Feb. 24, 1925.

1,527,749

E. F. RAYMOND

WELL CEMENTING PLUG

Filed March 24, 1924

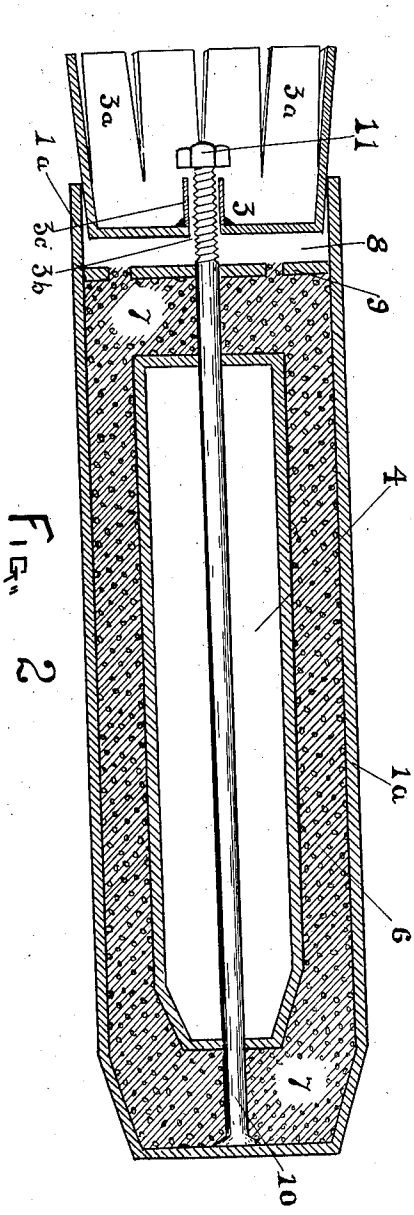


FIG. 2

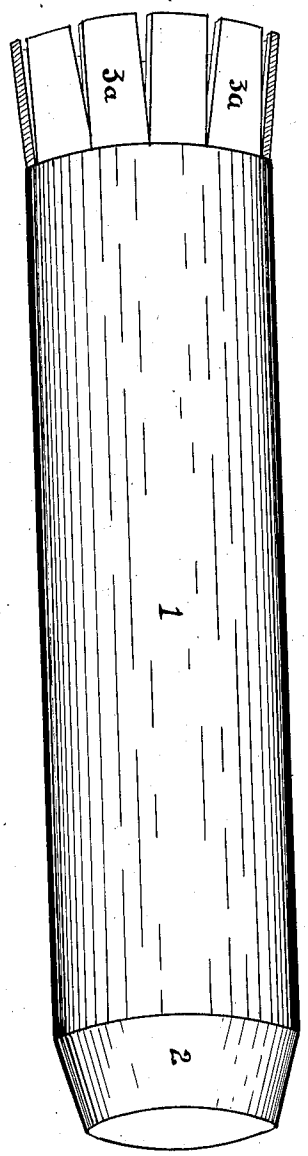


FIG. 1

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UNITED STATES PATENT OFFICE.

EDWARD F. RAYMOND, OF SANTA FE SPRINGS, CALIFORNIA.

WELL-CEMENTING PLUG.

Application filed March 24, 1924. Serial No. 701,467.

To all whom it may concern:

Be it known that I, EDWARD F. RAYMOND, a citizen of the United States, and a resident of the city of Santa Fe Springs, county of Los Angeles, State of California, have invented new and useful Improvements in Well-Cementing Plugs, of which the following is a specification.

My invention pertains to a well plug adapted to follow the cement in the process of cementing a well, as an oil well. Its objects are to provide a plug constructed of material which will offer the least possible obstacle to drilling after the cement formation has hardened; that is provided with sufficient buoyancy for the purposes desired; that contains no vegetable fibre or other material which might clog the drill pipe and pump screen when drilled out; that is practically frictionless when advancing into the hole; and that is readily drilled and ground to powder by the well tools and removed as débris with the mud and sediment in the ordinary manner.

I attain these objects among others by the novel provision, formation, construction, association and combination of parts and members as shown in the accompanying drawings, in which—

Figure 1 is a general view in side elevation of the complete plug.

Figure 2 is a longitudinal cross section of the complete plug.

My plug has been especially designed for use in drilling and cementing of oil wells, and I have herein limited my description and explanation to its application in that line of business.

Plugs adapted to part the cement and mud in the process of cementing oil wells at the present time are commonly made of wood and provided with a rubber sleeve at its lower or entering end to serve as a seal, and a fibre cap nailed to the upper end upon which pressure of the mud above is made to sink the plug. As this plug advances into the casing the wooden part swells and soon moves with great difficulty because of the increasing friction. At the same time the rubber sleeve is torn and shredded by the burrs at the ends of the casing sections, the shreds being forced between the plug and casing to increase the friction as well as to destroy in great measure its sealing effectiveness. A further objection to this commonly used type of plug is the fact that ground rubber and wood fibre form with the mud a homogeneous mass that speedily clogs the drill pipe and pump screen. In this case there is no recourse except to "come out of the hole" to clean the drill pipe and screen. Further, this necessity frequently occurs for two or three days after the cement has hardened and is being drilled, the remedy being tedious and expensive.

