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Meitzen

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[54] **METHOD OF PLUGGING BACK A WELL**

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[73] Assignee: **Esso Production Research Company**

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[52] **U.S. Cl.** **166/250,** 166/277, 166/285

[51] **Int. Cl.**.....**E21b 47/00,** E21b 29/00

[58] **Field of Search**.....166/250, 277, 285, 291, 315, 166/77

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[57] **ABSTRACT**

A method of plugging back a tubingless well cased with small diameter pipe which requires an accurate determination of the well depth by wireline measurements. The perforated interval in the tubingless well is located by pumping fluid into the well past a flow restricting tool attached to the lower end of a wireline. A decrease in the wireline load indicates when the flow restricting tool has entered the perforated interval which establishes the depth of the perforated interval. Accurate depth control with the wireline is thereby obtained. A tubing stop is set above the perforated interval and a cement squeeze is displaced into the perforated interval with a conventional cement wiper plug until the wiper plug bumps on the tubing stop. The remainder of the workover utilizes conventional perforating methods.

5 Claims, 5 Drawing Figures

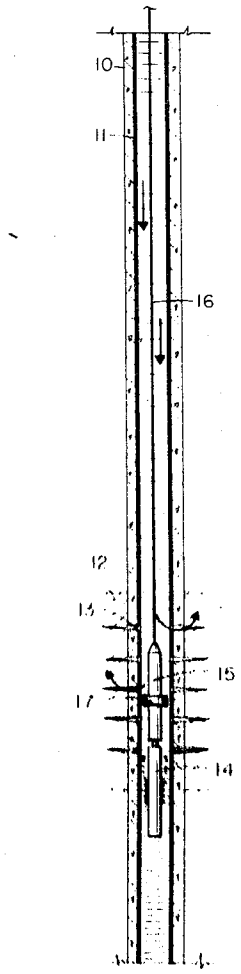

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FIG. 1.

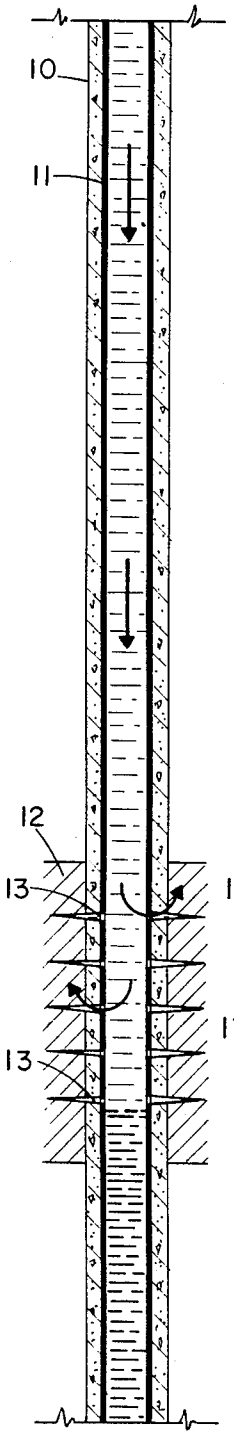


FIG. 2.

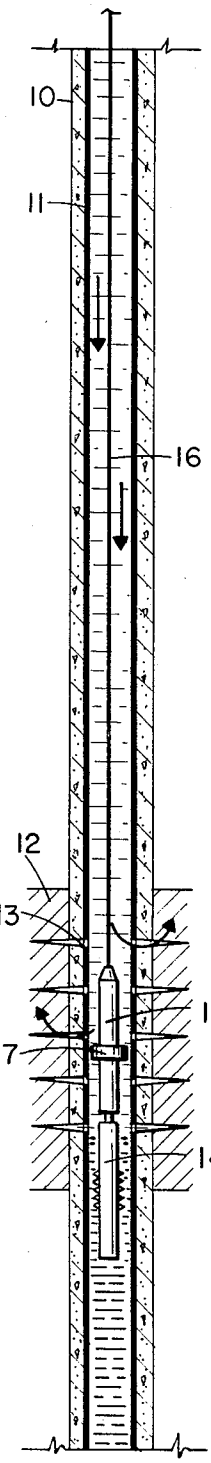


FIG. 3

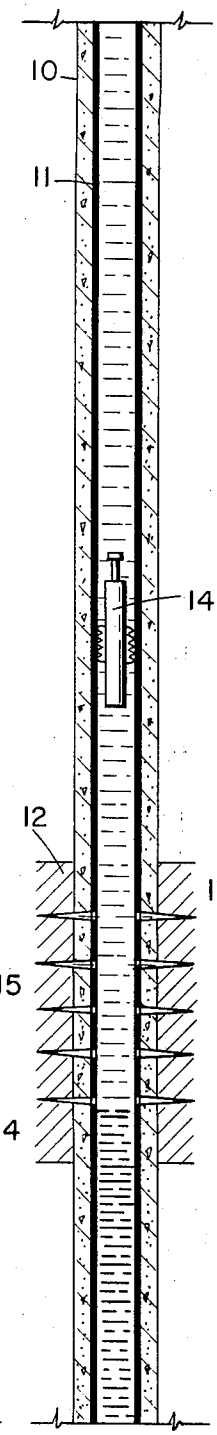


FIG. 4.

