Sept. 23, 1930. R. C. BAKER 1,776,613

FLOATING AND CEMENTING PLUG

Filed Jan. 16, 1929

Fig. 1.

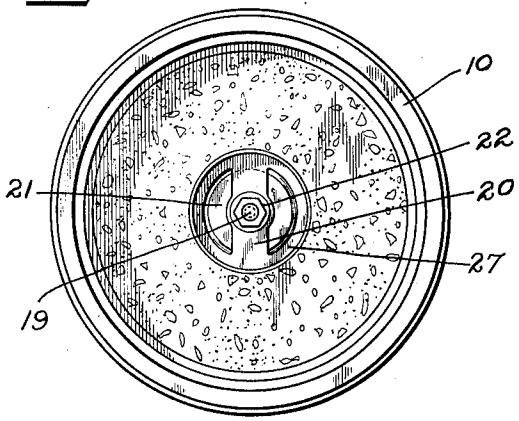
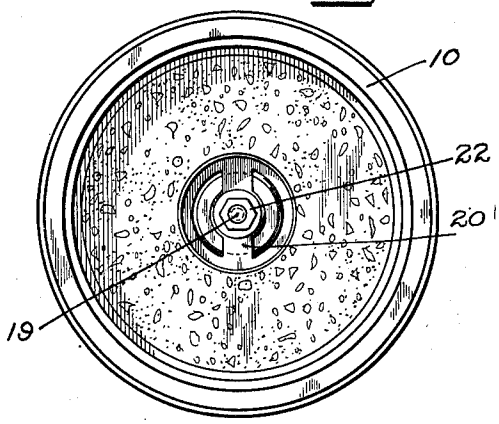


Fig. 3.



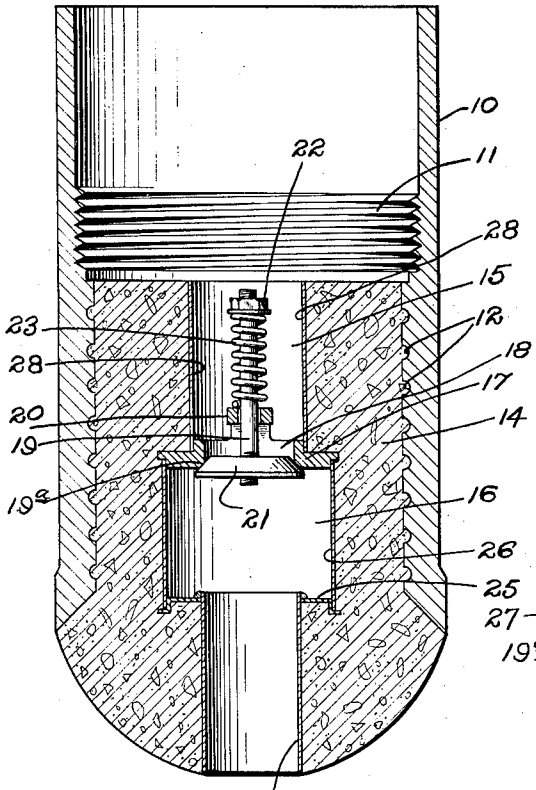


Fig. 2.

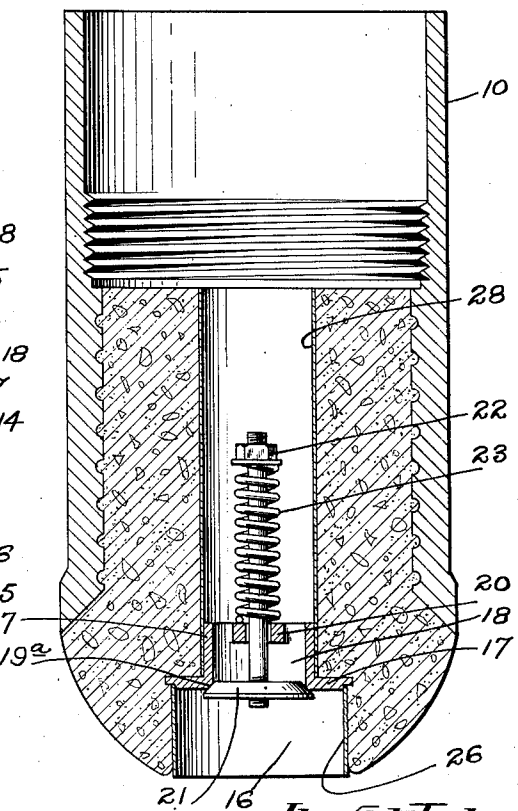


Fig. 4.

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Patented Sept. 23, 1930 1,776,613

UNITED STATES PATENT OFFICE

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FLOATING AND CEMENTING PLUG

Application filed January 16, 1929. Serial No. 332,770.

This invention relates to deep well drilling equipment and particularly pertains to a floating and cementing device for use in connection with strings of well casing when lowering the latter into a well and then cementing the well.

This type of device is disclosed in my prior Letters Patent of the United States bearing Number 1,748,007, entitled "Guiding, floating and cementing shoe," and issued to me on the 18th day of February, 1930. In this prior patent referred to, I disclosed a floating and cementing device formed principally of friable, non-metallic material so that it would be non-injurious to the drilling tools when removing it from the casing to continue the drilling operations.

It is the principal object of the present invention to provide an improved device of the character described, wherein the passage of material through the plug is controlled by a spring-pressed valve of the poppet type. This construction has certain advantages in operation and in economy of construction.

