

July 10, 1928.

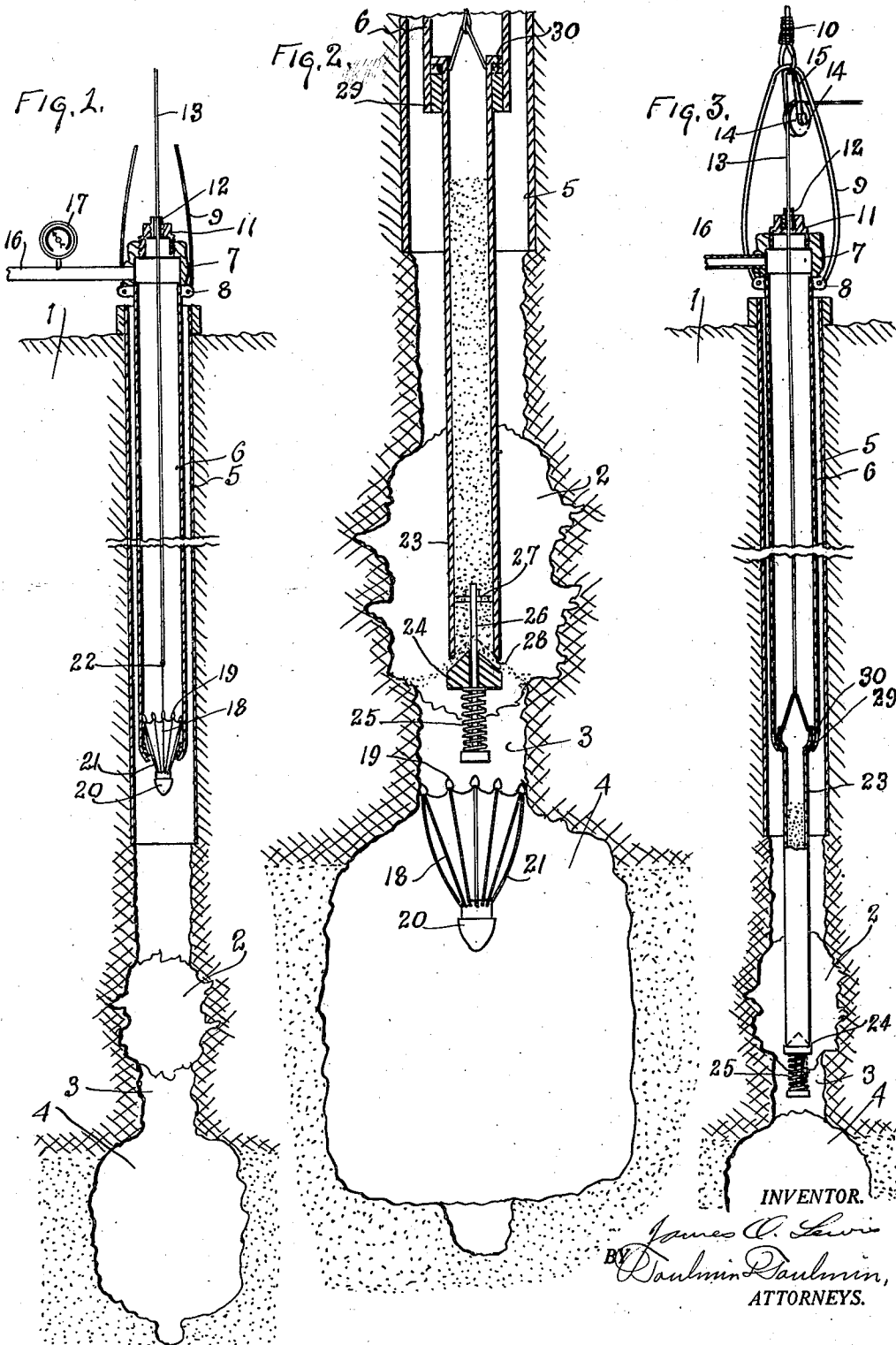
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1,676,785

