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W. V. VIETTI ET AL

2,167,191

METHOD AND APPARATUS FOR SCREENING WELLS

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FIG. 1.

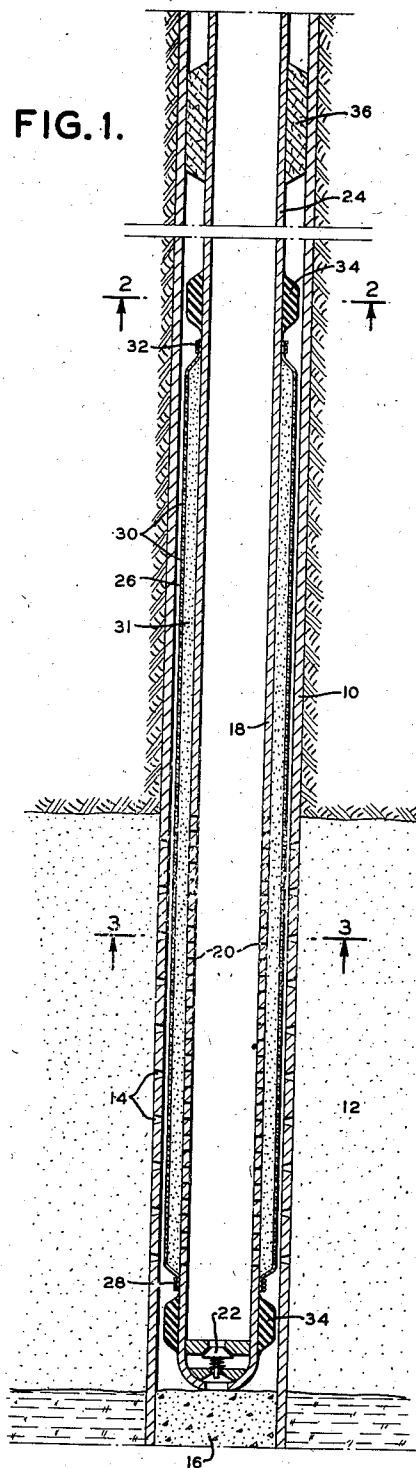


FIG. 2.

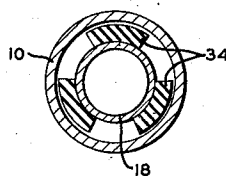


FIG. 3.

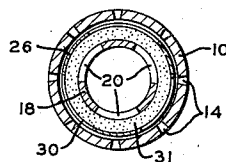
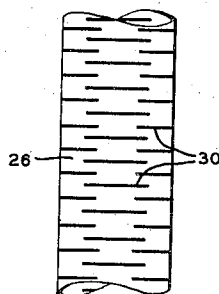


FIG. 4.



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METHOD AND APPARATUS FOR SCREEN-
ING WELLSWilliam V. Vietti and Joe K. Butler, Houston,
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3 Claims. (Cl. 166—21)

This invention relates to a method and apparatus for screening wells and more particularly to a method and apparatus for placing granular material such as gravel or small pieces of carborundum in the space around a well screen or the perforated liner. The principal object of the invention is the provision of a method and means for accomplishing this result effectively without the necessity of maintaining circulation in the well. Another object is to provide a method and means for placing granular material in the space between a well screen and a section of perforated well casing.

One way of placing granular material such as gravel in the space in a well around a well screen is by maintaining reverse circulation of a fluid in the well, placing the gravel in the circulating fluid at the surface and causing the gravel to be screened off at the bottom of the well so that it will fill the space around the screen, the circulating fluid passing through the screen and upwardly to the surface through the drill pipe or flow tubing. This method of placing gravel is described in a copending application Serial No. 145,561 filed May 29, 1937. When a packer is used on the screen or perforated liner above the perforations, the gravel may lodge above the packer and thus fail to reach the space around the perforations. One way of eliminating this difficulty is by placing the gravel before the packer is set. After placing the gravel the packer can be set as by attaching it to the top of the liner. The present invention relates to another method of overcoming this difficulty which method has proved to be very successful.

Although the invention will be described as applied to an oil well, it is equally applicable to water wells. Likewise, although "gravel" will be referred to as the material to be placed in the well, any material such as granular carborundum or other abrasion resisting material may be used.

In accordance with the invention, a thin cylinder or pipe of metal or other material is placed around the screen while at the surface, this cylinder forming an envelope in which the gravel is then placed. The cylinder is perforated as by means of a plurality of narrow slots and the combination of the screen and envelope containing the gravel is then run into the hole on a string of drill pipe or flow tubing to the desired position opposite the stratum or sand containing the oil to be produced. The sand being carried by the oil will pass through the slots in the gravel retaining envelope, the oil passing on through the gravel and through the perforated

screen or liner into the tubing and upwardly to the surface. The sand on passing through the slots of the envelope will quickly cut or wear away the envelope due to the abrasive action whereupon the gravel will be released so as to fill the space around the screen or liner. In case it is desired to place the gravel in the space between the screen and a section of perforated casing, the hole is cemented off below the section of perforated casing after which the operation is carried out in the manner previously described.

