

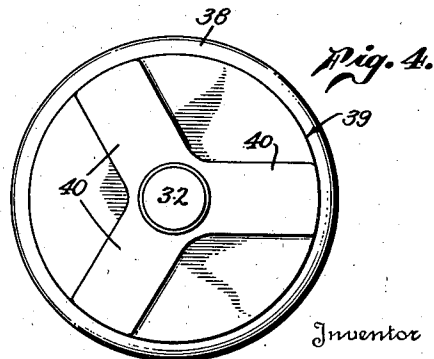
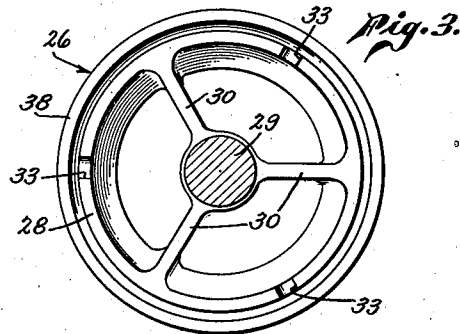
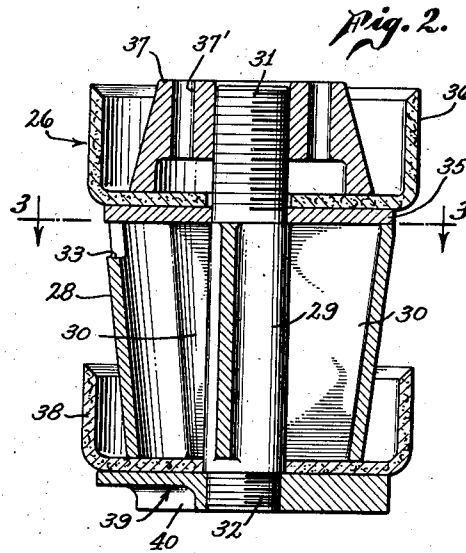
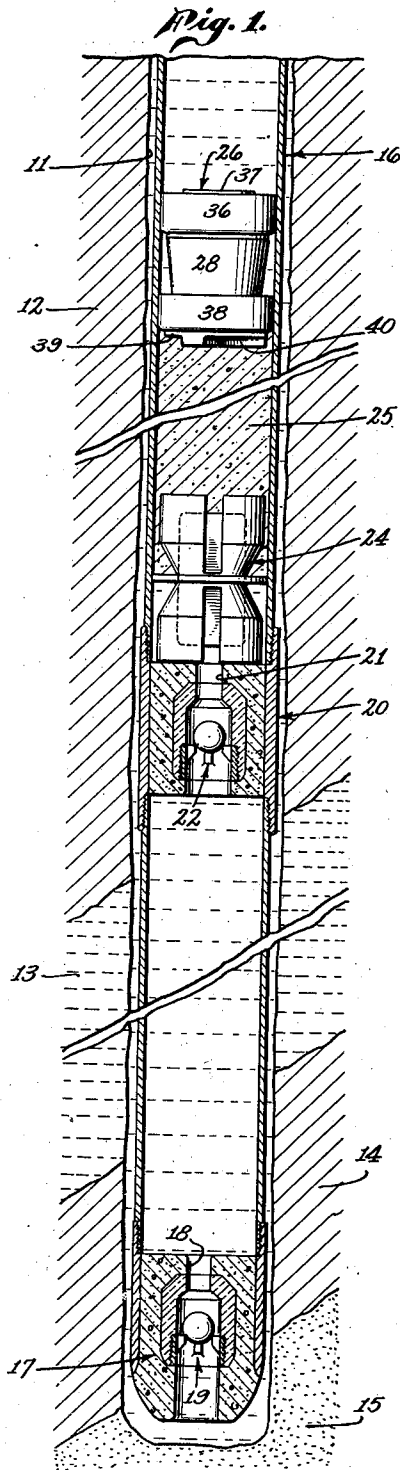
July 11, 1939.

N. W. WICKERSHAM

2,165,433

TOP CEMENTING PLUG

Filed Aug. 2, 1938



Inventor

NEWTON W. WICKERSHAM,

By *Max K. Mahan*

Attorney

UNITED STATES PATENT OFFICE

2,165,433

TOP CEMENTING PLUG

Newton W. Wickersham, Whittier, Calif., assignor
to Perkins Cementing, Inc., a corporation of
California

Application August 2, 1938, Serial No. 222,614

7 Claims. (Cl. 166—1)

This invention relates generally to oil well cementing operations and particularly to plugs used in such operations.

