March 8, 1927. 1,620,412

J. TWEEDDALE

LINER FOR OIL WELLS

Filed July 30, 1925 2 Sheets-Sheet 1

Fig. 1.

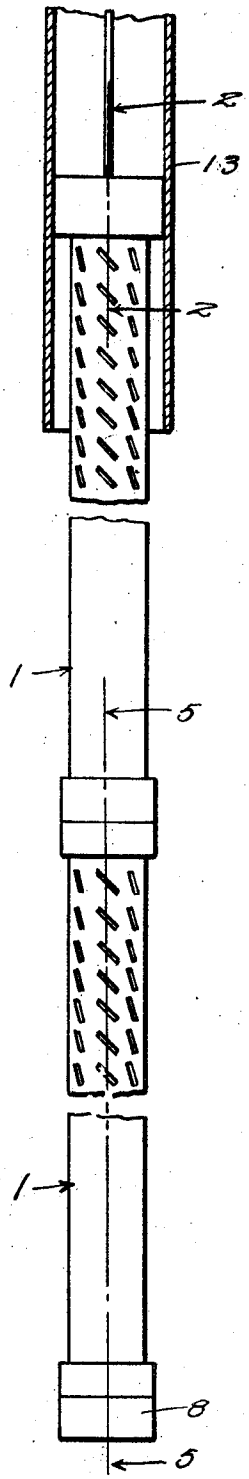


Fig. 2.

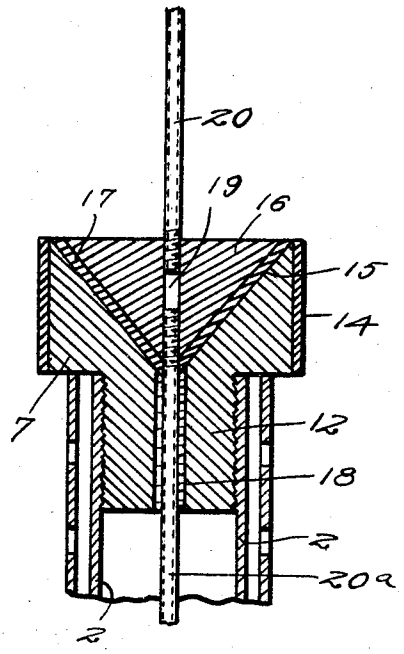
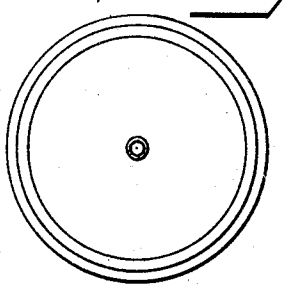


Fig. 3.



Inventor

John Tweeddale

By W. Randolph Jr. Attorney

March 8, 1927. 1,620,412

J. TWEEDDALE

LINER FOR OIL WELLS

Filed July 30, 1925 2 Sheets-Sheet 2

Fig. 4.

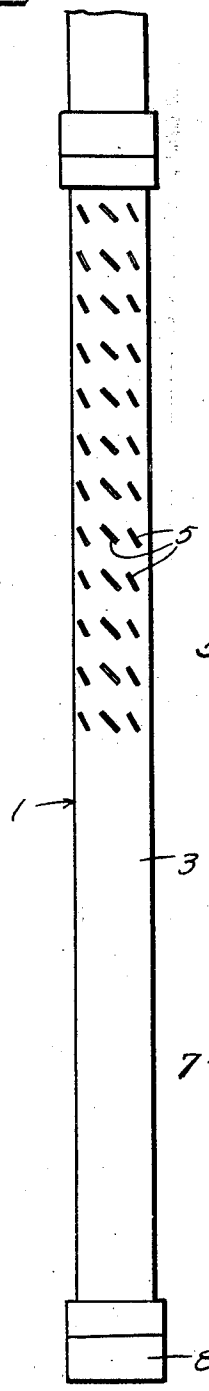


Fig. 5.