For a better understanding of the invention, reference may be had to the accompanying drawing in which

Figure 1 is a vertical section through the perforated casing showing the gravel and the gravel retaining envelope in position before it has been worn or cut away by the sand.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1, while

Figure 4 is a fragmentary view of a portion of the envelope.

Referring to the drawing, a well casing 10 is shown as having a perforated section opposite an oil bearing sand 12. The casing perforations 14 may be formed in any suitable manner as by means of a gun perforator. The casing is cemented in place with the lower portion of the cement 16 in the casing being left undrilled.

Before running into the hole the screen and gravel retaining envelope is made up as follows: A screen or a section of pipe 18 having perforations or slots 20 is provided at its lower end with a suitable back pressure valve 22. As shown in Figure 1, the portion of the pipe containing the perforations 20 comprises the "screen" through which the oil is to pass into the interior of the tubing string 24 to which the screen is attached. A cylinder which may be a piece of thin pipe 26 of the nature of stove pipe and which has a diameter slightly smaller than the internal diameter of the casing 10 is placed around the pipe 18, and the lower end of the cylinder 26 is attached to the lower end of the pipe 18 by wire 28 or by any other suitable means such as soldering. The cylinder 26 thus forms an envelope around the screen and the envelope is provided with perforations or slots 30. These slots preferably extend laterally around the envelope and are of about .03 inch in width such as may be made by means of an ordinary hack saw. The envelope is filled with gravel or other granulated abrasion resisting material 31 and the upper end of the envelope is attached to the pipe 18 as by wire 32.

Protectors 34 of rubber or other suitable material are placed on the pipe 18 above and below the envelope 26 to protect the latter while the device is being run into the hole.

After being made up as described in the preceding paragraph, the device is lowered into the hole to a position such that the screen perforations 20 will be opposite the oil sand 12 and a suitable packer 36 is placed on the flow string so as to seal the annular space between the string and the casing 10. As will be noted in viewing Figure 1, the envelope 26 extends upwardly along the pipe 18 some distance beyond the screen perforations 20, thus providing space for more granular material than will be needed to fill the annular space between the screen section of the pipe 18 and the perforated section of the casing 10.

After being placed in position in the well hole the oil from the sand 12 will pass inwardly through the casing perforations 14 and then through the slots 30 in the envelope 26, through the gravel 31 and will enter the pipe 18 through the perforations or slots 20, whereupon the oil will pass upwardly to the surface through the flow string 24. The oil in passing into the flow string will carry sand and this sand on passing through the narrow slots 30 of the envelope 26 will wear or cut away the thin material from which the envelope is formed. The gravel 31 will thus be released and will form a filter bed around the screen between the perforations 20 and the perforated section of the well casing. The additional material 31 which was in the upper portion of the envelope will descend thus forming a compact bed of material around the perforations 20.

Gravel may be placed around a screen in an open hole in a manner similar to that which has been described. In this case when the retaining envelope has been worn away by the sand the gravel will be released and will fill the cavity in the producing sands around the screen, which cavity may have been previously enlarged as by underreaming, if desired.

By placing the gravel in the manner which has been described, the necessity of maintaining circulation in the hole is eliminated and by this method the gravel can be placed quickly at any desired position in a well hole. Furthermore, the dangers of misplacing the gravel which are attendant when the gravel is dropped into the hole from the surface are also eliminated.

Obviously many modifications and variations of

the invention may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated by the appended claims.

We claim:

1. The method of placing granular material in a bore hole so as to form a filter bed around a screen having lower perforate and upper imperforate areas and attached to a string of tubing, which comprises confining in a perforated envelope granular material circumferentially around the periphery of the screen, lowering the assembly of screen, envelope and granular material into the well, sealing the tubing string above the screen from the walls of the well so that sand passing into the well with the liquid to be produced will pass through the perforations in said envelope to corrode and wear away said envelope and then into said granular material, thus allowing the granular material to settle down in the bore hole around the perforate area of the screen from the space around the imperforate area of the screen.

2. A screen assembly to be lowered into a well bore comprising a hollow screen member, a body of granular material arranged around the periphery of said screen member and extending upwardly above said screen member, means to confine such granular material during the lowering of the assembly including a perforated sheath of material, thinner than the structure of the screen, to be disintegrated by corrosion and wear due to the flow of fluids therethrough after the assembly is positioned in the well bore so as to release the granular material to settle in the well bore to provide a filter pack around said screen member.

3. A screen assembly to be lowered into a perforated casing in a well producing formation comprising a hollow screen member, a body of granular material arranged around the periphery of said screen member and extending upwardly above said screen member, means to confine said granular material around said screen member during the lowering of the assembly including a perforated sheath formed of material more readily destructible than said screen, the arrangement being such that after the assembly has been lowered into the perforated casing within the producing formation the liquid being produced will pass through and disintegrate said sheath so that the granular material will be released to settle in the annular space between the screen member and the perforated casing.

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