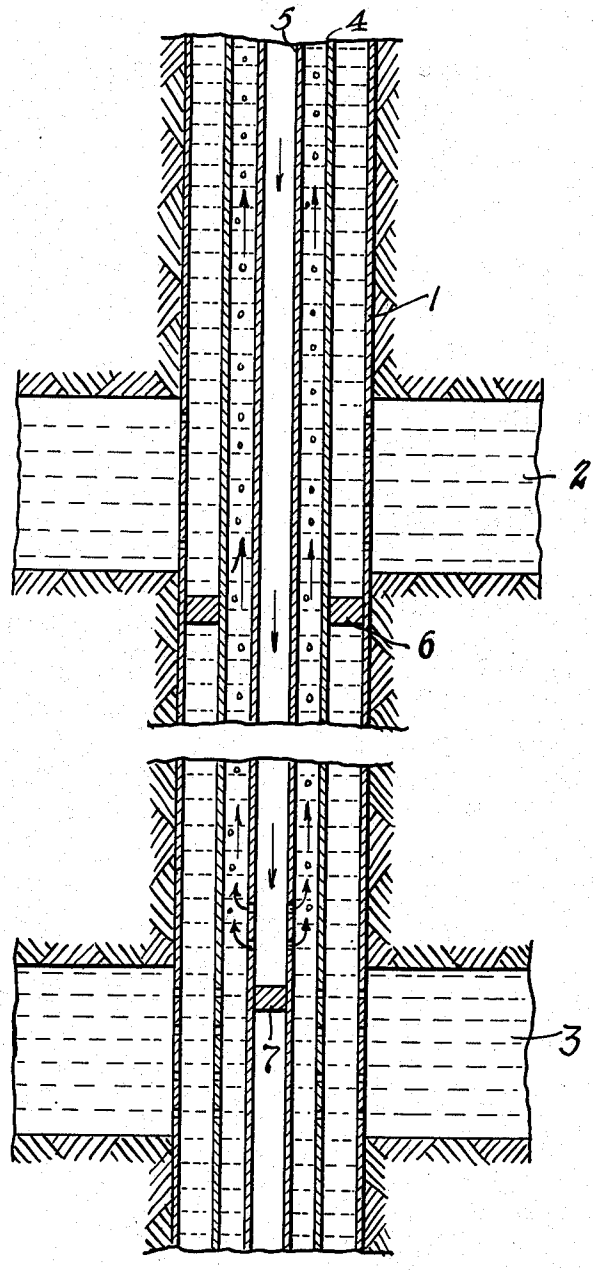
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GAS LIFTING DEVICE FOR FLOWING MULTIPLE ZONE WELLS

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GAS LIFTING DEVICE FOR FLOWING MULTIPLE ZONE WELLS

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2 Claims. (Cl. 166—2)

1

This application is a division of my copending application Serial No. 603,140 filed July 4, 1945, issued March 29, 1949, as Patent No. 2,465,344.

This invention relates as indicated to an improved method for producing multiple zone wells, i. e., wells which intercept a plurality of superposed vertically spaced producing zones at least one of which is not under sufficient pressure to raise the oil therefrom to the ground surface.

When the pressure in a producing zone is such that it is insufficient to raise the column of oil in the well to the surface of the ground, such a well can be caused to continue production without pumping if air or some other gas is introduced into the oil column in the well sufficiently below the surface of the ground so as to decrease the weight of this oil column sufficiently so that it will be forced upwardly by the pressure available in the producing zone. While this expedient has been utilized in wells producing from a single zone, it has never been accomplished successfully in wells intercepting a plurality of zones and especially where it is necessary to maintain separate the oil produced from each zone.

It is, accordingly, a principal object of my invention to provide a method capable of achieving the foregoing desirable result.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing, the single figure is a diagrammatic, broken, vertical section through a portion of a well intercepting two producing zones and illustrating one embodiment of the method comprising my invention.