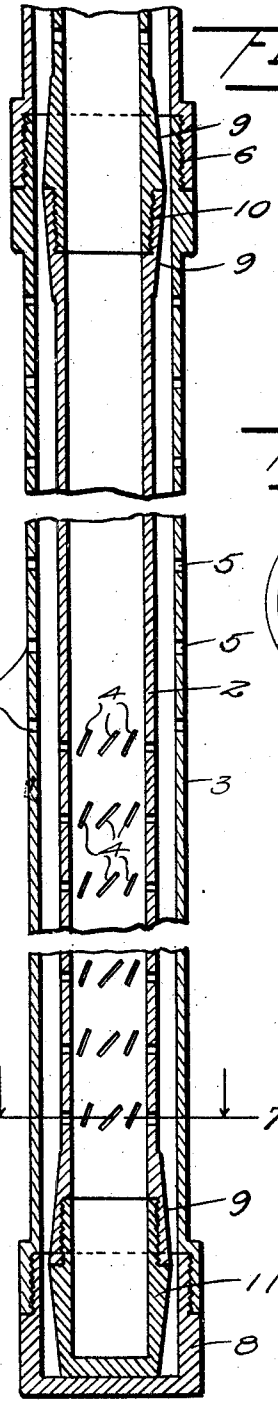


Fig. 6.

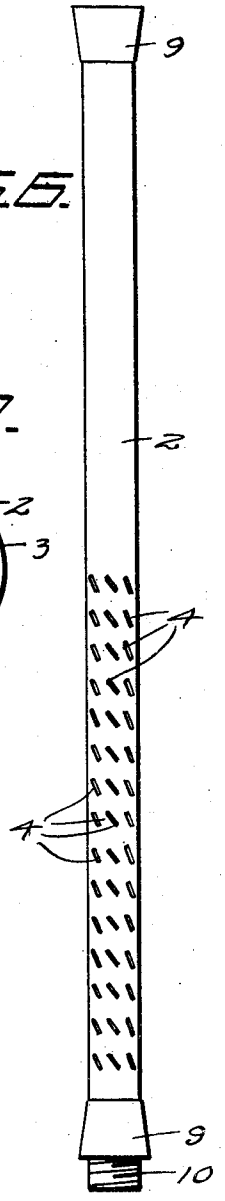
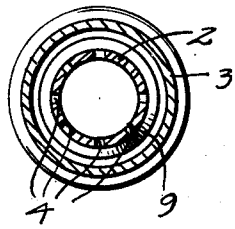


Fig. 7.



Inventor
John Tweeddale

By W. Randolph Jr.
Attorney

Patented Mar. 8, 1927. 1,620,412

UNITED STATES PATENT OFFICE.

JOHN TWEEDDALE, OF TORRANCE, CALIFORNIA.

LINER FOR OIL WELLS.

Application filed July 30, 1925. Serial No. 47,079.

This invention relates to oil well liners which at the present time consists merely of a string of pipes provided with oil inflow openings and which are set in the oil formation of oil wells primarily for the purpose of preventing the caving in of the walls of the wells. The gas pressure in the average well is sufficient to cause the oil, filled with particles of sharp sand, to spray through the liner openings with great force. The liner openings are gradually increased in size by reason of the contact of the sand with the walls thereof, and in time they are increased to such size that the liner is so weakened as to collapse under the pressure thereon. In addition to enlarging the liner openings, the sand gradually fills up the lower portion of the liner and the gas pressure below this sand forces the same upwardly in the liner with the result that a bridge is formed which shuts off the flow of oil.

The primary object of my invention is the provision of an oil well liner which cannot be weakened in the manner stated and in which a sand bridge cannot be formed.

The foregoing and other objects are attained by the construction, combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, wherein:

Figure 1 is a view partly in elevation and partly in vertical section of my improved liner and the lower end of an oil well casing, the liner being in elevation and the casing in section;

Figure 2 is a sectional view illustrating the construction of the head of the liner, the section being taken on the plane indicated by the line 2—2 of Figure 1;

Figure 3 is a top plan view of the head of the liner;

Figure 4 is a view in side elevation of one of the units of the liner;

Figure 5 is a sectional view taken on the plane indicated by the line 5—5 of Figure 1;

Figure 6 is a view in side elevation of the inner pipe of the liner units, and

Figure 7 is a sectional view taken on the plane indicated by the line 7—7 of Figure 5.

Corresponding and like parts are referred to in the following description, and designated in the several views of the accompanying drawings, by similar reference numerals.

The liner comprises sections or units 1, and each unit comprises an inner pipe 2 and an outer pipe 3. The lower half of the inner pipe 2 is provided with openings 4, and the upper half of the outer pipe 3 is provided with openings 5. As the openings 4 in the pipe 2 do not offset the openings 5 in the pipe 3, the oil entering the pipe 3 cannot pass directly into the pipe 2 but must first pass downwardly between the pipes 2 and 3 before entering the pipe 2, and due thereto the oil cannot flow through the openings at such a high velocity that the sand carried thereby will enlarge the openings. It will therefore be apparent that the liner will not collapse under the pressure thereon. The openings 4 and 5 may be as shown in the drawings of elongated formation and arranged at an angle with respect to the axis of the liner.

