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C. E. REISTLE, JR., ET AL

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CEMENTING WELLS

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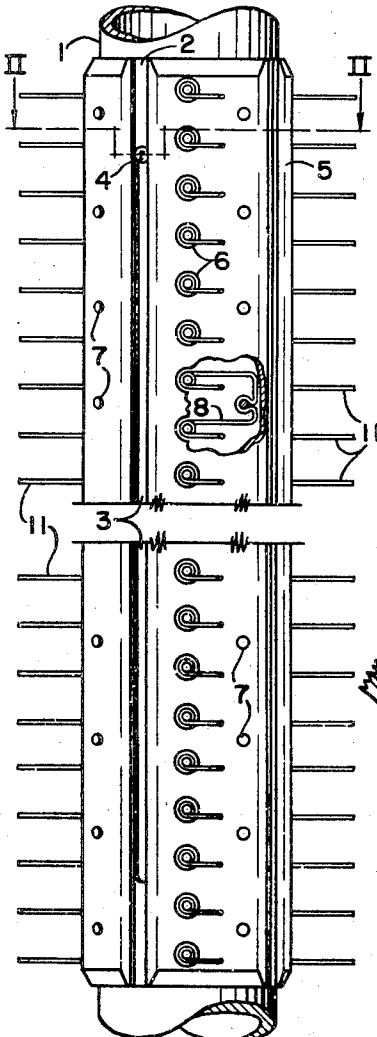


FIG. 1.

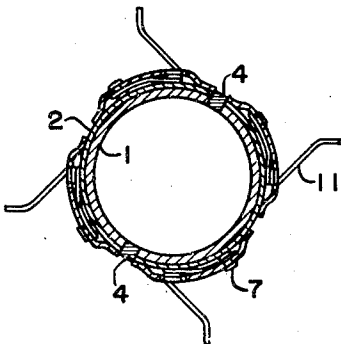


FIG. 2.

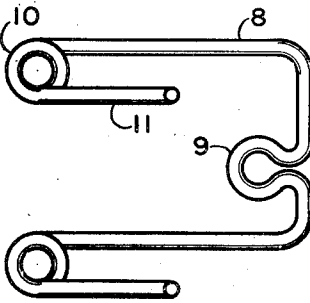


FIG. 3.

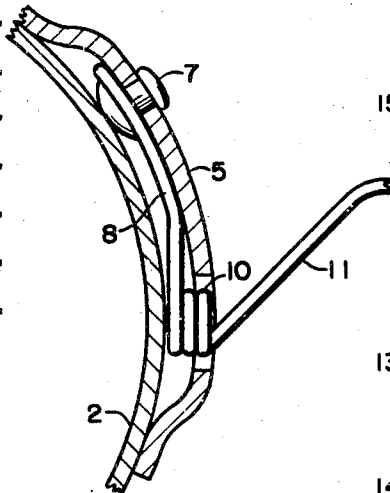


FIG. 4.

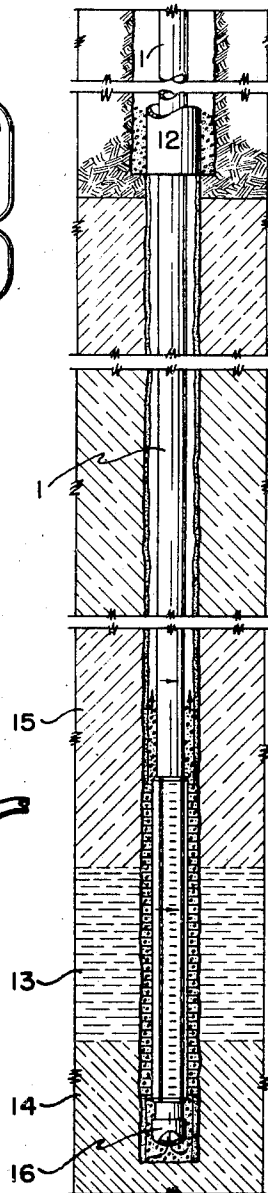


FIG. 5.

