Feb. 24, 1925. 1,527,956

O. MOWERS

SWAB

Filed March 6, 1922

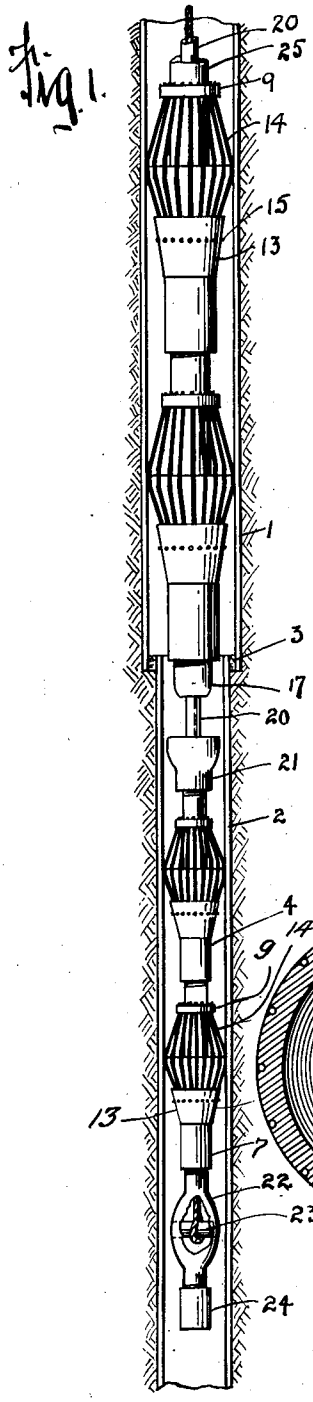


Fig. 1.

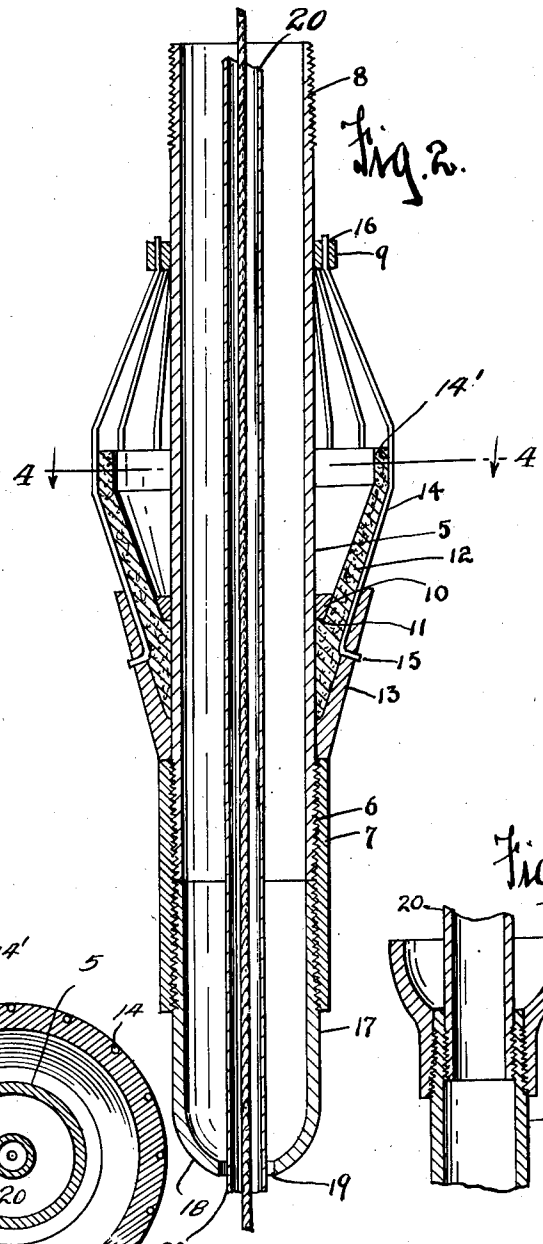


Fig. 2.