METHOD OF AND APPARATUS FOR GROUTING THE WALLS OF AN OIL WELL

Filed Oct. 20, 1924

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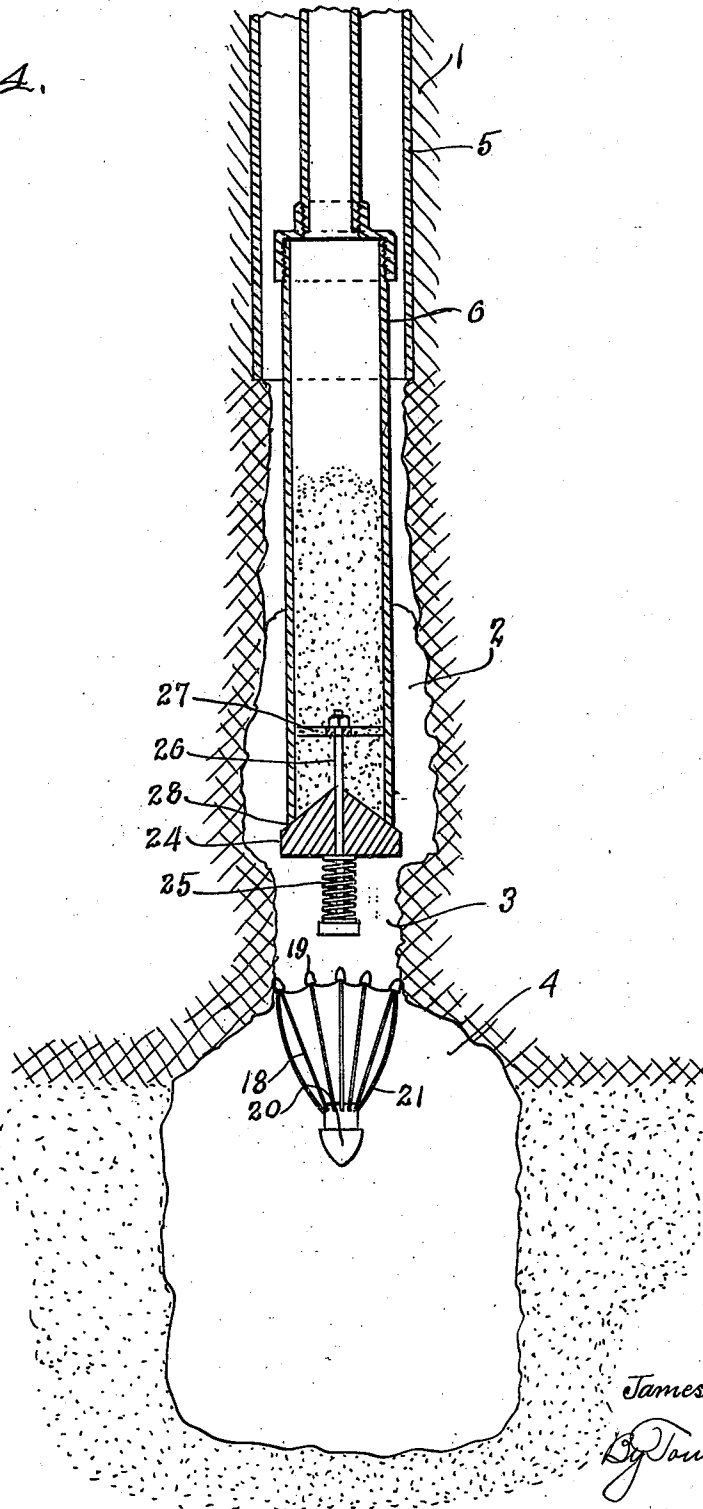
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Fig. 4.



UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR GROUTING THE WALLS OF AN OIL WELL.

Application filed October 20, 1924. Serial No. 744,608.

My invention relates to an apparatus and method of grouting the walls of an oil well.