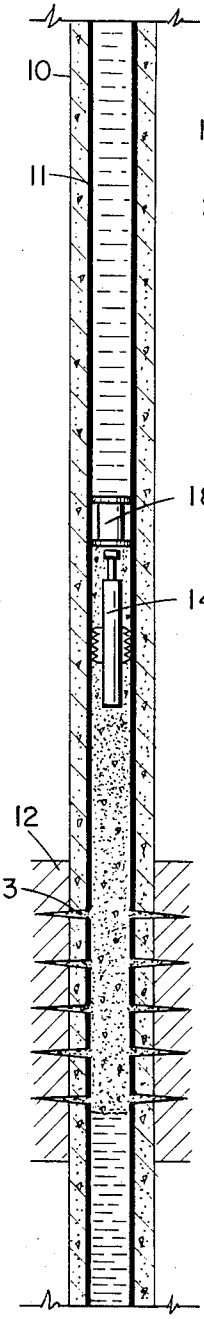
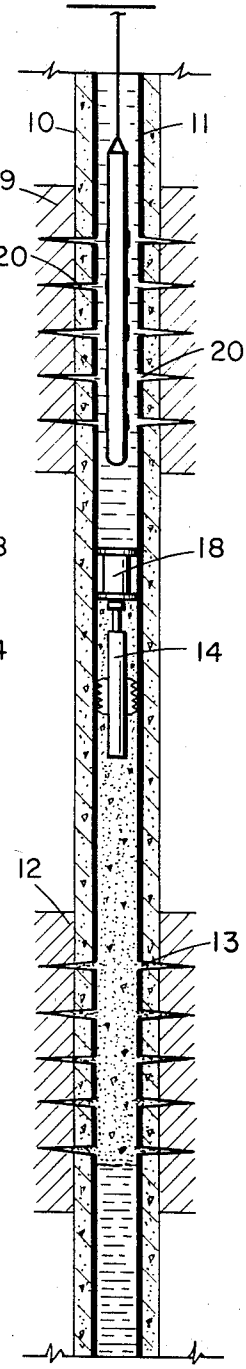


FIG. 5.



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METHOD OF PLUGGING BACK A WELL

BACKGROUND OF THE INVENTION

In tubingless wells cased with small diameter e.g., 2⅜ inch, 2⅞ inch or 3½ inch casing pipe, it is often necessary to rework the well to a higher sand stringer in the same reservoir or to recomplete slightly higher in a new reservoir.

Pumped-down cement plugbacks can seldom be placed with closer than one-quarter barrel accuracy which amounts to 45 feet in 2⅞ inch casing with a scattered interface between the cement and the displacing fluid often causing problems in getting down the casing pipe with perforating tools. The rig work that follows to achieve perforating depth has the disadvantages of (a) additional expense, time, and risk involved in performing macaroni tubing work and (b) the squeezed perforations are exposed to the well bore thereby risking a possible breakdown during production or during stimulation of the higher perforated interval.

Cast iron bridge plug plugbacks can be accomplished with about ½ foot accuracy but these have the disadvantages of (a) possible behind pipe communication between the old and the new perforating intervals will not be repaired and (b) future recompletions downhole will require removal of the bridge plug and squeezing of the old perforated interval.

SUMMARY OF THE INVENTION

Briefly, the invention resides in a method of plugging back a well which is provided with a pipe string having perforations at a selected interval and comprises the steps of (1) pumping fluid into the pipe string and through said perforations to establish a pump rate into the perforated interval; (2) lowering a tubing stop and flow restricting element on a wireline into the pipe string, the flow restricting element fitting sufficiently close inside the pipe string to create a noticeable increase in wireline tension when fluid is pumped past the flow restricting element; (3) positioning the tubing stop and the flow restricting element a selected distance above the perforated interval; (4) pumping fluid past the flow restricting element and into the perforated interval to impose additional tension on the wireline; (5) lowering the tubing stop and flow restricting element while pumping fluid past the flow restricting element until a wireline tension load decrease indicates that the flow restricting element is at or below the open perforations of the perforated interval which are receiving fluid; (6) pulling up and setting the tubing stop immediately above the perforated interval; (7) removing the flow restricting element from the pipe string; and (8) conducting squeeze cementing displaced with a conventional cement wiper plug until the wiper plug bumps on the tubing stop.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1** to **5** illustrate schematically the steps of the method of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, in FIGS. **1** to **5** there is shown a well bore **10** in which is located a small diameter casing or pipe string **11**. Well bore **10** and pipe string **11** have been perforated at an interval **12** by perforations indicated at **13**.

