

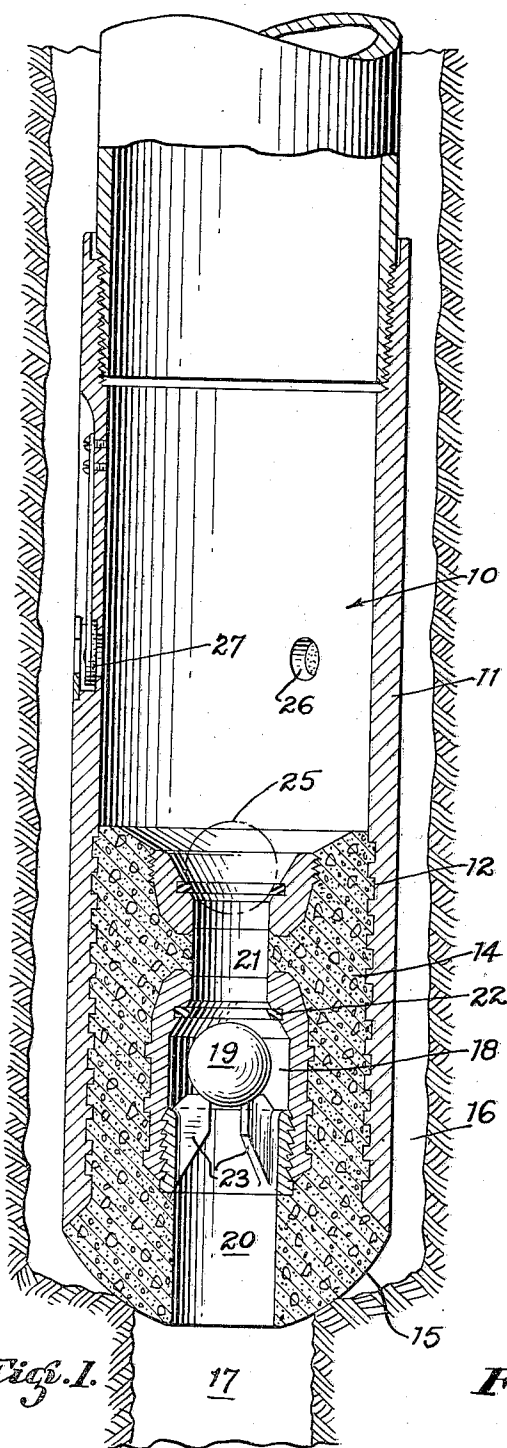
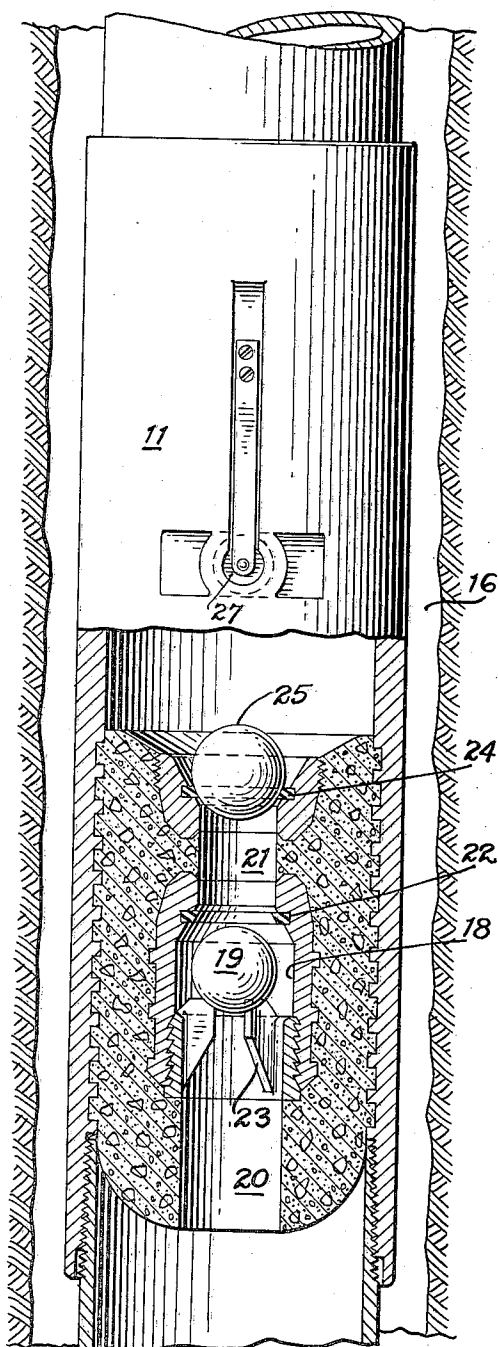
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GUIDING FLOATING AND CEMENTING DEVICE FOR WELL CASINGS

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GUIDING FLOATING AND CEMENTING DEVICE FOR WELL CASINGS

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This invention relates to the art of casing deep oil wells and particularly pertains to a guiding floating and cementing device for oil well casings.

It is a principal object of my invention to provide an improved device of the character referred to which may be fitted to a well casing to enable the same to be floated into place in the well bore, the device also enabling a washing fluid to be pumped therethrough to wash down ahead of the casing; the device being so constructed, however, that cementing will be effected through cementing ports formed through the side of the casing.

