Nov. 24, 1942. C. J. O'DONNELL 2,303,134

MEANS OF PACKING WELLS

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Fig. 1

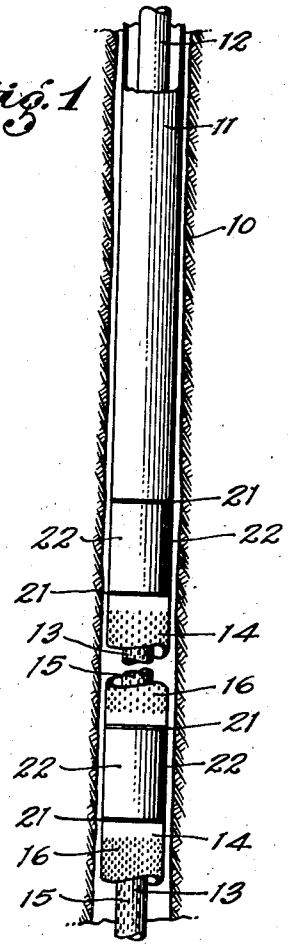


Fig. 2

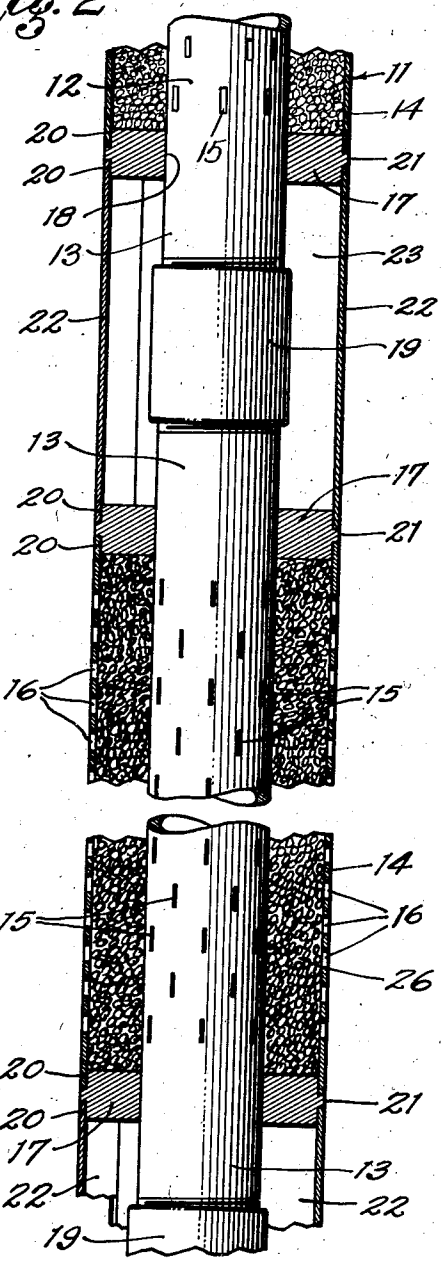
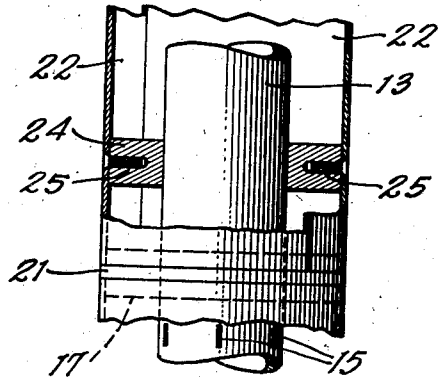


Fig. 3



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MEANS OF PACKING WELLS

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2 Claims. (Cl. 166—5)

This invention relates to the preparation of oil wells and the like for production and particularly pertains to a means of packing a well.

