

July 27, 1943.

V. J. BEISSINGER

2,325,218

PROCESS FOR THE GRAVEL PACKING OF WELLS

Filed Aug. 11, 1941

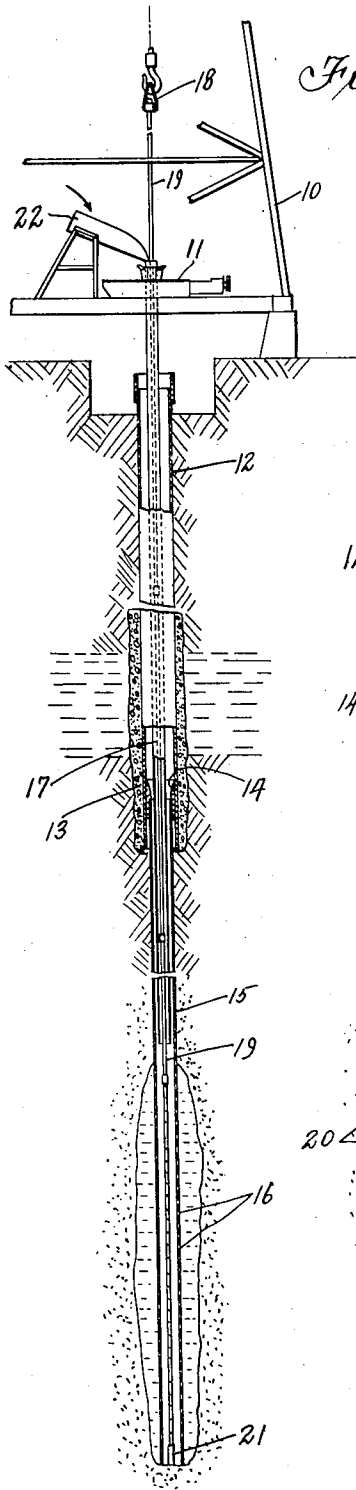


Fig. 1.

