March 13, 1945. N. B. DISMUKES 2,371,383

PLUGGING STRATA IN BORE HOLES

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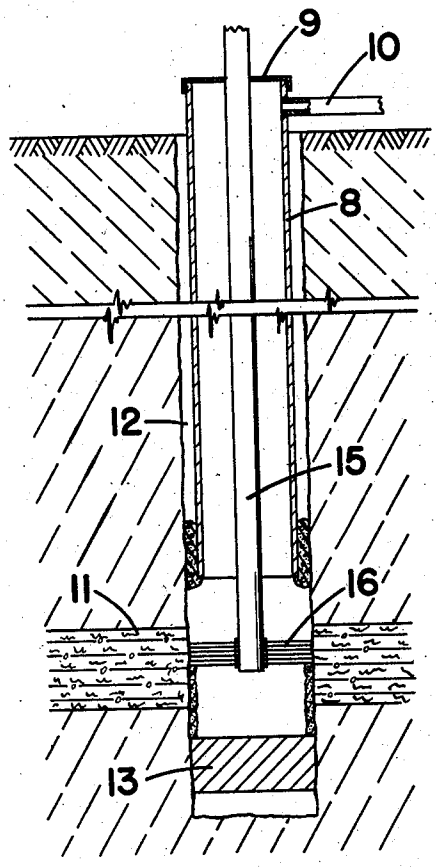


FIG. 1.

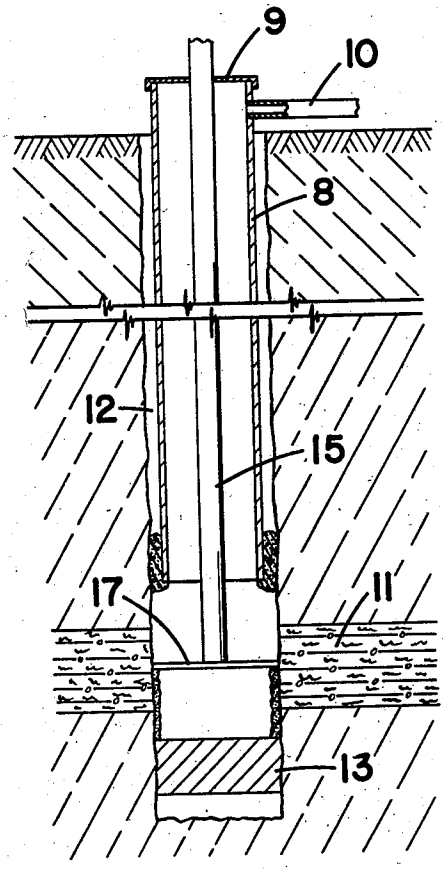


FIG. 2.

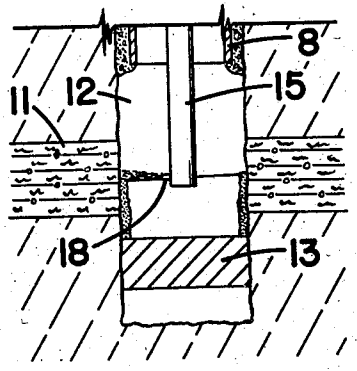


FIG. 3.

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PLUGGING STRATA IN BOREHOLES

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1 Claim. (Cl. 166—21)

The present invention may be briefly described as involving the removing of the filter cake from the face of the formation being treated concurrently with the injection of treating agents into the formation.

In the drilling of wells it is usual to employ a drilling fluid, which is a suspension of finely divided solids in a liquid base, to carry the cuttings from the bottom of the bore hole, to exert sufficient pressure on the formation penetrated to prevent the flow of fluid from formations into the bore hole, and to form a filter cake on the walls of the bore hole in order to prevent the exchange of fluid between the bore hole and the penetrated formations. This drilling fluid is almost invariably present in the bore holes during the completion and reworking of wells and, as stated above, one of the functions of drilling fluid is to build a filter cake or mud sheath on the wall of the bore hole.

