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METHOD OF CEMENTING WELLS

1,866,522

Filed April 13, 1931

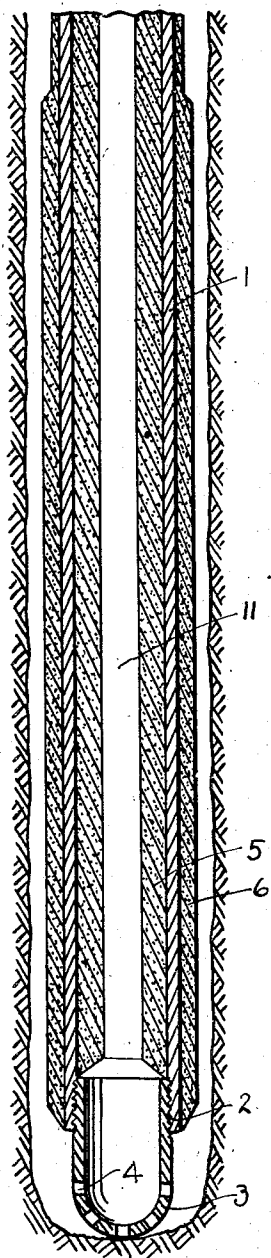


Fig. 1.

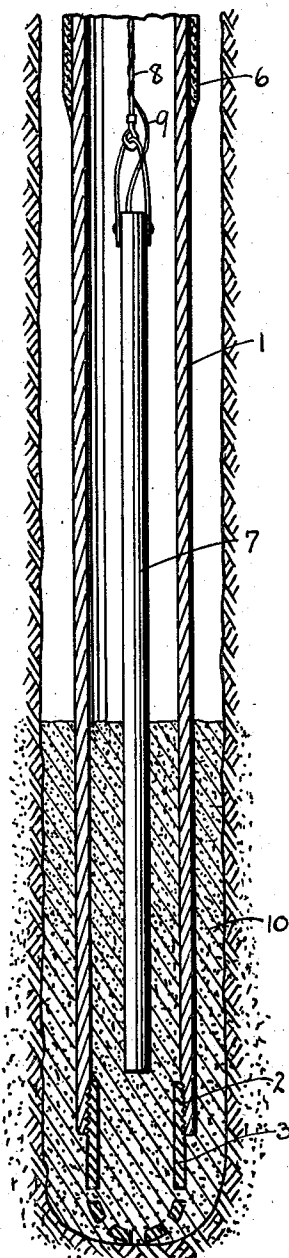


Fig. 2.

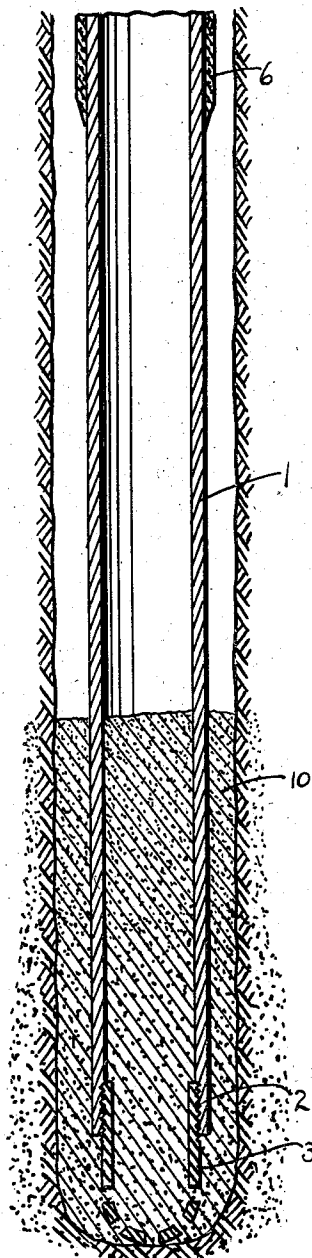


Fig. 3.

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METHOD OF CEMENTING WELLS

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Our invention relates to cementing casing in deep wells of oil, gas, water and the like. In equipping a well which has been drilled to the proper formation, it is common to set a casing in the well and then cement the space between the lower end of the casing and the wall of the well so as to prevent water from above the producing sands from flowing down into the well. This cementing is usually accomplished with Portland cement or some similar type of cement which must be forced into position at the bottom of the casing and then allowed to stand for a period of several days in order to allow the cement to harden.

If it is later desirable to withdraw the casing from the well, it is practically impossible to remove the casing from the cement.

It is an object of our invention to provide a method of cementing wells whereby the cementing operation may be performed more easily and cheaply than in the old method and which allows the casing to be withdrawn if desired.

We desire to use a material for cementing the well which may be melted under temperatures somewhat above atmospheric temperature so as to flow into position at the bottom of the casing and close the space about the casing within the well and in which the movement of the cement into proper position may be accomplished almost entirely by gravity.

In the drawing herewith, Fig. 1 is a central longitudinal section through the lower end of a well casing equipped for carrying out our invention.