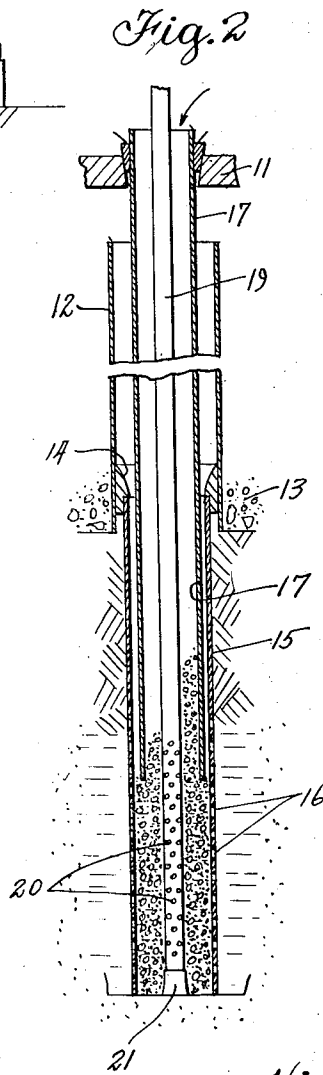


Fig. 2

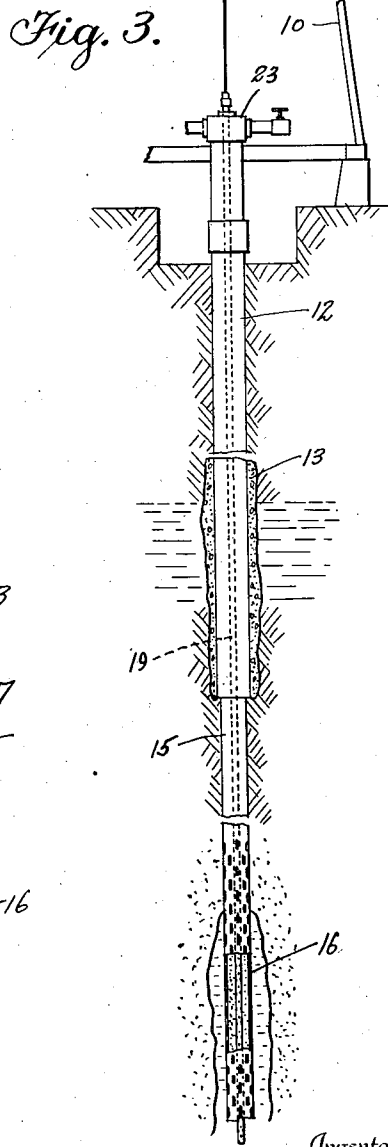


Fig. 3.

Inventor

Victor J. Beissinger

By

Lyon & Lyon

Attorney &

UNITED STATES PATENT OFFICE

2,325,218

PROCESS FOR THE GRAVEL PACKING OF WELLS

Victor J. Beissinger, Los Angeles, Calif., assignor to Richfield Oil Corporation, Los Angeles, Calif., a corporation of Delaware

Application August 11, 1941, Serial No. 406,326

8 Claims. (Cl. 166—26)

This invention relates to methods and equipments for the depositing of a gravel pack within a well to act as a filter bed therefor and to increase the production of the well. While applicable to wells in general, this invention finds its preferred embodiment and its optimum use in connection with wells drilled for the production of petroleum. The packing of gravel about the production strata of such wells is well known in the art and no claim to the invention of such subject matter is made. This invention specifically relates, however, to new methods and means for quickly, fully and economically placing said gravel pack in the well and particularly in the producing strata thereof.

Another feature of this invention relates to the use, in the step of inserting the gravel into the well, of a mixture of gravel and a relatively thick gelatinous binder capable of binding the particles of gravel into a cohesive unit and lubricating the travel downwardly through the well and yet also deteriorating upon the passage of time through the action of bacteria to a thin liquid capable of being drained off from the pack. One such gelatinous binder is well known in the art under the name "Dow Jelly" and reference is made to Grebe and Stoesser Patent No. 1,998,756 for a complete description thereof. When hereafter used in this specification or in the claims, the term gelatinous binder will be understood to mean a binder having the above described characteristics.

By the use of said mixture of suitably selected gravel and gelatinous binder, the operator is assured of a gravel pack which will remain cohesive and which will respond to the method of depositing hereinafter described.

Another feature of this invention is the elimination of circulation, either of the conventional type or of the reverse circulation type heretofore extensively used in the gravel packing of oil wells, it being proposed in this invention to deposit the gravel pack in the producing strata of a well by means of a gravity feed supplemented by a rotation of the working string or casing, thereby securing a slow spiral travel of the gravel pack to its intended position.

It is, therefore, one object of this invention to provide a method and means of depositing a gravel pack in the production strata of an oil well easily, economically and without the necessity of fluid circulation.

It is a further object of this invention to provide said gravel pack with a gelatinous binder which, upon the passing of time, will deteriorate

and thin down to a consistency which can be drained off from the gravel pack.

Further objects and advantages of this invention will appear hereinafter.

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

Fig. 1 is a vertical sectional view of an oil well showing the application of the present invention, with parts broken away for the sake of convenience.

Fig. 2 is an enlarged vertical, sectional, schematic view during the process of gravel packing, and

Fig. 3 is a vertical sectional view showing the well with the gravel deposited in the production area.

Referring more particularly to the drawing, I have shown the well as including a drilling rig having a rotary machine therein, the rotary head 11 of which is the only part illustrated.

The well includes a string of surface or water pipe 12 illustrated as cemented in the hole in the conventional manner as at 13. By means of a casing adapter 14 a perforated liner 15 extends below the surface string 12. This perforated liner is perforated opposite the production area as at 16. Within the perforated liner is hung a working string 17. The working string 17, during the deposit of the gravel, is suspended from the rotary head 11. Within the working string 17 and suspended from the elevator 18 is a tubing 19 perforated in its lower section as at 20 and having a shoe 21 on the lower end thereof. A hopper 22 is provided.