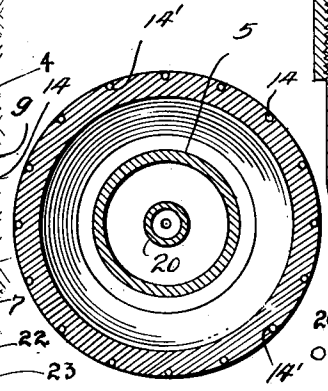


Fig. 4.

Fig. 3.

Inventor

OSMYN MOWERS,

By Jesse R. Stone

his Attorney

Patented Feb. 24, 1925. 1,527,956

UNITED STATES PATENT OFFICE.

OSMYN MOWERS, OF HOUSTON, TEXAS.

SWAB.

Application filed March 6, 1922. Serial No. 541,411.

To all whom it may concern:

Be it known that I, OSMYN MOWERS, a citizen of the United States, residing at Houston, Harris County, Texas, have invented a certain new and useful Improvement in Swabs, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in swabs for raising liquid from wells. It has especial application to swabs for use in cleaning deep wells in drilling for oil, water or gas.

In the drilling of deep wells, it is often necessary to drill the well down for a certain distance with a drill-bit of large diameter and after a certain depth has been reached to set a casing in the hole to retain the side walls thereof. It is then necessary to drill down through the casing already set with a drill of smaller diameter. This may be repeated several times before the well is completed, with the result that the hole is gradually decreased in diameter from top to bottom in several stages. In the employment of ordinary swabs now in use, a well drilled in this manner can not be properly cleaned of fluid, it being possible to introduce a swab of the largest diameter and clean the well to the depth to which the largest diameter extends, but it is not possible thereafter to use a swab for cleaning lower reduced portions of the well hole.

An object of my invention is to provide a swab made up of a plurality of sections, each section adapted to fit a different sized part of the hole, these sections being of decreasing diameter from top to bottom.

Another object is to provide a swab which is adapted to engage a load of certain predetermined weight.

Another object is to provide a swab the construction of which is adapted to sustain heavy loads and to be protected against mutilation.

Another object is to provide a swab which is simple and inexpensive in its construction and which is adapted to withstand the rough usage to which such tools are subjected. Other objects and advantages of my invention will be apparent to one skilled in the art, from the more detailed description which follows.

Referring to the drawing herewith wherein Fig. 1 is a side elevation of my invention shown in a well, the said well being shown in central longitudinal section. Fig. 2 is a detailed section longitudinally of one of the cups used with my invention. Fig. 3 is a central longitudinal section of the upper coupling member between two of the different sections. Fig. 4 is a cross-sectional view on the line 4—4 of Fig. 2.

In Fig. 1 I have shown a longitudinal section of a bored hole having therein an upper casing 1 of large diameter and a lower casing 2 of smaller diameter, these casings being used to sustain the side wall of the hole where the well has been drilled with bits or drills of decreasing size. It is ordinarily the custom where a hole has been decreased in diameter in this manner, to seal up the joint between the two sizes of pipe as shown at 3 by some sealing means such as a seal of lead or other similar material to maintain the hole liquid-tight. While I have shown but one joint of this kind, it is obvious that the well might be decreased in diameter several times more and in such construction the casing would also be decreased in diameter in the same manner.

The type of swab which is adapted to clean a hole of this construction is shown in the drawing. I provide a separate section for each different diameter of the hole. The lower section is of smaller diameter and is constructed in the same manner as each of the preceding sections. Each separate section comprises a series of suckers or cups 4 connected together by couplings. These cups or swabs may be of any desired number and while I have shown two cups on each section, I wish it understood that any number may be used. In some cases it will be possible of course, to handle the fluid with one cup only on each section.