A present trend of oil field practice in preparing a well for production is to lower a casing structure into a well adjacent the lower end of which an inner perforate liner tube is disposed and projects from the lower end of the main casing. This liner tube is fitted with an outer perforate casing or sheath spaced therefrom and closed around the inner liner at its opposite ends so that the circumscribing space may be filled with gravel or other comminuted material which will act as a filter for inflowing cognate well fluids. It is often the practice to extend the inner liner completely through the perforate sheath and to attach additional sheaths on the inner liner at other lengths in the well. In this practice it is necessary to space the contiguous ends of the outer sheath sections upon opposite sides of the coupling or joint of the inner liner so that access may be had to the couplings to tighten or unscrew them. It will be evident that since the sections of perforate sheath or other perforate casing are considerably larger in diameter than the diameter of the inner perforate liner that a constriction will occur between the ends of the perforate sheath sections which will increase the hazard involved in lowering the structure into a well or withdrawing it therefrom, since under such circumstances the casing will tend to catch and hang up on the side walls of the well bore and may be ripped or otherwise damaged. It is also evident that sand and other material from the geological formation may fill in to the restricted area between the enlarged casing portions and thus cause the casing to stick when an atempt is made to withdraw it from the hole. It is the principal object of the present invention, therefore, to provide a method and means of preparing and lowering a pre-packed liner for oil or water wells into a drilled hole in a manner to insure that the liner will not become lodged on the way into the hole or when withdrawn therefrom, that it may be readily withdrawn if desired, and that the accumulation or packing of extraneous materials around the casing will be minimized. It is the further object of the present invention to provide a liner of the type described in which the above mentioned advantages are accomplished, and which at the same time will insure that the liner parts may be readily connected or disconnected as required without inconvenience.

The present invention contemplates the provision of an inner liner around which and at points in the length thereof are mounted outer perforate liners or sheaths which are mounted upon the inner liner at points between the joints thereof and are closed at their opposite ends, said sheaths providing well strainers and being filled with packing material, such as gravel, the spaces between contiguous ends of sheaths and in which spaces the detachable joints of the inner liner occur being enclosed by sections providing a continuous uniform diameter for the liner structure including the space between the sections of perforate outer sheathing.

The invention is illustrated by way of example in the accompanying drawing, in which:

Figure 1 is a view in section and elevation showing the positioning of a liner of the character described in a well bore.

Fig. 2 is an enlarged view in central vertical section showing the construction of the liner assembly.

Fig. 3 is a fragmentary view in central section and elevation showing an alternate form of sleeve fastening.

Referring more particularly to the drawing, 10 indicates a well bore into which a casing 11 is set. Mounted within the casing is a tubing 12 including one or more perforate inner liner sections 13 at its lower end or at intermediate levels. Mounted at the lower end of the outer casing 11 or at levels in the length thereof corresponding to the levels of perforate inner liner sections 13 are perforate sheaths 14. The inner liner 13 is formed with the usual perforations 15 and the outer liner is perforated as indicated at 16. The perforate sheath sections 14 are mounted upon the lengths of inner liner by end plates 17. These plates are of an outside diameter agreeing with that of the sections 14 and have a central opening 18 in them through which the inner liner or tubing 12 extends, the said openings substantially fitting the inner liners so that the liners and the plates may be welded together. The tubing 12 or inner liners 13 are secured together by couplings 19. These couplings must be screwed and unscrewed when the lengths of tubing and inner liner are assembled or separated and as the structure is run into the well bore or withdrawn therefrom. The plates 17, therefore, are spaced a distance upon opposite sides of the coupling ends of the members 12 and 13 to insure that pipe tongs may be placed on the couplings and the members to facilitate in tightening or loosening