The method of depositing gravel in the well is as follows:

Gravel is deposited in easy stages mechanically through the annulus between the tubing 19 and the working string 17 by means of a hopper 22. The working string 17 will then be rotated slowly, causing the gravel to move downwardly in a slow steady spiral. In order to promote the continuity of the moving spiral of gravel and in order to preserve a cohesive integral mass of gravel, the gravel before introduction into the well is mixed with a relatively thick gelatinous binder.

The rotation of the working string 17 is continued until the mixture of gravel and gelatinous binder has been worked to the bottom of the well. The working string 17 is then pulled slowly upwardly, rotating through a long spiral in two or three foot stages. This movement of the working string 17 induces the mixture of gravel and gelatinous binder to emerge from the an-

nulus between the working string 17 and the tubing 19 and to fill up around the tubing in the annulus between said tubing and the liner 15, as clearly illustrated in Fig. 2.

By the foregoing operation the mixture of gravel and gelatinous binder is spotted in place. The working string should then be lowered to the top of said mixture for light tamping in order to solidify the gravel pack.

Following the foregoing operations, the working string may then be pulled, the tubing flanged up to the casing head 23 and the well placed upon production. As is well known in the art, the gelatinous binder mixed with the gravel will deteriorate due to the action of the bacteria therein to create a thin enough fluid to be drained from the gravel pack and to be recovered from the well along with the petroleum produced therefrom, thus leaving a compact gravel pack free from sand, mud, or other contamination and securely spotted in the desired position.

From the foregoing it will be noted that I have achieved an efficient and economical method of depositing a gravel pack in the well without the necessity of either type of circulation and, therefore, avoid the many well known disadvantages occurring from the use of such circulation during the gravel packing.

While the particular forms of the invention herein described are well adapted to carry out the objects of the invention, it is to be understood that various modifications and changes may be made without departing from the principles of the invention, and the invention includes all such modifications and changes as come within the scope of the appended claims.

I claim:

1. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and a gelatinous binder into the annulus between the tubing and the working string in said well, slowly rotating said working string during the downward travel of said mixture, removing said working string, and tamping said mixture to form a gravel pack.

2. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and a gelatinous binder into the annulus between the tubing and the working string in said well, slowly rotating said working string during the downward travel of said mixture, removing said working string, tamping said mixture to form a gravel pack, and draining said gelatinous binder from said gravel.

3. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and a gelatinous binder into the

annulus between the tubing and the working string in said well, slowly rotating said working string during the downward travel of said mixture, and removing said working string.

4. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and a gelatinous binder into the annulus between the tubing and the working string in said well, slowly rotating said working string during the downward travel of said mixture, removing said working string, and draining said gelatinous binder from said gravel.

5. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and an organic gelatinous binder into the annulus between the tubing and the working string at the top of said well, allowing said mixture to travel downwardly under the force of gravity in said annulus to form a pack opposite the producing zone in said well, and subsequently removing said working string.

6. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and an organic gelatinous binder into the annulus between the tubing and the working string at the top of said well, allowing said mixture to travel downwardly under the force of gravity in said annulus to form a pack opposite the producing zone in said well, tamping said working string upon said gravel pack, and subsequently removing said working string.

7. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and an organic gelatinous binder into the annulus between the tubing and the working string at the top of said well, allowing said mixture to travel downwardly under the force of gravity in said annulus to form a pack opposite the producing zone in said well, subsequently removing said working string, and allowing said pack to emerge from the working string and fill the space surrounding the lower end of said tubing.

8. The method of depositing a gravel pack in wells comprising the steps of introducing a mixture of gravel and an organic gelatinous binder into the annulus between the tubing and the working string at the top of said well, allowing said mixture to travel downwardly under the force of gravity in said annulus to form a pack opposite the producing zone in said well, subsequently removing said working string, allowing said pack to emerge from the working string and fill the space surrounding the lower end of said tubing, and draining said gelatinous binder from said pack.

VICTOR J. BEISSINGER.