Heretofore, when injecting chemical sealing agents or other treating agents into selected strata of bore holes, it has been customary to simply pack off the desired strata so that the sealing agent may be directed thereto, and the agent then placed in the bore hole under sufficient pressure to force it into the desired formation. It has been found that this conventional procedure has often resulted in unsatisfactory penetration because of the mud sheath, which reduces the rate and amount of flow of fluid from the bore hole into the formation.

In accordance with the present invention these mears are used when forcing known chemical sealing agents into preselected strata. In addition to these conventional steps plastering solids are removed from the wall of the bore hole prior to or concurrently with, or both prior to and concurrently with the step of forcing the treating agent into the strata. The cleaning step insures a substantially greater penetration of the agents into the strata.

Other objects and advantages of the present invention may be seen from a reading of the following description taken in conjunction with the drawing in which

Figs. 1, 2 and 3 are fragmentary views illustrating several modifications in the practice of the present invention.

One of the methods of carrying out the present invention is illustrated in Fig. 1 which is a fragmentary view showing a section of a bore hole. In Fig. 1 it is desired to inject a chemical sealing agent into stratum 11. In order to carry out this step, the bore hole 12 is provided with a packer 13 arranged below stratum 11. The upper part of the well is provided with a surface string of casing 8 to which is attached a conventional well head diagrammatically shown as cap 9 having a drawoff line 10. Drill pipe 15 is slidably arranged in the well. The lower end of the drill pipe is provided with a wire brush 16 arranged to remove the wall of the bore hole.

A treating agent in fluid form is pumped down drill pipe 15 to a point adjacent formation 11 and sufficient pressure exerted upon the treating fluid to overcome the pressure present in formation 11. As the treating fluid is being forced into the bore hole under pressure, brush 16 is given both rotary and vertically reciprocating motion in order to clean the mud sheath from the wall of the bore hole. The step of cleaning the plastering solids from the bore hole insures a prompt and thorough penetration of the treating agent therein. As stated previously, if desired, a cleaning step may be carried out before the treating agent is forced into the bore hole.

An alternative method of practicing the present invention is shown by Fig. 2. The arrangement here is similar to that of Fig. 1 with the exception that drill stem 15 is provided with a conventional wall reamer 17. Reamer 17 is utilized to remove the mud sheath from the bore hole and to prevent the deposition of plastering materials on the wall of the bore hole during the injection of the fluid treating agent into formation 11 by the operation of the reamer simultaneously with the injection of sealing material into the bore hole.

Another modification of the present invention is illustrated in Fig. 3. In this embodiment, a jet 18 is attached to the lower end of drill stem 15 so that the jet may be directed on the wall of the bore hole, thereby removing foreign matter therefrom. In utilizing this embodiment, it is preferred to first force a readily available liquid, such as water, down through the drill pipe to remove the mud cake from the wall of the bore hole, and follow this with a charge of fluid treating agent, utilizing the agent as the liquid to be jetted against the formation to remove foreign matter therefrom while placing it. The jetting action on the wall of the bore hole removes foreign plastering materials concurrently with the forcing of the chemical treating agent into the stratum.

As still another embodiment of the present invention, an acid soluble plastering material, such as calcium carbonate, may be employed in the drilling fluid, and a sealing agent containing

an appreciable amount of acid employed, whereby the acid dissolves any of the solid material which may be deposited on the wall of the bore hole during the injection of the sealing agent.

I claim:

A method of completing wells comprising the steps of packing off a predetermined stratum, removing the mud sheath comprising plastering materials from the wall of the bore hole adjacent said stratum, injecting a plugging agent into the borehole adjacent said stratum and after the removal of the mud sheat placing a sufficient pressure on said plugging agent to overcome the pressure of the formation and to force it from the borehole into the formation, and simultaneously with the application of said pressure, scraping that portion of wall of the borehole adjacent said stratum from which the mud sheath was previously removed to prevent the accumulation of plastering materials thereon.

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