well pipe above it so that the trapped fluid may be discharged from the well as the swab is pulled upwardly.

It is a further object of the invention to provide, in a swab, a novel type of sectional swab rubber or packing of such construction that upon movement of the swab downwardly through the fluid the sections will separate to permit the passage of the well fluid but upon upward movement of the swab the complementary sections of the swab rubber will move into closed position to completely close the space between the well pipe and the swab mandrel whereby the liquid above will be discharged from the well upon upward movement of the swab.

It is a further object of the invention to provide in a swab, a sectional swab rubber, whose sections are so shaped that their contacting faces will fit closely together when the swab is in active position to prevent the leakage of the well fluid past the swab rubber.

A further object of the invention is to provide a swab of the character described of such construction that a vacuum will not be formed beneath the swab as the swab moves upwardly, there being an air channel through which air may be permitted to enter the well beneath the swab. It is usually not desirable to permit the creation of a vacuum or partial vacuum beneath the swab during the swabbing operations for the reason that if a vacuum is so created sand from the surrounding stratum may be drawn into the well or if the pressure on a producing stratum is suddenly relieved by creation of such vacuum, a blowout may be thereby induced and for that reason provision has been made for relieving the vacuum beneath the swab.

It is another object of the invention to provide a swab having an air conduit therethrough for relieving the vacuum beneath but which may be closed if it should be desired to produce a vacuum beneath the swab.

With the above and other objects in view, the invention has particular relation to certain novel features of construction, operation and arrangement of parts an example of which is given in this specification and illustration in the accompanying drawings, wherein:

Figure 1 shows a side view of a swab shown partly in section, showing the swab rubbers in closed position.

Figure 2 shows a fragmentary side view showing the swab open or in the position it will occupy in passing downwardly through the well fluid.

Figure 3 shows a fragmentary side view taken at right angles to the view shown in Figure 2.

Figure 4 shows a cross sectional view taken on the line 4—4 of Figure 1.

Figure 5 shows an enlarged fragmentary vertical sectional view, showing the swivel and cable socket.

Figure 6 shows an enlarged fragmentary vertical sectional view showing the upper end of the carrier.

Figure 7 shows an enlarged fragmentary vertical sectional view showing a type of swab rubber employed.

Figure 8 shows a fragmentary perspective view of another embodiment of the swab rubber, and

Figure 9 shows a side elevation of a complete swab shown in active or closed position, in a well pipe.

Referring now more particularly to the drawings, wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a tubular mandrel whose lower end may be outwardly threaded as at 2 to receive a cap 3 as shown in Figure 1 to be used in case it may be desired to close the lower end of the mandrel. A reducing nipple 4 is screwed on to the upper end of the mandrel and the lower end of a tube 5 may be attached to said reducing nipple 4. This tube 5 may be of any desired length and may be in the form of a metal pipe or a flexible hose whichever may be selected. A swivel 6 is connected to the upper end of the tube 5 and a nipple 7 is connected to the upper end of the swivel. The swab may be manipulated by means of a suitable cable 8 whose lower end is attached to the upper end of the nipple 7 by means of the conventional socket 9. The cable is operated from the ground surface and is permitted, by the swivel, to turn as may be required during the swabbing operation. The nipple 7 has a cross bore 10 and leading from this cross bore there is a lengthwise bore 11 which is connected into the passageway through the tube 5 and mandrel 1.

Secured on the mandrel 1 and spaced the re-

quired distance beneath the nipple 4 there is a half-round, fixed anchor 12 which is nested with the mandrel and secured thereto in any suitable manner, as by set screws 13. On this anchor are fastened the upper and lower sections 14, 15 of the swab rubbers, hereinafter to be more accurately described.

Slidably mounted on the mandrel 1 there is the movable anchor or carrier 16. This carrier is half-round and is nested with the mandrel opposite the fixed anchor 12 and its upper and lower ends terminate in the upper and lower sleeves 17, 18 which are fitted around and slidable on the mandrel. These sleeves preferably have rubber lining 19 so that sand will not so readily collect between the sleeves and mandrel and congest therein to prevent the movement of the carrier on the mandrel. The movable anchor or carrier 16 is of somewhat greater length than the fixed anchor 12 so that the distance between the sleeves 17, 18 will be somewhat greater than the length of the fixed anchor 12. On the carrier 16 are the upper and lower sections 14*a*, 15*a*, which are complementary to the corresponding sections of the sections 14, 15, so that when said corresponding sections are in coinciding relation as shown in Figures 1 and 9, they will close the space between the mandrel and the well pipe 20 in which the swab works.

The complementary sections 14, 14*a* and 15, 15*a*, may be secured on their respective anchors in any suitable manner as, for example, by set screws 21, as shown in Figure 2. The sections 14, 15 as shown, are of different construction, but it is to be understood that the swab rubbers composed of the sections 14, 14*a* or the swab rubbers composed of the sections 15, 15*a* may be used interchangeably.

Each section 14, or 14*a* is composed of a supporting cage 22 having an external circumferential groove 23 to receive the packing material as 24. Each section 15, 15*a* is composed of a half round lower end ferrule 25 into which the lower end of the half round packing material 26, such as rubber, is fitted, as more clearly shown in Figure 7. The rubber 26 is secured in the ferrule by being molded about a corrugated, half round, cup shaped anchor 27, preferably formed of metal and which is secured in place by means of the bolts 29 which are fitted upwardly through the bottom of the ferrule and whose upper ends are threaded to the lower end of the anchor 27 as shown in Figure 7.

A series of upstanding flexible rods 29 have their lower ends inwardly turned through the material 26 adjacent the upper end of the ferrule and they closely embrace said material 26 and their upper ends are attached to an open, expansible metal ring 30 whereby the rubber 26 is protected and maintained in place.