One form which the invention may assume is exemplified in the following description and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a plan view of a casing shoe fitted with a plug embodying the preferred form of my invention.

Fig. 2 is a central, vertical section through the same.

Fig. 3 is a plan view of a slightly modified form of the device.

Fig. 4 is a central, vertical section through the modified form.

Referring more particularly to the accompanying drawings, 10 indicates a casing shoe preferably formed of steel and having internal threads 11, by means of which it may be connected to the lower end of a string of well casing. Intermediate the threads 11 and the lower end of the shoe, the interior thereof is scored, as at 12, to provide anchoring grooves which act as a bonding medium between the shoe 10 and a plug 14 of cementitious material. This plug 14 is cast directly into the lower end of the shoe by the use of a suitable mold such as described and claimed in a prior Letters Patent #1,720,878 issued to me on the sixteenth day of July, 1929 and entitled "Method and mold for producing guiding, floating and cementing shoes."

The lower end of the plug 14 projects from the lower end of the shoe 10 and is semi-spherical so that it will act to guide the lower end of the casing while it is being lowered into a well. The plug 14 is formed with a longitudinal chamber or passageways which extends through opposite ends thereof. This chamber is of comparatively small diameter relative to the plug and is indicated by the numeral 15 in Fig. 2. In the form of the device shown in Fig. 2, the chamber is slightly enlarged at its center to form a valve chamber 16. The upper end of this chamber is divided by a valve seat plate 17 formed with a valve port 18 which is surrounded by a valve seat 19. A bridge 20 extends over the port 18 and the stem 19 of a valve 21 is guided for vertical reciprocation in the bridge 20. The upper end of the valve stem 19 is fitted with a nut 22; interposed between it and the bridge 20, is a compression spring 23. This compression spring normally maintains the valve 21 closed to prevent the passage of fluid through the longitudinal chamber and through the plug. Therefore, it is seen that when a string of casing is being lowered into a well with the plug at the lower end thereof, the pressure will be upward on the valve 21 and will maintain the same closed so that the casing may be floated into place in the well. When the plug reaches the bottom of the well and it is desired to cement the well, cement is pumped downwardly through the casing at a pressure greater than the pressure in the well. This pressure will overcome the spring 23 and will force the valve 21 open, enabling the cement to be discharged through the plug and into the well. When the pressure in the casing is relieved, the external pressure will cause the valve 21 to close and prevent the entrance of the cement from the well back into the casing.

It will be noticed from the drawings that the longitudinal chamber through the plug is lined with a thin, metallic lining. This lining is in reality sheet metal tubes which

are utilized as a core structure when casting the plug. It is seen that the lower end of the chamber is formed by a tube 24 having a flange 25 at its upper end which is united with the lower end of a tube 26 forming the valve chamber 16. The upper end of this tube is connected with the valve plate 17. This valve plate is formed with a reduced, cylindrical portion 27 which receives the lower end of a tube 28, forming the upper end of the longitudinal chamber. In forming the plug, the tubes 24 and 26 are connected by means of the flange 25 and the valve plate 17 is assembled on the upper end of the tube 26. The tube 28 is then connected with the valve plate and the entire core structure is properly positioned within the mold.

In assembling the core structure, the valve parts are properly assembled on the valve plate 17. After this core structure has been properly positioned in the mold, the space between it and the shoe is filled with cementitious material. When this material has set, it is removed from the mold and the plug is ready for use.

It is desired to point out that the plug here disclosed is very valuable for a floating plug for the reason that, should it be damaged during its travel downward into the hole, it will not render the entire device inoperative, as considerable of the plug may be broken away without impairing the operativeness of the valve. The metallic parts of the plug serve to reinforce it so that, should the lower portion of the plug be entirely broken away, the upper portion of the plug will still remain intact due to the strengthening metallic structure lining the longitudinal chamber. It is also desired to point out that the structure here disclosed is very inexpensive to manufacture.

In the modified form shown in Fig. 4, the valve chamber is formed directly at the lower end of the plug which enables the valve to be positioned almost at the extremity of the plug. Except for this slight difference, the plug disclosed in Figs. 3 and 4 is exactly the same as that shown in Figs. 1 and 2.

While I have disclosed the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention, as defined in the appended claim.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

A floating plug for deep well casing comprising a tubular member adapted to be connected with a well casing to form a part thereof, a plug of cementitious material cast within the tubular member and inseparably united therewith, a tubular metallic structure arranged coaxially of said tubular member and embedded centrally within the plug and extending from the upper to the lower end thereof, said metallic tubular structure forming a single straight passageway entirely through the plug and of a diameter relatively small compared with the diameter of the plug, said tubular metallic structure having a valve seat formed therein, a spring pressed downwardly opening valve cooperating with said seat and movable longitudinally of the plug, and spaced from the lower terminal of the plug, engaging the tubular metallic structure and constantly tending to maintain said valve closed to interrupt the flow of fluid through said passageway, said valve opening downwardly whereby to permit fluid under pressure sufficient to overcome the spring to pass downwardly through the plug but to prevent the flow of fluid upwardly through the passageway.

REUBEN C. BAKER.

CERTIFICATE OF CORRECTION.

Patent No. 1,776,613. Granted September 23, 1930, to

REUBEN C. BAKER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 76, in claim, beginning with the comma and word ", engaging" strike out all to and including the word "passageway" in line 84; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of October, A. D. 1930.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)