It is the object of my invention to provide both a method and an apparatus for practicing the method of grouting or otherwise treating the walls of an oil well with cement or similar material to prevent the walls from caving in. In particular it is my object to provide a method and apparatus for spraying the walls with liquid cement by means of fluid pressure.

It is an additional object of my invention to practice a method and provide an apparatus which will permit of the accurate reinforcing of the walls of the well with a uniform coating at a predetermined location in such a way as not to stop up the well or encumber in any way the well pit.

In drilling and producing oil wells large expense, loss of time and labor are caused by the caving in of the rock walls of the hole. Heretofore the expensive and tedious practice of removing the material in the well which had caved in until the caving had ceased or was reduced to the extent that drilling or pumping could be continued has been followed. Or the method was followed of shutting off the caving material by lining the walls of the hole with pipe or casing. Such methods are very expensive and are not altogether successful.

It is my object to overcome and eliminate such difficulties by providing means for spraying, under considerable pressure a film of quick-setting cement over the caving surface thus forming a rigid shell of cheap material which is thoroughly incorporated with the walls which are caving to prevent any further trouble. It is my object also to provide means for plugging the lower end of the cavity being treated to prevent the cement dropping into the well pit and interfering with the flow of oil.

Referring to the drawings:

Figure 1 is a section through the well and casing illustrating the method of lowering the plug into position.

Figure 2 is a similar, but enlarged view showing the cementing apparatus in position just starting to apply the coat of cement with the plug in position.

Figure 3 is a similar view illustrating the apparatus used in the upper end of the well

such as the bailer and the like for supporting the cementing apparatus in the well.

Figure 4 is a modified form of my invention showing the cementing apparatus in position just prior to applying the cement coating to the interior of the well.

Referring to the drawings in detail:

1 designates the upper crust of the earth about the top of the well. 2 designates the rock cavity, 3 the well hole below the cavity and 4 the well pit in the oil-bearing sand. 5 designates the well casing in which is suspended the compressed air pipe 6. This pipe is provided with a collar 7 at its upper end beneath which fits the elevator collar 8 carrying the bail 9 which in turn is suspended by the cable 10. The upper end of the collar 7 is provided with a plug 11 having a stuffing box 12 through which passes the cable 13 suspended over the pulley 14. This pulley may be supported in any desired fashion as by linking it at 15 to the cable 10. The cable 13 may be used either for supporting the umbrella plug or the cementing apparatus. The interior of the pipe 6 is provided with compressed air from any suitable compressed air source through the feed pipe 16 which is threaded in the collar 7. A gauge 17 may be provided for indicating the pressure on the line.

In practice, I first lower the umbrella plug through the pipe 6 until it passes through the pipe, whereupon the arms 18 of the umbrella which have the points 19 expand so that the points rest against the wall of the well. A head 20 is provided for the umbrella which carries a fabric covering 21 on the ribs or arms 18. When the umbrella has so expanded it cannot be withdrawn into the pipe so that by pulling upwardly on the wire 13 the connection with the umbrella can be broken at for instance, 22 which is a weak point in the suspending line. This allows the umbrella to drop down through the rock cavity to the relatively narrow throat 3 where it is held by the engagement of its arms with the wall to prevent any cement in the subsequent operation from dropping down into the well pit. Or I may use a wad of burlap or any other suitable means for plugging the hole above the top of the oil sand to prevent cement from entering the well pit.

I then lower on the cable 13 a tubular member 23 which contains the cement. At the lower end of this tubular member is a pressure valve arranged as follows. A conical plug 24 is suspended on a helical spring 25 which in turn is carried by a rod 26 which passes through the plug 24 to the interior of the cement-carrying casing 23 and is supported on a cross member therein designated 27. The tendency of the spring 26 is to keep the conical plug 24 against the conical edges 28 of the lower end of the cement carrying casing 23. The spring pressure is such that it will not allow the valves to open and the cement to be released until the predetermined air pressure is applied behind the cement. The upper end of the casing 23 engages with the lower end of the casing 6 and forms a relatively air-tight joint by the engagement of the shoulders 29 and 30. These shoulders may be arranged in any fashion as in Figure 2 or Figure 3. It is essential there shall be a relatively tight joint.