Each of the separate cups is constructed in accordance with the design disclosed in Fig. 2. There is a length of pipe or tubing 5 threaded at its lower end at 6 for connection to a coupling 7. The upper end is also threaded at 8 for connection by means of a similar coupling, to the swab above. On the pipe 5 at the desired position thereon I fix a ring 9 by brazing or other similar means. Spaced at a point below this ring 9 I fix a second ring 10. This lower ring tapers slightly toward the lower end providing a shoulder 11 for contact with the cup 12.

Said cup 12 is of flexible material preferably of some composition containing rubber which will resist wear and be strong enough to sustain a heavy load and yet be adapted to collapse somewhat. It may be tapered downwardly and adapted to fit within a lower flaring sleeve or sustaining ring 13. A shoulder on the inner face thereof contacts with the lower face of the ring 10 to limit its movement upwardly on the pipe. When the sleeve 13 has been forced upwardly against the cup, the said cup will be gripped or clamped between the sleeve 13 and the ring as shown. To support the cup and to prevent the same from mutilation when going out of or into the hole I provide a series of wires or rods 14. These rods are bent outwardly at 15 so as to extend through openings in the lower flaring sleeve 13. The rods are bowed outwardly to the shape of the cup and are inclined inwardly at a point spaced above the cup so that the upper ends of the said rods may project through openings 16 in the upper ring 9 previously described. These rods are embedded in surface grooves or depressions 14′ in the cup (Fig. 4) and are resilient and are adapted to be forced inwardly by projections on the interior of the pipe or at the joints and when thus forced inwardly the upper ends thereof will slide vertically through the openings in the ring 9. This construction is an improvement upon the type of cup shown in my previous co-pending application Serial Number 462,385 filed April 18th, 1921:

In arranging my improved swab in sections to accommodate the different sizes of the hole, I provide a coupling means between the same so that when fitted together there will be a fluid-tight joint between the separate sections. In accomplishing this I provide at the lower end of the upper section a swedged nipple 17 having the lower end thereof rounded as shown at 18 in Fig. 2. This nipple is provided with a central opening 19 therethrough to allow passage for a pipe 20 connected with the section below.

The section next beneath this upper section is provided with a central pipe 20 secured to the upper end of the cup next beneath. This pipe extends upwardly through the section of swab above for a predetermined distance and is open at the upper end. At the joint between the upper end of the lower section and this pipe 20 I provide a nipple 21 shown particularly in Fig. 3. This nipple is rounded on its inner face and is shaped to receive the lower rounded end 18 of the section above. The cable by which the swab is supported and operated is extended downwardly through the different sections composing my swab and is secured at the lower end of the lowest section. To provide an attachment for the cable I screw into the coupling 7 at the lower end of the said section a joint 22 of special construction having an enlarged central portion with a cross pin 23 therein to which the cable may be attached by any well known means. The lower end of the joint 22 is protected by means of a coupling or collar 24. If it is desired to use a foot valve as is customary in the ordinary type of swab the said foot valve may be of any ordinary type and may be attached to the coupling 24. In the operation of the swab here described the presence of a foot valve will not be absolutely necessary, as will more clearly appear.

In describing the operation of my device it will be assumed that the well is of only two different diameters. Thus there will be the lower section of small diameter to fit the lower pipe 2 and the upper section of larger diameter to fit the larger pipe 1. The two sections of the swab will be assembled as shown in the drawing, the cable extending downwardly through the two sections and secured to the cross pin 23 at the lower end. The device will then be lowered downwardly into the well. The cups 12 composing the swabs are adapted to give inwardly, collapsing a certain amount so that the fluid will be allowed to pass outside of the cups and between the same and the inner face of the casing. A part of the fluid in the hole may also pass upwardly through the central passage in the pipe composing the body of the swab. The upper section will drop downwardly until it contacts with the upper end of the lower casing 2 and will there stop. The lower section will drop away from the upper section downwardly as far as is desired. The pipe 20 will slide downwardly through the opening 19 in the upper section and when the lower section is raised will allow the fluid outside of the lower cups and above the same to overflow into the upper end of the pipe 20 and thus find a passage downwardly and past the swab. It will thus be seen that when the lower section is pulled upwardly by the cable it will raise, as its load, the fluid which has passed these cups and fills the space between the body of the swab and the casing above the cups. This fluid will extend to the upper end of the pipe 20. When the load on the lower section is thus raised upwardly the fluid will be forced up into the larger casing 1 and past the cups that form that portion of the swab. When the coupling 21 contacts with the lower nipple 18 of the upper section there will be formed a fluid tight joint at this point and the fluid above the lower section will have been drawn upwardly into the casing 1. A further raising of the lower section will obviously raise the upper section therewith and the fluid which has passed the cups of the upper section will be raised by