When it is desired to abandon interval **12** and perforate at a slightly higher location in well bore **10**, the following procedure is carried out. The example used to illustrate the procedure assumes a 2⅞ casing string, perforations at an interval **12** to be abandoned between 7,950 and 7,960 feet and a new interval **19** to be perforated between 7,930 and 7,935 feet.

Fluid is pumped into the perforated interval **12** using a pump truck and a pump rate into performations **13** is established. The fluid used to establish the pump rate is preferably field produced salt water but may be oil, such as lease oil or gas plant lean oil, if an oil reservoir non-damaging fluid is desired. As illustrated in FIG. **2**, a conventional tubing stop **14**, as for example a commercially available aluminum alloy slip type tubing stop, is run on a wireline **16** into pipe string **11** along with a running tool **15**, which is provided with a flow restricting element **17** having about a 2¼ inch outside diameter, to a depth of about 7,900 feet. Fluid is pumped into the open perforations **13** and 100 to 200 pounds of additional wireline tension is imposed. The wireline tools **14** and **15**, **17** are lowered slowly until the tension load decrease indicates that the flow restricting element **17** has passed the open perforations **13** receiving fluid. As illustrated in FIG. **3**, the wireline tools **14** and **15**, **17** are then pulled up in pipe string **11** about 12 feet where the tubing stop **14** is set. To assure achieving a plugback of the entire perforated interval **12**, it is assumed that the bottom perforation at 7,960 feet was receiving the pumped fluid. When the tubing stop has been set immediately above the perforated interval **12**, the running tool **15** and flow restricting element **17** are disconnected from tubing stop **14** (running tool **15** and tubing stop **14** may be shear pinned to each other) and removed from pipe string **11**. As illustrated in FIG. **4** a squeeze cement slurry is loaded into pipe string **11** followed by a cement wiper plug **18** and displaced with any desired fluid until the wiper plug bumps on tubing stop **14**. Pressure is held as desired and the cement is permitted to set. The squeeze cement job may be tested with additional pressure or by swabbing as desired. Then as illustrated in FIG. **5** the new interval **19** at 7,930 to 7,935 feet is perforated as indicated by perforations **20**.

Changes and modifications may be made in the illustrative embodiment of the invention shown and/or described herein without departing from the scope of the invention as defined in the appended claims.

Having described the objects, advantages and operation of my invention, I claim:

1. A method of operating in a well which contains a pipe string and in which said pipe string and an interval penetrated by said well are perforated at a selected level comprising the steps of:

pumping fluid into said pipe string and into said perforations to establish a pump rate;

lowering in said pipe string on a wireline a tubing stop and a flow restricting element releasably attached to said tubing stop, said flow restricting element being sized to fit close to the inner wall of said pipe string so as to create a noticeable increase in wireline tension while pumping fluid past said flow restricting element;

positioning said tubing stop and said flow restricting element a selected distance above said perforated interval;

pumping fluid past said tubing stop and flow restricting element and into said perforated interval to impose additional tension on said wireline and lowering said tubing stop and flow restricting element until a wireline tension load decrease indicates that said flow restricting element is at or below said open perforations receiving fluid;

pulling up and setting said tubing stop immediately above said perforated interval;

removing said flow restricting element from said pipe string; and

loading a squeeze cement slurry into said pipe string followed by a cement wiper plug and displacing said cement slurry and wiper plug with a desired liquid until said wiper plug bumps on said tubing stop.

2. A method as recited in claim 1, including the step of maintaining a desired pressure and permitting said cement to set.

3. A method as recited in claim 2, including the step of perforating another interval in said well at a level above said tubing stop.

4. A method of operating in a well which contains a pipe string and in which said pipe string and an interval penetrated by said well are perforated at a selected level comprising the steps of:

suspending a tubing stop and a flow restricting element attached to said tubing stop in said pipe string;

pumping fluid past said tubing stop and flow restricting element and into said perforated interval while lowering said tubing stop and flow restricting element in said pipe string until a wire line tension load decrease indicates that said flow restricting element is at or below said open perforations receiving fluid;

setting said tubing stop immediately above said perforated interval;

removing said flow restricting element from said pipe string; and

displacing cement into said perforated interval to plug back said perforated interval.

5. A method recited in claim 4 including the step of perforating another interval at a level above said tubing stop.

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