Fig. 2 is a central longitudinal section showing the cement in position and illustrating a type of heating element which may be employed.

Fig. 3 is a section similar to that shown in Fig. 2 illustrating the cementing operation completed.

In carrying out our invention we contemplate employing as a cementing agent sulphur, asphalt or other similar material, which may be deposited upon the pipe or casing before it is introduced into the well

and later melted so as to flow into the proper position. The agent which we particularly prefer for this process is sulphur for the reason that it is a good cementing agent and acts to close off the space about the casing at the lower end in a proper and satisfactory manner and will penetrate the formation about the casing so as to form a satisfactory seal.

In Fig. 1 we have shown a casing which is of ordinary tubular construction, the lower end of which is threaded internally to receive a bull plug or nipple 3. This plug may be provided with openings 4 therein to allow the entrance of fluid to the casing while it is being lowered into the well. It is understood, of course, that in shallow wells where it is desired to float the casing into the well, the perforations in the bull plug may be omitted.

Where the plug is perforated we contemplate depositing upon the casing 1 an interior layer of sulphur 5. Said layer will be of sufficient thickness to provide a quantity of sulphur to cement the lower end of the casing. This interior layer is supplemented by an outer layer 6 deposited upon the pipe in any suitable manner. We contemplate covering the pipe with sulphur in this manner for a height sufficient so that when the mass of sulphur is melted it will be sufficient in quantity to fill the lower end of the well to the desired height. There is an opening 11 centrally of the pipe when thus equipped which is sufficient to allow a heating element to be introduced downwardly therein.

In Fig. 2 we have shown a heating element 7 which may be of any ordinary construction and housed within an outer casing. Said element is suspended by a cable 8 extending upwardly to the surface. Electrical connections shown at 9 extend from the heating element to a source of electric energy at the surface.

When our invention is put in execution the casing will be set upon the bottom of the well approximately as shown at Fig. 1 with layers of sulphur in its ordinary hard condition on both the outer and inner walls of the casing. When the casing has thus been set upon the bottom the heating element 7 will be lowered to the bottom and passed downwardly in the opening 11 to a position near the bottom of

the casing and then the element will be energized so as to heat up the sulphur in the casing to a temperature above the melting point of sulphur. If there is liquid in the well, ordinarily the static pressure of the liquid at that depth will be sufficient to prevent the vaporization of any water present. If this weight is not sufficient it will, of course, be necessary to apply pressure upon the liquid in the well sufficient to prevent the vaporization of the liquid about the sulphur. When the sulphur has been thus melted, it will be of higher specific gravity than the liquid in the well and will flow into position as shown at 10 filling the lower end of the well enclosing the space about the lower end of the casing. When the melting of the sulphur has been accomplished, the heating element may be withdrawn and the well will be cemented as shown in Fig. 3. Where the lower end of the casing is closed we will provide sufficient sulphur on the outer wall alone to suitably cement the pipe. Also, it will be obvious that any desired heating means may be employed.

It is customary after the well has been cemented to introduce a drill bit and remove the cement from within the casing and drill away the bull plug at the lower end thereof, so as to allow the oil or gas to enter the lower end of the casing. This will be done in carrying out our invention as if it is found that production has been reached, the well may be allowed to stand. If, however, a dry hole is encountered or production in insufficient quantities is obtained, the casing may be loosened by heating the sulphur at the lower end thereof so as to melt the same, allowing the casing to be withdrawn.

It is, of course, to be understood that the sulphur may be introduced into position in its powdered form after the casing has been set on the bottom. This may be accomplished in the manner that ordinary cement is placed in position. After the bottom of the well has been filled with sulphur in that manner, it may be melted to cement the casing in an obvious manner. We contemplate the use of sulphur as a cement, said sulphur being melted at the lower end of the well whether the sulphur is on the casing when it is introduced into the well or whether the sulphur is introduced after the casing is in position. Furthermore, we do not wish to be confined to the use of sulphur as a cementing agent, but any material which may be melted at the lower end of the well so that it will flow into a cementing position is contemplated by our invention.

What we claim as new is:

1. A method of cementing well casing consisting of coating the lower end of the casing on the inner surface thereof with a charge of cementitious material hard at atmospheric temperatures, introducing the casing into

position in the well, heating said charge to reduce the same to a liquid state and thus causing it to flow to the bottom of the well.

2. A method of cementing well casing consisting of coating the lower end of the said casing with sulphur forming a thick layer on the inner surface thereof setting the casing in the well, introducing a heating element to the lower end of the casing to heat and melt said sulphur and causing it to flow to the lower end of the well by gravity.

3. A method of cementing a casing in a deep well comprising coating said casing both on the inner and outer surfaces with a charge of sulphur, setting said casing with the sulphur attached into the bottom of the well, melting said sulphur to fill the well bottom about said casing, and cooling and hardening said sulphur.

In testimony whereof we hereunto affix our signatures this 14th day of March, A. D. 1931.

CLARENCE E. JACKSON.
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