the expansion of said cups under the weight of this load and be thus carried upwardly to the surface. To regulate the load above the upper cups the pipe above the cups of the upper section shown at 25 may be extended upwardly as far as is desired. It might for example, be extended upward for a hundred feet and the fluid that would be raised by the swab would be the amount of fluid which could be contained within the space above the lower cup of the upper section and the upper open end of the pipe 25. It would of course be obvious that fluid above the upper end of the pipe 25 would overflow into the central passage through the said pipe and find an outlet downwardly therethrough. Thus by regulating the length of the pipe 25 the weight of the load could be adjusted to any desired amount. There would be no danger of overloading the swab in this manner and the size of the load could be regulated before the swab was inserted into the well. The load of fluid thus brought upwardly to the surface would pass outwardly through the outlet provided therefor at the surface in the usual manner. By allowing this escape of fluid through the central pipe the vacuum which would otherwise tend to result when the swab is raised would be relieved and the raising of the load greatly facilitated.

The advantages of this type of construction are obvious. The construction of the swab itself is of simple and durable design and not liable to become mutilated in use. It is strong in its construction and will raise loads considerably in excess of the loads handled by the ordinary type of swab. The arranging of the swab in sections in the manner described will enable the use of this tool in wells which cannot be cleaned of fluid with the ordinary type of swab now in use. These and other advantages will be apparent to one skilled in the art without further description.

What I claim is new and desire to protect by Letters Patent is:

1. In a swab, a length of pipe, a ring fixed thereon forming a shoulder, a cup of flexible material shaped to fit against said shoulder, a sustaining ring below said cup having a row of perforations therein, an upper ring fixed on said pipe above said cup and having vertical perforations therein and rods fitting in the perforations in said sustaining ring and bent upwardly along said cup and having the upper ends thereof fitting slidably through the openings in the said upper ring in the manner described.

2. In a swab, a length of pipe, an upwardly flaring cup of flexible material adapted to be clamped thereon, and means to protect and support said cup comprising a sustaining ring, rods removably secured thereto, and an upper ring fixed on said pipe and having openings therein to slidably receive the upper ends of said rods.

3. In a swab, a supporting member, a cup of flexible material thereon, a sustaining ring fitting over the lower end of said cup, rods passing through openings in said cup and bent upwardly to conform to the shape thereof, and a ring on said support above said cup having openings therein in which said rods are slidably received.

4. A multiple stage swab for use in wells wherein the diameter of the well is successively decreased, comprising a separate section for each size of casing to be cleaned, a liquid lifting cup on each section, a supporting cable and means adjacent the lower end of the lowest of said sections to which said cable is attached.

5. In a swab, a cylindrical supporting member, a shoulder thereon, a cup of flexible material on said supporting member below said shoulder, a sustaining ring below said cup and supporting the lower end thereof, a series of rods inside said sustaining ring and bent to support said cup, and a ring fixed to said support above said cup and having openings in which the upper ends of said rods are slidably supported.

6. In a multiple stage swab, a plurality of sections of different diameter, collapsible suction means on each said section, a rounded lower end on the upper sections, means to make a close fit between said sections comprising a cup on the upper end of each of the lower sections wherein the rounded lower end of the adjacent upper section is held by gravity, and a cable for operating said swab.