It is customary to make top cementing plugs of either rubber or wood. Rubber plugs are disadvantageous in that they are difficult to drill; they ball up during the drilling operation; it is difficult to remove pieces of the drilled plug from the hole by the ordinary circulation with the result that pieces remain in the hole and interfere with the use of various testing instruments in the well. Wooden plugs are objectionable in that they are fragile and often break in use; they tend to check when stored; and they are difficult to assemble without injury to the plug.

In view of the disadvantages of ordinary types of plugs it is a primary object of this invention to provide a new and improved top cementing plug of simple form, constructed from a light material which is inexpensive and which is readily drillable and which will stand up under the extremely high pressures.

It is a further object of this invention to provide a top cementing plug, the major portion of which is made of a light, easily drillable, non-corrosive metal, preferably a cast aluminum alloy.

It is also an object of this invention to provide a top cementing plug which is not subject to cracking, expansion, vulcanization, corrosion, or physical change when subjected to the fluids, pressures and temperatures encountered in an oil well during a cementing operation.

It is a further particular object of this invention to provide a top cementing plug which is adapted to resist spinning when it is being drilled out.

These and other objects will be apparent from the drawing and the following description thereof. Referring to the drawing which is for illustrative purposes only;

Fig. 1 is a fragmentary sectional elevation of a bore hole showing the cementing plug of this invention in operative relation with a casing and other elements used in a typical cementing operation;

Fig. 2 is a sectional elevation of the plug of this invention;

Fig. 3 is a sectional plan view on the line 3—3 of Fig. 2; and

Fig. 4 is an inverted plan view of the bottom of the plug.

More particularly describing the invention, reference numeral 11 generally indicates the lower portion of a bore hole which is shown traversing a stratum 12, a stratum 13 of water filled sand

formation, a relatively impervious stratum 14, and partially penetrating an oil sand stratum 15.

A casing, generally indicated by reference numeral 16 is shown in the bore hole and partially raised off the bottom of the hole. The lower end of the casing is provided with a float shoe 17 which has a passageway 18 therethrough controlled by a check valve 19 which is adapted to permit downward passage of fluid through the passageway 18 but to prevent upward passage of fluid therethrough. Spaced above the float shoe is a float collar 20 which is also provided with a passageway therethrough indicated by reference numeral 21 which is controlled by a check valve 22 similar in all respects to the check valve 19 above described.

The float collar and float shoe are ordinarily constructed of a readily drillable material except for the portion which forms a continuation of the casing wall. Thus, the valve seat and cage are often of Bakelite set in a body of cement.

Shown above the float collar 20 and resting on the upper end thereof is a bottom cement plug 24. Above this plug is a body of cement slurry 25 which has been placed in the casing on top of the plug. On top of this cement slurry is the top cementing plug 26 of this invention which separates the cement slurry from the fluid pumped into the well and prevents mixing of those two liquids.

The casing 16 has been shown raised off the bottom of the hole in a position where circulation may be established downwardly through the interior of the casing outwardly through the float shoe 17 and upwardly exteriorly of the casing. In the cementing operation, after circulation has been established the plug 24 is placed in the top of the casing and cement slurry 25 pumped in on top of it until the desired amount has been placed in the casing. The plug 26 is then placed on top of the slurry and liquid is pumped on top of plug 26, forcing the two plugs downwardly in spaced relation with the body of cement slurry 25 confined between them. The drawing (Fig. 1) illustrates the position of the plugs at the time the bottom plug comes to rest upon the float collar. Subsequent pumping of liquid into the top of the casing forces the top plug 26 closer to the bottom plug 24 and cement slurry 25 escapes past the plug 25 (deflecting the flexible wiper thereon) and through the passages therein through the float collar 20 and downwardly and out of the casing through float shoe 17 after which it may fill the bottom of the hole and flow

upwardly in the hole surrounding the casing and to some extent enter the formation.

Referring to Figs. 2, 3 and 4 for details in the construction of the plug, the plug comprises a body member 28 which is preferably formed of cast aluminum alloy, such as the product sold under the trade name "Securaloy", for example. The product referred to has the necessary strength and yet has a hardness of only approximately 70 Brinell as compared with drilling bits, the main bodies of which are approximately 300 Brinell and which have hard faced blades, the hardness of which greatly exceeds the hardness of the main body of the bit.

This body member 28 is substantially in the shape of a frustum of a cone and is provided with a longitudinally extending central portion 29 which is connected to the outer portion of the body member by means of three bridge portions 30. The portion 29 may be referred to as an axial core and it is provided with the extended threaded stud portions 31 and 32.

In order to establish communication interiorly and exteriorly of the body member, to prevent collapse of the member when subjected to high fluid pressure, three grooves 33 are provided at the upper edge of the body member which communicate with the interior of the body member.