The openings 4 and 5 are made at an angle to the axis of the liner and elongated to eliminate as far as possible the danger of collapse or breaking of the pipe because of the perforations, due to pressure of the gas and oil in the well, it having been found by experiment that this arrangement permits maximum passages for the liquid at a minimum of weakening of the pipes.

The pipes 3 are threadedly connected together as shown at 6. The upper end of the liner is closed by the head 7 having threaded engagement with the upper end of the inner pipe 2 of the top unit, and the lower end of the liner is closed by the cap 8 having threaded engagement with the lower end of the outer pipe 3 of the bottom unit.

The ends of the inner pipes 2 are provided with tapered collars 9 which will confine a "heave-in" of sand to one unit of the liner which will retain the string of inner pipes 2 in spaced relation to the string of outer pipes 3 and which are slightly spaced at their larger ends from the string of outer pipes 3 to permit the oil to pass from one unit of the liner to another. Certain of the collars 9 are internally screw threaded to receive externally screw threaded hollow extensions 10 on certain of the other collars whereby to connect the adjacent ends of the inner pipes 2. The lower end of the bottom inner pipe 2 is closed by a cap 11 having

threaded engagement with the collar 9 at said end of said pipe, and the upper end of the top inner pipe 2 is closed by the head 7.

The head 7 is larger in diameter than the external diameter of the liner, and is provided with a depending stem 12 which is threaded in the upper end of the top inner pipe 2. The head 7 is located in the lower end portion of the well casing 13, and a gasket 14 of rubber or other suitable material establishes a liquid-tight connection between the head and well casing. In its upper side the head 7 is provided with a conical recess 15 in which a removable plug 16 is positioned. A conical gasket 17 of rubber or other suitable material is located between the plug 16 and the wall of the recess 15. The head 7 is also provided with an axial opening 18 which registers with an axial opening 19 in the plug 16. The lower end of a well tubing 20 is threaded in the opening 19 of the plug 16, and extends from said plug to and through the casing head of the well. If desired the well tubing 20 may extend below the liner head 7 and to attain this end a tubing 20^a is threaded at its upper end in the opening 19 of the plug 16 and passes downwardly into the liner through the opening 18 of the head 7.

The liner may be readily positioned for use by first inserting the string of outer pipes 3 in the well, and next inserting the string of inner pipes 2 in the string of outer pipes 3, and by next inserting the plug 16 in the recess 15 of the head 7 which last named step may be readily performed after securing the plug to the well tubing 20 and by employing the well tubing as a guide for directing the plug 16 into the recess 15. The oil flows through the outer pipes 3 into the inner pipes 2 and thence through the well tubing 20. If the oil does not flow naturally a pump may be connected to the well tubing 20. As the liner cannot be weakened by the action of the sand on the openings 4 and 5 thereof, there is no danger of the same collapsing. Furthermore the liner cannot become clogged for the reason that sand bridges cannot form therein. The opening 18 in the head 17 is larger diametrically than the tubing 20^a so as to permit the tubing to be freely passed through the head. This opening is screw threaded to permit a fishing string of light drill pipe to be screwed into the head 7 if at any time it is necessary to pull the inner liner pipe from the well.

It should be understood that the drawing is merely illustrative and does not pretend to give exact proportions. Furthermore, the said drawing is illustrative of a preferred construction, it being my expectation that various changes and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. An oil well liner unit comprising relatively spaced inner and outer pipes provided with perforations the perforations of one pipe being located in the upper half thereof and the perforations of the other pipe being located in the lower half thereof.

2. An oil well liner unit comprising inner and outer pipes provided with perforations, the openings of the inner pipe being located in the lower half thereof, and the perforations of the outer pipe being located in the upper half thereof.

3. An oil well liner comprising relatively spaced inner and outer pipes provided with perforations, the perforations of the respective pipes being at opposite ends thereof and out of registration and arranged at an angle to the axis of the liner, all of the perforations in each pipe being inclined in the same general direction.

4. An oil well liner comprising a string of outer pipes provided with perforations, and a string of inner pipes provided with perforations and tapered portions on the outer surface thereof.

5. An oil well liner comprising a string of outer pipes provided with perforations, and a string of inner pipes provided with perforations and provided at their meeting ends and on the outer surfaces thereof with oppositely tapered enlargements.

6. An oil well liner comprising inner and outer pipes provided with non-registering perforations, a closure for the lower end of the outer pipe, a closure for the lower end of the inner pipe, relatively spaced tapered enlargements on the inner pipe, and a head for the upper end of the liner.

In testimony whereof I affix my signature.

JOHN TWEEDDALE.