Referring more particularly to the drawings:

1 indicates the cylindrical barrel of the plug.

2 indicates the lower or entering end of the plug, tapered to a blunt nose in the form of a truncated cone.

3 indicates a cup-shaped cap to fit into the upper end of barrel 1, the sides of which are divided into multiple sections 3^a—3^a by means of multiple slits in the same reaching from the rim to approximate the bottom of said cap.

4 indicates a hermetically sealed metal chamber within said barrel 1 and positioned therein by means of rod 10 passing therethrough.

6—6 indicate the walls of said chamber 4.

7—7 indicate a cement or concrete mass filling barrel 1 and completely surrounding chamber 4.

8 indicates an open shallow chamber in the upper end of barrel 1, adapted to form a receptacle for cap 3.

9 indicates a diaphragm fitting tightly within the upper end of barrel 1, adapted to form a bottom for receptacle 8, and provided with multiple perforations 9^a—9^a through which the concrete mass 7—7 may be poured, and aperture 9^b for rod 10.

10 indicates a rod adapted to pass longitudinally from end to end of said barrel 1 and position air chamber 4 therein, provided with a threaded end adapted to receive nut 11.

3^b indicates an aperture through the bottom of cap 3, through which rod 10 passes.

3^c indicates a short section of a pipe adapted to be brazed at one end to bottom 8 over aperture 3^b to serve as a guide for rod 10 and to insure the proper seating of cap 3 in cavity 8.

The function of a well cementing plug is to follow the concrete mixture and prevent the mud admitted above to pass and mix with the concrete. It is necessary that the plug be somewhat buoyant and sturdy

enough to withstand great pressure. To provide buoyancy I have provided an hermetically sealed air chamber 4, adapted by its size to offset the specific gravity of the metal plug and its concrete content.

In assembling, rod 10 is passed through air chamber 4 longitudinally and brazed therein. The lower end of rod 10 is brazed to the blunt nose of the barrel 2 to position air chamber 4. Diaphragm 9 is then positioned somewhat above the top of chamber 4, rod 10 passing through the center aperture 3^b therein, and fixed by brazing or soldering. The concrete mixture 7—7 is then poured through perforations 9^a—9^a until the cavity of the barrel is completely filled. Cap 3 is then slipped over rod 10 into receptacle 8 and nut 11 threaded onto the projecting threaded end of rod 10 against the free end of pipe 3^c. Sections 3^a—3^a are slightly flared somewhat and the plug is ready for insertion into the casing.

I prefer to make this plug of flat metal copper sheeting of rather thin gauge, the outside diameter of barrel 1 being approximately the same as the inside diameter of the casing of the well. Flaring of the divided sections 3^a—3^a very slightly will bring them in contact with the casing wall and effectually seal against passing of mud downward. Novel and valuable advantages lie with my type of plug, namely, friction between plug and casing is reduced to a minimum; sections 3^a—3^a of the cap 3 will pass the burred ends of the casing without damage; copper is easily cut and later ground into fine powder by the drilling tools, and because of its high specific gravity this powdered débris will sink to the bottom of the hole; any amalgamation or binding of the metal with mud is impossible, so that in powdered form it will be carried readily in suspension through the drill pipe and screen.

Having thus disclosed the construction and mode of operation of my well cementing plug, I claim as new and desire to obtain Letters Patent of the United States upon:

1. A metallic plug of the character disclosed comprising a cylindrical tubular body; a hermetically sealed air chamber positioned in approximately the center of said body; a compound filler within said body and surrounding said chamber; and an automatically acting cupped cap adapted to fit into the upper end of said body above said filler.

2. A metallic plug of the character disclosed comprising a cylindrical tubular body, one end thereof tapered to form the frustrum of a cone; a hermetically sealed air chamber positioned in approximately the center of said body by means of a metal rod passing longitudinally therethrough and fixed against lateral movement within said body; a composition filler within said body and surrounding said air chamber; the upper portion of the walls of said body forming a receptacle above said filler; and a cupped cap adapted to fit into said receptacle.

3. A metallic plug of the character disclosed, comprising a cylindrical tubular body; an air chamber positioned in approximately the center of said body; a metal rod passing longitudinally through said chamber adapted to position said chamber and provided with a threaded end adapted to receive a nut thereon; a filler within said body and surrounding said air chamber; a diaphragm adapted to fit said body and serve as the bottom of a receptacle formed by the walls of said body and said diaphragm, the same being provided with a central aperture for the passing of said rod, and multiple perforations through which said filler may be poured; and an automatically expandible cap comprising a metallic cup adapted to fit into said receptacle, the sides thereof being divided by slits into multiple sections adapted to flare peripherally when said cap is filled and pressure exerted thereon; said cap being provided with a tubular guide corresponding to the center perforation in the bottom thereof adapted to receive said rod and against the free end of which said nut advances.

In witness whereof I have signed this application and power of attorney in the presence of two subscribing witnesses.

EDWARD F. RAYMOND.

Witnesses:
P. G. JOYCE,
D. L. COSBEY.