

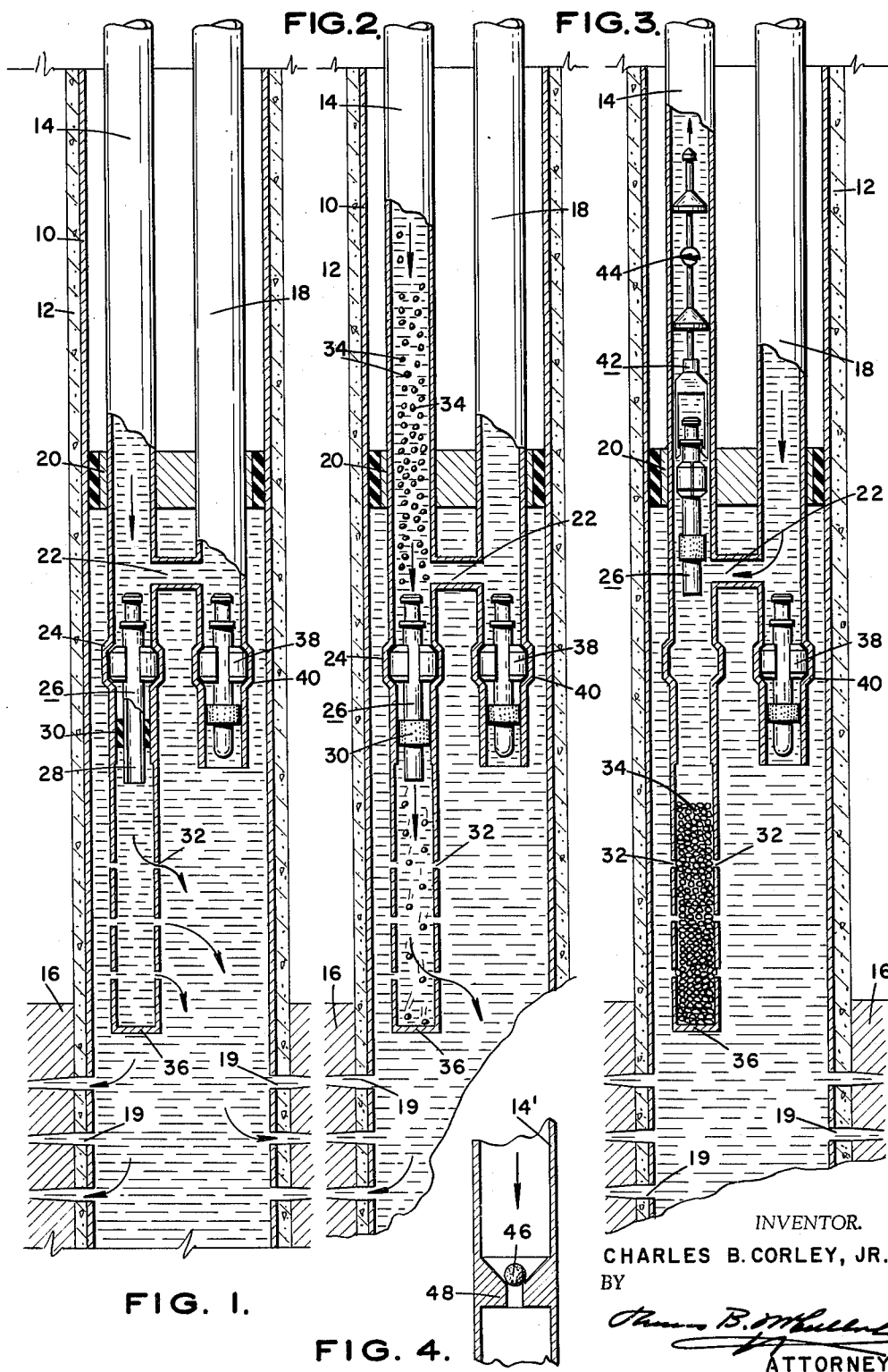
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COMPLETION SYSTEM FOR WELLS

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COMPLETION SYSTEM FOR WELLS

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3 Claims. (Cl. 166—205)

This application is a division of Serial No. 323,742, entitled "Completion Method and System for Wells" filed November 14, 1963, by Charles B. Corley, Jr.

This invention relates to oil and gas wells. More particularly, this invention is a method and system for removing tools from a well when the conventional methods and systems cannot be used to remove these tools because of excessive lost returns.

Certain operations are performed in oil and gas wells which require the fluid circulation of pump tools. Pump tools, for example, may be used extensively in completing submarine wells. An example of an operation which may be performed by the use of pump tools is the installation or removal of a storm choke or subsurface safety valve from its position within a tubing string placed in the well.

However, in order to properly utilize pump tools for removing subsurface devices by fluid circulation, it is necessary that excessive loss of the circulating fluid to the subsurface formations be prevented. If there is excessive loss of the circulating fluid to the formations, sufficient pressure and circulating volume cannot be developed to circulate the pump tool and remove the subsurface devices.

The invention to be described herein provides the art with a method and system which can be used to prevent excessive loss of the circulating fluid to the formation during the removal of subsurface tools such as storm chokes.

The invention, as well as its many advantages, will be further understood by reference to the following detailed description and drawings in which:

FIG. 1 is a schematic, elevational view showing a storm choke in position within the well;

FIG. 2 is a schematic, elevational view showing the introduction of a dissolvable granular material for placement in the well to prevent excessive loss of circulation;

FIG. 3 is a schematic, elevational view showing the removal of a storm choke from the well after the dissolvable granular material has been properly located; and

FIG. 4 is a schematic, elevational view illustrating the use of an acid dissolvable ball for preventing excessive loss of returns instead of the acid dissolvable granular material.