7. In a swab, a longitudinal supporting member, a flaring cup of flexible material on said supporting member, means to secure said cup in position including a cup-shaped sustaining ring below said cup, a ring above said cup having openings therein and rods slidable in the openings in said last named ring to support and protect said flexible cup.

8. In a multiple stage swab, a plurality of sections of pipe of different diameter, suction cups on each section, an upwardly extending pipe on each section above said cups forming an open passage through said swab, said pipe being of such length as to regulate as desired the amount of liquid to be carried, and means to raise said swab from the well.

9. In a multiple stage swab, a plurality of open pipe sections of different diameter, flexible cups on each said section, adapted to allow passage of fluid outside thereof while going into the well, a detachable joint between said sections, a cable to raise and lower said swab and means to regulate the load carried by said swab.

10. In a multiple stage swab, a plurality of swab sections of different diameter de-

creasing downwardly, means to raise and lower said swab and means to relieve the vacuum when said swab is raised.

11. In a swab, a central pipe, suction means on the outer surface thereof, an upwardly extending pipe connected with said central pipe of such length as to properly regulate the load to be lifted, and means to raise and lower said pipe.

12. In a swab, a pipe of predetermined length having an open and unobstructed passage therethrough, a suction means secured on the outer surface thereof adjacent the lower end and means to raise said pipe.

13. In a swab, a pipe, a suction means thereon and means to relieve the vacuum when said swab is raised upwardly in a well.

14. A multiple stage swab for use in wells wherein the diameter of the well casing is decreased in successive stages from the top to the bottom, comprising a section of pipe for each successive stage of the hole, a collapsible cup on each section adapted to fit the corresponding stage of the hole, a cable secured to the lowest of said sections to support said swab, and automatically detachable joints between adjacent sections maintained in fluid tight relation by the weight of said sections.

15. In clearing liquid from wells wherein the diameter of the hole decreases in successive stages from top to bottom the improvement consisting of providing a separate lifting means for each stage of the hole, clearing the fluid from the lowest section first and forcing the fluid up into the next higher stage allowing the back flow into the said lowest stage of all but the desired load, then raising the fluid from the next higher section in the same manner and repeating the operation until the last upper section has been thus cleared.

16. In a swab, a pipe, a frusto-conical cup of flexible material thereon, a sustaining ring clamping the base of said cup to said pipe, and protecting and reinforcing means for said cup comprising rods secured at the base of said cup, bent outwardly along the outer face thereof, and extending beyond the edge of said cup, and a ring to which the extended ends of said rods are slidably engaged.

17. In a swab, a support, a cup of flexible material disposed on said support, a sustaining member mounted on the support and with which the closed end of the cup is engaged, and protecting and reinforcing means for said cup comprising rods secured to the cup and extending along the outer wall thereof, said rods extending beyond the lip of the cup.

18. In a swab, a support, a cup of flexible material disposed on said support, a sustaining member mounted on the support and with which the closed end of the cup is engaged, protecting and reinforcing means for said cup comprising rods secured to the cup and extending along the outer wall thereof, said rods extending beyond the lip of the cup, and means surrounding the support for sustaining the projecting ends of the rods.

19. As a sub-combination in a swab, a flexible cup of mushroom shape having an annular lip and provided with longitudinal spaced grooves in its outer surface.

20. In a swab, a support, a cup of flexible material mounted on the support, said cup having a mushroom shape and being provided with longitudinal grooves in its outer surface, a protecting cage comprising rods embedded in the grooves of the cup and extending beyond the lip thereof, a ring on the support with which said rods are engaged, said rods being inclined inwardly from the cup to the ring, and a sleeve mounted on the support receiving the contracted end of the cup and surrounding the ends of the rods thereat.

In testimony whereof, I hereunto affix my signature this the 2nd day of March, A. D. 1922.

OSMYN MOWERS.