Referring now more specifically to the drawing, there is here illustrated a single well provided with a casing generally indicated at 1, which intercepts two vertically spaced superposed producing zones generally indicated at 2 and 3. The casing 1 has arranged preferably coaxially therein two strings of tubing generally indicated at 4 and 5, whereby there are provided within the case portion of the well three substantially independent columns.

Positioned in the outer column, i. e., in the space between the tubing 4 and the casing 1, is

2

an annular packer 6 of conventional design and also within the inner column, within the tubing 5 is another packer 7, likewise of conventional design. Since packers of this character are available and well known to those familiar with the art, they have been illustrated diagrammatically.

In the embodiment of my invention illustrated in the drawing the casing is perforated in each of the producing zones, and the tubing 5 is perforated in an area just above the lower producing zone, although it should be noted that the perforations in the tubing 5 may be at any point within or above the producing zone 3 depending upon the distance of such zone below the surface and the natural pressure in such zone.

A suitable gas, such as air, carbon dioxide, natural gas, and the like, may be introduced under pressure by conventional means not shown into the tubing 5. Such gas under pressure will be bled through the perforations in tubing 5 into the producing column between tubings 4 and 5 as illustrated, and such gas reducing the weight of the oil in such column will make possible the flowing of the column under the pressure available in the producing zone 3 with which it is in communication.

When a situation is encountered in the field where only the lower of two producing zones lacks sufficient pressure to raise the oil to the surface of the ground, then an expedient such as illustrated and described above may be employed to very efficiently and economically produce such zone. The perforations in the tubing 5 may be at any point within or above the producing zone 3, the location of such perforations being determined largely by the amount of pressure available in the producing zone and the depth of such zone.

From the foregoing description, it will be observed that I have provided a method whereby a single well intercepting a plurality of producing zones may be operated so as to provide a gas lift for the zone which lacks sufficient natural pressure to be self-producing while at the same time maintaining separate the production from each zone. Detailed illustration or description of the apparatus necessary has not been given since all of the described apparatus required for the performance of the several steps is old and well known in the art and familiar to those skilled in the art.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the fea-

tures stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In producing wells constituting a series of vertically spaced superposed producing zones, an apparatus for enhancing liquid flow from a lowermost producing zone comprising a casing, perforations in said casing adjacent each producing zone whereby said casing is in direct fluid communication with each producing zone; a first string of tubing disposed in said casing adapted to receive gas at the upper extremity thereof and containing perforations in the lower extremity for the passage of gas therefrom, said perforations being at a position above said lowermost producing zone; a packer located in said first tubing at a position below said perforations; at least one other string of tubing disposed in said casing in an outer concentric position with respect to said first tubing to form a series of concentric annular spaces between said first tubing and the casing; a packer located within each of said annular spaces between said casing and said other tubing intermediate said producing zones; perforations in said other tubing whereby said other tubing is in direct fluid communication with at least one lower producing zone for the passage of fluids from said lower producing zone through an annular space between said other tubing and said first tubing.

2. In producing wells constituting two vertically spaced superposed producing zones, an apparatus for enhancing liquid flow from the lowermost producing zone comprising a casing, perforations in said casing adjacent each producing zone whereby said casing is in direct fluid communication with each of said producing zones; a first string of tubing disposed in said casing the upper extremity of said tubing adapted to receive gas from an external source, the lower extremity thereof containing perforations for the passage of gas therefrom, said perforations being at a position which is above the lowermost producing zone; a packer disposed in said first tubing at a position below said perforations; a second string of tubing disposed in said casing in an outer concentric position with respect to said first tubing forming an inner annular space with said first tubing and an outer annular space with said casing; a packer in said outer annular space intermediate said two producing zones; perforations in said second tubing adjacent said lowermost producing zone whereby said second tubing is in direct fluid communication with said lowermost producing zone for the passage of fluids therefrom upward through said inner annular space.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
45,153	Gunning	Nov. 22, 1864
1,723,682	Deming	Aug. 6, 1929
2,298,834	Moore	Oct. 13, 1942