Referring to the drawings and more particularly to FIG. 1, a casing 10 is shown cemented to the sides of a borehole by the usual cement 12. A tubing string 14 extends from the earth's surface (not shown) to a point adjacent the subsurface producing formation 16. The usual perforations 19 have been made through casing 10, cement 12, and into producing formation 16 for the production of oils and gases from producing formation 16.

A tubing string 18 is also provided in the well. The tubing string 18 extends to a point within the well adjacent the subsurface producing formation 16 and is used primarily to form a circulating path from the surface to the well bottom. Tubing string 18, serving as an alternate to tubing string 14, may also be used to conduct oils and gases produced from subsurface formation 16 to the earth's surface. The usual packing 20 is provided about the tubing string 14 and tubing string 18.

The tubing strings 14 and 18 are fluidly interconnected by a crossover or interconnecting line 22 located below the packing 20. The tubing string 14, interconnecting line 22, and tubing string 18 provide a fluid circulating path into and from the well. A retrievable plug 38 is placed in landing nipple 40 in tubing string 18 at a point below interconnecting line 22.

A landing nipple 24 is provided within the tubing string 14. A storm choke 26 provided with a bore 28 is shown positioned within the landing nipple 24. The usual seal 30 is provided about the storm choke 26.

A plurality of perforations 32 is formed adjacent the bottom of tubing string 14. If it is desired to remove the storm choke 26 with a pump tool circulated into the tubing string 14 from the earth's surface, it is necessary that sufficient circulating pressure be developed. Therefore, a surface pressure test is conducted, as shown in FIG. 1, to estimate whether or not sufficient fluid pressure can be placed against the subsurface formation 16. If excessive fluid is lost to the subsurface formation 16 at low pressure, sufficient pressure cannot be maintained against the pump tool to remove the storm choke 26.

My new method and system can be used to remove the storm choke 26 or other similar tools from the tubing string 14 when conventional methods and systems for removing these devices cannot be utilized because of excessive loss of circulating fluid to the subsurface formation. The perforations 32 are provided in tubing string 14 so that acid dissolvable granular material 34 (FIG. 2) may be pumped down the tubing string 14 through the bore 28 of storm choke 26 and into the bottom portion of tubing string 14 to pack off the perforations 32. The tubing string 14 is closed at the bottom by plate 36 for this purpose.

Examples of acid dissolvable materials are calcium carbonate and aluminum. These materials may be dissolved by acids such as hydrochloric acid or acetic acid. The granular materials may be placed into the well by mixing it with viscous fluids, such as oil-water emulsions or conventional drilling muds, in order that the granular material can be pumped as a slug to the proper position. The bridging of the granular material 34 against perforations 32 will sufficiently restrict loss of returns to permit application of adequate pressure against circulated pump tools to allow the storm choke 26 to be removed from the well.

FIG. 3 illustrates the removal of the storm choke 26 from the tubing string 14 by means of reverse circulation after the pump tool 42 has been pumped into the tubing string 14 by direct circulation to engage the storm choke 26. The pump tool 42 is provided with knuckle joints 44 to permit pumping through curved tubular members and flow lines (not shown) located at the surface. As shown in FIG. 3, the pump tool has engaged the storm choke and is being removed upwardly through tubing string 14 by reverse circulation of fluid through tubing string 18, interconnecting line 22, and tubing string 14.

FIG. 4 shows an alternate to the use of granulated material with a perforated tubing. An acid dissolvable ball 46 is placed on the tapered seat 48 positioned within the tubing string 14'. The tapered seat 48 is located in a position similar to the location of the perforations 32 of FIGS. 1 through 3. The ball 46 can be made of aluminum or calcium carbonate and can be either porous or fluted to permit acid to be circulated to the bottom when it is desired that the ball be dissolved for restoration of the well to production.

In operation, if the storm choke 26 cannot be removed by conventional means because of loss of returns, the acid dissolvable granular material 34 is pumped down tubing string 14 to bridge the perforations 32. In the alternative, the acid dissolvable ball 46 can be dropped to the

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bottom of the well through tubing string 14. Thereafter, the pump tool 42 is directly circulated down tubing string 14 to engage storm choke 26. The pump tool 42 along with the storm choke 26 is then removed from the well by reverse circulation. The well can be returned to production by circulating acid, such as hydrochloric acid or acetic acid, to dissolve the granular material 34 or if the ball 46 is used, to dissolve the ball 46.

The method and system described herein has applicability to the use of tools other than storm chokes in the well. Also, the method and system may be used to remove material, such as paraffin, by pumping a plug into and from the well.

I claim:

1. A system for use in a well from which hydrocarbons are produced from a subsurface producing formation comprising: a first tubing string extending to a point adjacent the subsurface producing formation and provided at the bottom thereof with perforated means adapted to receive acid dissolvable material to limit the flow of fluid from the tubing string; a second tubing string extending to a point adjacent the subsurface producing formation; packing means positioned about the tubing strings; a first tubing string-second tubing string interconnecting line; acid

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dissolvable material arranged in said first tubing string to limit flow of fluid from said first tubing string; and means in the second tubing string below the interconnecting line adapted to receive a plug.

2. A system in accordance with claim 1 wherein the perforated means adapted to receive acid dissolvable material to limit the flow of fluid from the first tubing string comprises perforations formed in the first tubing string.

3. A system in accordance with claim 1 wherein the perforated means adapted to receive acid dissolvable material to limit the flow of fluid from the first tubing string comprises a seat for receiving a ball of said acid dissolvable material.

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