Carl B. Reistle, Jr. INVENTOR.
George E. Cannon
BY

P. Y. Whelan

ATTORNEY.

UNITED STATES PATENT OFFICE

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CEMENTING WELLS

Carl E. Relstle, Jr., and George E. Cannon,
Houston, Tex., assignors to Standard Oil De-
velopment Company, a corporation of Delaware

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1

The present invention is directed to a method for performing cementing operations in bore holes and to apparatus useful in the practice of such a method.

Much difficulty is experienced in attempts to cement casing in bore holes where the object is to seal off one or more formations. This difficulty arises out of the fact that at the time a cementing operation is performed the wall of the bore hole is usually covered with a sheath of clay which has been deposited from the drilling mud. This sheath of clay makes the effectuation of a tight bond between the cement and the formation difficult.

There have already been proposals and repeated attempts to overcome the aforesaid difficulties by scraping the mud sheath off the wall of the bore hole prior to the cementing operation. Some degree of success has been achieved by this expedient, but in view of the fact that during the scraping operation the bore hole is full of drilling mud or clay suspension, it is quite evident that the clay sheath tends to redeposit as fast as it is scraped off. Furthermore, such scraping devices as hitherto employed have been of such configuration as to permit channeling of the cement through the scraping device thereby resulting in breaks in the cement lining along the bore hole.

Another difficulty which has been encountered in the use of scraping devices has also arisen from the design of such devices. Those which have been most commonly employed are of such design that they scrape the wall of the bore hole along its entire length as they are being lowered into place to scrape the desired section. It is undesirable, however, to remove the clay sheath from the major portion of the wall of the bore hole since it serves to seal off this wall. The objective is to remove the clay sheath from the particular portion of the wall which is to be cemented while preserving the clay sheath to the fullest extent possible in the remainder of the bore hole. Of course, when the scraper only disturbs the clay sheath in its downward travel, this is not serious because the clay will redeposit. In most common designs, however, the scraper actually pushes the clay ahead of it until the scraper itself has a clay sheath over its forward surface. When this happens, the scraper actually interferes with rather than aids the cementing operation.

According to the present invention, a cementing operation is improved by lowering into the well rotatable member carrying a scraper in the form of circumferentially spaced longitudinal rows of substantially vertically aligned fingers or

2

scrapers to a position in the well adjacent the formation which is to be cemented off, rotating the member upon which the scraping elements are disposed for a period sufficient to effect the removal of the clay sheath from the selected formation and, while still continuing the rotation, spotting the cement against said formation. When this procedure is followed, redeposition of the clay sheath on the formation is prevented and channeling of the cement is eliminated and an effective seal of cement on the formation surface is realized.

The nature of the present invention will appear more clearly in the following detailed description of the accompanying drawing in which

Fig. 1 is a side elevation of a rotatable member, such as a casing carrying the scraping device of the present invention;

Fig. 2 is a cross section along the line II—II of Fig. 1;

Fig. 3 is a detail of the scraping fingers;

Fig. 4 is a detailed section showing the securing means for said fingers; and

Fig. 5 is a vertical section of a bore hole showing the device in place during a cementing operation.

Referring to the drawing in detail, numeral 1 represents a casing which is to be cemented in a well and numeral 2 represents a sleeve slidably mounted upon said casing. This sleeve is provided with oppositely disposed longitudinal slots 3 in which ride studs 4 carried by the casing. Welded to the sleeve 2 are a plurality of channel members 5 which, in the specific embodiment shown, are four in number. Each channel member is provided with a longitudinal row of aligned holes 6 and spaced transversely from said holes a longitudinal parallel row of rivets 7 in staggered relation to said holes. Each scraping unit is a U-shaped spring member 8, having at its base an eye 9 adapted to seat on the head of the rivet 7, and having at the end of each of its legs a coil spring 10 adapted to seat in the holes 6. From the end of each coil spring a spring finger 11 extends outwardly. The extending finger may assume any configuration and in the drawing is shown to be inclined rearwardly with respect to the direction of rotation of the casing for a portion of its length and then radially from the casing.