A cover member 35 which consists of a flat annular plate also formed of cast aluminum alloy is adapted to fit over the upper threaded stud portion 31. Above the cover plate there is provided a cup member 36 of leather or other suitable material which is upwardly turned and is adapted to engage the inner side of the casing in which the plug is used. While the cover plate forms a base for supporting the upper cup it is within the scope of the invention to eliminate this plate and permit the cup to seat directly on the upper edges of the body member.

A top plate 37, which threads on the upper end of the stud portion 31, serves to secure the cup 36 and cover plate 35 to the top of the body member. Holes 37' are provided in the plug to aid in the operation of securing it to the stud 31 and to equalize pressure on opposite sides of the plate. This top plate extends upwardly to the top of the cup or slightly thereabove in order to act as a support for the bottom of another top plug, it being the custom in some cases to use two top plugs in tandem when performing a difficult cementing operation. The upper plug rests on the upper portion of this top plate 37 and cannot distort the cup 36.

Mounted below the body member is a lower cup 38 which is similar to the upper cup and fits over the lower stud portion 32. Below the bottom cup there is threaded on the lower stud portion 32 a bottom plate 39 which serves to hold the lower cup in place.

The bottom plate as shown in Fig. 4 is provided with lug portions 40 which are designed to prevent the member from turning or spinning when it is drilled out. In this connection, it is pointed out that the top plug will be resting on cement which will have set by the time the plug is to be drilled out and that the lugs on the bottom plate will be embedded in the cement and thereby serve to prevent the member from turning.

It should be apparent that a simple, inexpensive plug of light weight, easily drillable material is provided by the construction illustrated and described above.

While the invention has been illustrated and described as of particular structural details, it

is possible to change the construction somewhat without departing from the scope of the invention and it is intended to cover such changes as come within the spirit of the claims.

While the plug has been described as preferably made of aluminum alloy, other materials having the above described characteristics might be employed.

I claim as my invention:

1. A cementing plug of the type described comprising: a hollow body member of lightweight metal, said body member having a threaded stud at its upper end and a threaded stud at its lower end; a cover plate over the upper end of said body member and on said upper stud; an upper cup mounted on said upper stud; a lower cup mounted on said lower stud; a top plate threadably mounted on said upper stud and adapted to act as securing means for said upper cup; and a bottom plate threadably mounted on said lower stud and adapted to act as securing means for said lower cup.

2. A cementing plug of the type described comprising: a hollow body member of aluminum alloy, said body member having a threaded stud at its upper end and a threaded stud at its lower end and having ports through its walls; a cover plate over the upper end of said body member and on said upper stud; an upper cup mounted on said upper stud; a lower cup mounted on said lower stud; a top plate threadably mounted on said upper stud and adapted to act as securing means for said upper cup, said top plate extending upwardly to the upper limits of said upper cup; and a bottom plate threadably mounted on said lower stud and adapted to act as securing means for said lower cup, said bottom plate having downwardly projecting lugs thereon.

3. A cementing plug of the type described comprising: a hollow body member of metal having an axial core terminating in threaded stud portions extending beyond the ends of the body member; a flexible cup mounted on each stud; and a member threadably mounted on each stud and securing the respective cup members to the body member.

4. A cementing plug of the type described comprising: a hollow body member of metal, said body member having a threaded stud at its upper end and a threaded stud at its lower end and having ports through its walls; an upper cup mounted on said upper stud; a lower cup mounted on said lower stud; a top plate threadably mounted on said upper stud and adapted to act as securing means for said upper cup, said top plate extending upwardly at least to the upper limits of said upper cup; and a bottom plate threadably mounted on said lower stud and adapted to act as securing means for said lower cup.

5. A cementing plug of the type described comprising: a body member of metal, said member having an outer wall, an axial core and bridging wall portions connecting said outer wall and core, said core terminating in threaded stud portions extending beyond said body member, said outer wall having ports; a cup member mounted on each of said studs; and a member threadably mounted on each stud for securing the respective cup members to said body member.

6. A body member for a cementing plug of the type described comprising: an axial core, an outer wall, and bridging wall portions connecting said core with said outer wall, said outer wall having ports therein, said axial core extending beyond

the other portions of said body member and terminating in threaded stud portions.

5 7. A cementing plug of the type described comprising: a body member of metal, said body member having a frustro conical outer wall portion, an axial core and bridging wall portions connecting said outer wall and said core, said core termi-

nating in threaded stud portions extending beyond said body member, said outer wall having ports; a cup member mounted on each of said studs; and a member threadably mounted on each stud for securing the respective cup members to the body member. 5

NEWTON W. WICKERSHAM.