the coupling. The length of the inner perforate sheath 13 may be as desired. In fitting the perforate sheathing sections 14 on the plates 17 the plates are turned down at their opposite ends to a diameter agreeing with the inside diameter of the perforate sheath, as indicated at 20, which sections are separated by a circumferential bead 21 having an outer diameter agreeing with the outer diameter of the sheath. This prevents the ends of the perforate sheaths from catching on side walls of the well bore while going into or out of the hole. Mounted upon the innermost portions 20 of contiguous plates 17 are sleeves 22 which span the space 23 between the contiguous plates 17 and within which spaces the couplings 19 occur. The sleeves 22 may be welded in position or if desired may be screwed in place. It is preferable that the sleeve 22 shall be made in a plurality of parts separable along vertical joints, under which circumstances the contiguous edges may be formed with a V-shaped groove and tongue and welded together therealong. It will be evident that these welded joints may be readily separated when desired or that the sleeve segments may be secured in position by collars 24 fastened onto the inner liner sections 13 and receiving screws 25 which pass through the sleeve sections 22, as shown in Fig. 3 of the drawing.

In operation of the present invention the sections of inner liner or tubing 12 are fitted with the perforate sheathing sections 14 so that a packing space 26 occurs around and within the sheathing section. Packing material, such as gravel, is placed within the spaces indicated at 26. The sheathing sections are sealed and disposed upon opposite sides of the coupling joints 19 of the inner sections 12. The plates 17 are fastened in position upon the inner liners 13 and the perforate sheathing is placed thereover. This causes a space to occur between the contiguous plates 17 to accommodate the coupling 19 and to permit pipe tongs to be placed upon the inner liner and the coupling. After the joint of the coupling 19 has been "set up" the outer sleeve sections 22 are applied as indicated in Fig. 2 of the drawing. These sections are secured in position and will tend to "streamline" the casing 11 so that no open or restricted joints will occur between the ends of the perforate sheathing and around the inner liner, thus producing the result particularly shown in Fig. 2 of the drawing. The structure may then be lowered into the well and the casing set. If it is desired to meet any emergency by withdrawing the casing from the well it will be evident that the only binding action upon the casing will be that produced by the friction of the wall of the well against the surface of the casing and the sleeves 22 which are both of the same uniform outer diameter.

It will be seen that by the method and means of setting the pre-packed perforate casing it is possible to rapidly run the casing into the hole without having it "hang up" on the side wall, thereby subjecting the casing to undue strain while insuring that the casing is of uniform diameter and strength throughout its length.

While I have shown the preferred form of my invention and a method of practising the same, it is understood that various changes in the combination, construction and arrangement of parts and variation in the steps of the method may be made by those skilled in the art without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A pre-packed liner for wells, comprising an inner string of pipe including a plurality of connected pipe sections, sections of said pipe being perforated to form an inner perforate liner for a well, outer perforate sheathing sections shorter in length than the length of the inner sections and arranged with their ends terminating short of the joints of the inner sections, whereby a gap will be formed between the contiguous ends of the outer perforate sheathing at joints of the inner section, filter material filling the annular space occurring between the inner liner and the outer perforate sheathing, closures at the opposite ends of the outer liner for confining the filtering material within said inner space, and cylindrical sleeves bridging the gap between the ends of the perforate sheathing, said sleeves being substantially equal in diameter with the outer perforate sheaths, whereby a continuous cylindrical outer surface of uniform diameter will be provided by the perforate sheath.

2. A pre-packed liner for wells, comprising an inner string of pipe including a plurality of connected pipe sections, a section of said pipe being perforated to form an inner perforate liner for a well, an outer casing including a plurality of sheathing sections each shorter in length than the length of the inner pipe sections and arranged with their ends terminating short of the joints of the pipe sections, whereby a gap will occur between the contiguous ends of the outer sheathing sections adjacent to the joints of the inner sections, the section of the outer sheathing which circumscribes the inner perforate pipe section being also perforate, filter material filling the annular space between the inner perforate pipe section and the outer perforate sheathing section, closures at the opposite ends of the outer sheathing sections for confining the filtering material within said annular space and cylindrical sleeves bridging the gap between the ends of the outer sheathing sections, said sleeves being substantially equal in diameter to the outer sheathing sections, whereby a continuous cylindrical outer surface of uniform diameter will be provided by the outer sheathing sections.

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