The purpose of the stud and sleeve arrangement is to permit the collar 2 to travel longitudinally with respect to the casing as the latter is rotated. By this expedient the scraping mechanism is made effective for a length considerably

3

greater than its own length. It will be understood, however, that the collar 2 is not necessary to the assembly since the channel members 5 can be welded directly to the casing.

In Fig. 5, is shown a bore hole in which surface casing 12 has been set and the hole then extended to traverse a producing horizon 13. In the operation to be described, the purpose is to cement a string of casing to the producing horizon in such a way as to seal off the producing horizon from the adjacent formations, the lower one, 14, of which, for example, may contain water while the next higher one, 15, may contain gas. In the practice of the present invention, the casing which carries the scraping assembly is lowered into the bore hole until the scraping assembly is opposite the producing formation and preferably extending on either side thereof. In this stage the hole is full of drilling mud. The casing carries a cementing shoe 16 at its lower end. The casing is rotated for a period, such as 15 to 30 minutes, and then with the casing still rotating cement is pumped through it and caused to rise up on the outside of the casing to a point above the producing formation. In some cases, it will be preferable to precede the charge of cement with a charge of clear water to assist in carrying away the broken up clay sheath. After sufficient cement has been forced into the well to reach the desired level, the rotation of the casing is stopped and the cement allowed to set. Thereafter a perforating device is lowered into the casing and holes punched through the casing and cement into the producing formation.

It will be observed that the scraping fingers are of such a configuration and so arranged that as the casing is lowered into the well, the fingers cause a minimum of disturbance of the clay sheath above the point in which effective scraping is desired. Furthermore, the arrangement of fingers is such that the possibility of any bridges of clay sheath forming around the lower end of the scraper is extremely remote. Finally, the fingers serve to center the casing so as to insure a layer of cement of substantially uniform thickness around the casing.

In the specific embodiment shown, a particular cementing operation is portrayed. It is to be understood that the invention is not limited to this particular operation but is applicable to any cementing operation. These operations may be conducted from time to time for sealing a high pressure gas or water stratum regardless of the position thereof with respect to the producing formation.

4

The nature and objects of the present invention having been described and illustrated, what we desire to claim is:

1. A scraping device for well casings comprising an elongated channel member having a longitudinally aligned row of spring fingers.

2. A scraping device for a well casing comprising an elongated channel member, a longitudinal row of retaining members on said channel member and a spring member secured to each retaining member provided with a spring finger adapted to extend outwardly from said channel member to thereby provide a longitudinal row of spring fingers on said channel member.

3. A scraping device for well casing comprising an elongated channel member, a longitudinal row of retaining members on said channel member, a longitudinal row of perforations in said channel member spaced from and parallel to said retaining members, a spring member secured to each retaining member having a coil portion adapted to seat in one of said perforations and terminating in a spring finger extending outwardly from said channel member.

4. A scraping and centering device for well casing comprising a collar having therein a longitudinally extending slot and slidably mounted on a section of the casing, a multiplicity of outwardly extending spring arms mounted in a few circumferentially spaced longitudinal rows on said collar with all of the spring fingers in each row in alignment and a stud mounted on the section of casing and riding in said slot whereby the collar is secured to the casing for rotation therewith and is free to move longitudinally relative thereto.

5. A scraping and centering device for a well casing comprising a collar secured to said casing for rotation therewith and for longitudinal movement relative thereto and a plurality of circumferentially spaced longitudinal rows of outwardly extending spring fingers carried by said collar.

CARL E. REISTLE, JR.
GEORGE E. CANNON.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,151,416	Black et al.	Mar. 21, 1939
2,374,317	Wright	Apr. 24, 1945