It is to be noted that the contacting faces of the sections 14, 14*a* and 15, 15*a* are diagonal with respect to the axis of the mandrel 1 and in the form shown in Figure 8, the said faces of the section 14*b* diverge from each other and the opposing faces of the section 14*c* fit against the faces of the section 14*b* with wedge like effect so as to form a very close fit to prevent leakage. In use, the swab may be assembled as shown in Figure 9 and attached to the lower end of the cable 8 and lowered into the well. When the swab becomes submerged in the liquid in the well the buoyancy of the sections 14*a* and 14*b* will cause said sections to be retarded by the liquid and the mandrel 1 will move downwardly relative to the carrier 16 until the lower end of the anchor 12 contacts with the upper end of the sleeve 18. In this position the sections 14, 15 of the swab rubbers will be staggered with relation to the sections 14*a* and 15*a* as shown in Figures 2 and 3 so that the swab will readily move downwardly through the liquid, there being a free passageway for liquid between the sections of the swab rubbers. As stated the contacting faces of the sections of the swab rubbers are diagonal. The angle is such, however, as to permit the sections 14, 15 to move downwardly relative to the sections 14*a*, 15*a* as above stated. The liquid to be removed will thus pass above the swab. Upon upward movement of the swab, the mandrel 1 will move upwardly relative to the carrier 16 so as to carry the sections 14, 15 into coinciding relation with the corresponding sections 14*a*, 15*a*, so as to completely trap the liquid above and prevent it from escaping past the swab as the swab moves upwardly, the contacting faces of the sections of the swab rubbers forming fluid tight joints. As the swab is pulled upwardly the liquid above it will be carried upwardly and eventually discharged from the well. A vacuum will not be formed beneath the swab, however, for the reason that air will be permitted to enter through the bores 10, 11 and pass downwardly through the tube 5 and the mandrel 1 and be discharged into the well from the lower end of said mandrel as indicated by the arrows in Figures 5 and 9.

If, however, it should be desired to create a vacuum in the well beneath the swab, during the swabbing operation, the lower end of the mandrel may be closed by the cap 3 which may be screwed thereon as indicated in Figure 1.

The tube 5 may be extended any desired distance above the swab rubbers. If the swab is lowered into the liquid at a depth which would otherwise overload the swab upon upward movement thereof, the excess liquid above the swab may drain out through the bores 10, 11 and through the tube 5 and the mandrel 1 so that the load of liquid sustained by the swab, upon upward movement, will be only the liquid trapped between the upper swab and the bore 10.

It sometimes happens in swabbing that strong gas pressure beneath the swab will be developed. In such event the excess pressure will be relieved by passing upwardly through the mandrel 1 and tube 5 and out through the bores 10, 11 and then on upwardly from the well.

The drawings and description disclose what is now considered to be preferred forms of the invention by way of illustration only while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. A swab shaped to be lowered into a well containing liquid, and comprising a tubular mandrel, a nipple mounted on the upper end of said mandrel, tubular connecting means connected into said nipple at one end, a swivel means connected to the other end of the nipple, a cable socket, a tubular nipple mounted between said swivel and cable socket, said last mentioned nipple having a cross bore therein connected to the passageway through the mandrel, sectional sealing means mounted on said mandrel relatively movable into spaced relation upon downward movement of said mandrel and into coinciding relation upon upward movement of the mandrel.

2. A swab for wells comprising a mandrel, sealing means on the mandrel formed of sec-

tions, one of said sections being fixed relative to the mandrel, upper and lower stops fixed on the mandrel one above and the other beneath the fixed section, a longitudinally movable section carrier on the mandrel having upper and lower sleeves slidable on the mandrel and forming stops engageable with the stops fixed on the mandrel to limit the range of movement of the carrier, the other section being fixed on said carrier, whereby said sections are relatively movable into spaced relation upon downward movement of the swab to provide a passageway for liquid between said sections and the sections being relatively movable into coinciding relation upon upward movement of the swab to form a complete seal between the mandrel and the walls of the well, said fixed and movable stops forming means for limiting the relative movement of said sections in each direction.

3. A swab for wells comprising a mandrel, a fixed and a movable semi-cyclindrical shell around the mandrel, the movable shell being longer than the fixed shell, sleeves slidably connecting the ends of the movable shell to the mandrel and being arranged to co-act with the ends of the fixed shell to limit longitudinal movement of the movable shell, sealing means formed of sections, one of which is on the movable shell and the other being on the fixed shell, said sections being positioned on the shells so that they are in confronting relationship when the movable shell is in one extreme longitudinal position and are spaced apart when the movable shell is in the opposite extreme position.

4. A swab shaped to be lowered into a pipe in a well containing a liquid and comprising a tubular mandrel, a semi-cylindrical anchor fitted to and removable from the mandrel, upper and lower sealing member sections fastened to the anchor, a semi-cylindrical carrier mounted on the mandrel opposite the anchor, sleeves on the upper and lower ends of the carrier fitted around and slidable along the mandrel and spaced a distance apart greater than the length of the anchor, upper and lower sealing member sections fastened to the carrier, said sealing member sections on the carrier being movable, by the liquid as the swab is lowered therethrough into upper position in staggered relation with the sealing member sections on the anchor to provide a passageway for the liquid between the sections, said sections on the anchor being movable into confronting relationship with the corresponding sections on the carrier as the swab is moved upwardly through the liquid to thus form complete upper and lower sealing means between the mandrel and the walls of the well, said anchor being of such length as to allow said sealing member sections to move into said two positions only.

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