As soon as the apparatus has been lowered so that the lower end of the cement applying mechanism is in position, the compressed air is applied behind the cement which forces the valve head 24 open, compressing the spring 25 and applying a spray of cement under considerable air pressure against the walls of the rock cavity. The apparatus is gradually elevated or lowered by the cable 10 through the bail 9 so that the entire cavity may be uniformly treated. When this is completed the umbrella plug is pushed downwardly and dropped to the bottom of the well pit where it will not be injurious.

The result will be a smoothly coated interior of the rock cavity. The cement is of the quick-setting type and is thoroughly introduced into the interstices of the rock due to the pressure. The irregularities of the rock hold the shell of cement in position and prevent any further caving.

It is apparent that this apparatus is adaptable not only for this specific purpose but also for the lining of any cavity or bore of similar kind.

In practice, I prefer that the valve open only at a pressure in excess of fifty pounds or some similar predetermined amount. I do not desire to confine myself, however, to any specific pressure. The cement can be introduced into the pipe either by pouring it into the top or by dumping it in at the bottom by means of a bailer or sand pump or other suitable device, but I prefer to lower it into the well by means of the bailer suspended on a line as shown in Figures 1, 2 and 3.

When the gauge shows a large drop in pressure it indicates the cement has been ejected from the apparatus.

By the practice of my invention it is possible to eliminate much of the lining by casing

now being done of oil wells, and to prevent material from caving off the walls of the hole into the well pocket.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a method of grouting oil wells, lowering a tubular member into the well, lowering a plug through said tubular member, permitting the plug to pass out of the tubular member and expand against the walls of the well, detaching the lowering means from the plug, lowering a valved bail of grouting material through the tube until the spraying end of the bail is exposed, sealing the connection between the bail and the tube, applying air in the tube to the material in the bail, forcing open the valve in the bottom of the bail and spraying the grouting material on the walls of the well.

2. In a method of grouting oil wells, lowering a tubular member into the well, lowering a plug through said tubular member, permitting the plug to pass out of the tubular member and expand against the walls of the well, detaching the lowering means from the plug, lowering a bail of grouting material through the tube until the spraying end of the bail is exposed, sealing the connection between the bail and the tube, applying air in the tube to the material in the bail, forcing open the valve in the bottom of the bail and spraying the grouting material on the walls of the well and moving the apparatus so as to uniformly coat the interior of the well in the locality desired.

3. In a method of grouting oil wells, lowering a tubular member into the well, lowering a plug through said tubular member, permitting the plug to pass out of the tubular member and expand against the walls of the well, detaching the lowering means from the plug, lowering a bail of grouting material through the tube until the spraying end of the bail is exposed, sealing the connection between the bail and the tube, applying air in the tube to the material in the bail, forcing open the valve in the bottom of the bail and spraying the grouting material on the walls of the well and moving the apparatus so as to uniformly coat the interior of the well in the locality desired, and pushing the plug into the well pit after the cementing operation has been completed.

4. In a grouting apparatus for oil wells, the combination of an air conveying tubular member, means to apply compressed air thereto, the lower end of said tubular member being opened and the upper end sealed, means to support said tubular member in different positions in the well, a lowering

cable passing through said tubular member and means to provide an air tight stuffing box at the top of the tubular member to accommodate the passage of the lowering cable, a bail for containing coating material, a pressure valve at the bottom thereof adapted to support the material in the bail which is lowered by the lowering cable within the tubular member until air pressure behind the material in the bail achieves the predetermined point for opening the valve and discharging the material, and means for joining the upper end of the bail with the tubular member to prevent the escape of air.

In testimony whereof, I affix my signature.

JAMES O. LEWIS.