In practicing my invention I provide a tubular member to be fitted to and form a part of the well casing. This member which may be either a shoe or a collar is fitted with a valved float plug constructed so as to prevent upward flow of fluid through the member but permitting washing fluid to be pumped under pressure downwardly through the lower end of the casing. The shoe or collar above the float plug is provided with radial cementing ports, each fitted with a normally closed back pressure valve requiring greater pressure to open than the pressure usually required to "wash down". What I prefer terming a "bridging valve" is provided which is effective after the casing has been positioned in the bore to bridge the casing at the float plug and thereby prevent the downward passage of fluid through the lower end of the casing. This construction enables the plug to "float" the casing into place in the bore, thereafter permits a washing down action and then enables cement to be discharged through the side of the casing into the annular space between the casing and the wall of the hole.

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

Figure 1 is a central vertical sectional view through a device embodying the preferred form of my invention;

Figure 2 is a similar view disclosing the device as a casing collar rather than as a casing shoe.

Referring more particularly to the accompanying drawing, 10 indicates a device for use in casing a deep well bore. In Figure 1 I have illustrated the device as comprising a casing shoe 11 which is a cylindrical steel member usually threaded on the lower end of a well casing. This casing shoe 11 is interiorly scored as at 12 and a concrete float plug 14 is cast therein. The lower end of this float plug 14 is rounded to form a guide 15. In

this instance, this guide 15 serves two functions, one of which is to guide the casing on its way down the bore, the second being so that it will firmly seat on the shoulder between the main bore 16 and what is termed the "rat-hole" 17.

The float plug 14 is what is known as a valved float plug, that is, it is provided with a centrally located valve chamber 18 in which a float ball valve 19 is positioned. A passageway 20 extends from the lower end of the valve chamber 18 through the lower end of the plug 14, and a passageway 21 extends from the upper end of the chamber 18 through the upper end of the plug 14. At the junction between the passageway 21 and the valve chamber 18 I provide a valve seat 22 with which the valve 19 cooperates. When the fluid pressure above the valve 19 is no greater than the fluid pressure below the valve 19, this valve will float in the fluid and seat tightly on the seat 22, thus preventing the passage of fluid from the bore into the well casing. By this means the casing may be floated into place in the bore.

Lugs 23 are provided in the lower end of the valve chamber to maintain the ball in the chamber but to permit the passage of fluid under pump pressure downwardly through the casing through the passageway 21 through the valve member 18 and thence through the passageway 20. This is occasionally necessary when lowering the casing into the hole to enable washing down of bridges or other formation obstructions in the bore.

At the upper end of the passageway 21 I provide a second valve seat 24 which I prefer to term a bridging valve seat. Cooperating with this seat is a bridging valve 25 which is likewise a ball-type valve. This valve is not in place when the casing is lowered into the hole but is dropped into place after the casing has been positioned. When this valve is in place it is obvious that fluid can not be pumped downwardly through the plug 14 so that the latter then becomes a bridge in the casing.

Above the plug 14 the cylindrical member or shoe 11 is formed with a series of radial cementing ports 26. At the exterior of the shoe 11 each port is fitted with a spring pressed valve 27. These valves prevent the flow of fluid into the casing through the ports 26. However, under certain conditions, as will be pointed out, these valves 27 may be opened by fluid pressure from within the casing to enable this fluid to discharge through the ports 26 into the space in the bore surrounding the well casing.

The device shown in Figure 2 is in all respects

similar to that shown in Figure 1, with the exception that in Figure 2 the device is incorporated in a casing collar which may be positioned at any point along the well casing, whereas the device in Figure 1 is purely a casing shoe always fitted to the lower extremity of the casing.

In operation, the device is constructed substantially as illustrated in Figure 1 and fitted to the lower end of the well casing. The casing is then lowered into the well bore and inasmuch as the bore is always filled with a heavy fluid, the valve 19 will seat on the seat 22 to prevent the fluid from passing upward through the plug into the casing. This enables the casing to be floated into place in the well bore.

Should it be desired to wash down at any time while the casing is being lowered, the pressure within the casing becomes greater than the pressure in the bore so that the ball valve 19 will unseat and permit the washing fluid to discharge at considerable velocity through the passageway 20. After the case has been positioned, the ball 25 is dropped so that it will seat on the seat 24. Thereafter cement in a fluid form may be pumped downwardly through the casing by any preferred method, which cement will open the valves 27 so that it may discharge through the ports 26 and travel upwardly around the casing to cement the same in. I wish to point out that the springs of the valves 27 will resist opening of the valves, until the fluid pressure in the casing exceeds that used for washing down so that while washing down the ports 26 will remain closed and all the washing fluid will discharge through the passage 20 ahead of the casing. This is important for the reason that a washing action must be accomplished in this manner to be effective.

A particular use for my improved tool is illustrated in Figure 1. Conditions are met in some fields where the main bore is advanced to a point adjoining the producing sands. From this point into the sands a smaller bore is advanced, same usually being termed a rat-hole. It is very undesirable that any cement enter this smaller bore or rat-hole because of the sands being porous the cement will be readily absorbed. It is, however, essential that the casing be cemented in above these producing sands so as to prevent passage of migratory waters from upper strata into the sands. By the use of my device a shut-off can be effected between the main bore and the rat-hole by firmly seating the guiding end 15 on the shoulder between the main bore and the rat-

hole. Then with the bridging valve 25 in position all of the cement will discharge through the ports 26 and will not be able to gain access to the rat-hole 17 due to the formation shut-off effected by firmly seating the guide nose 15 on the shoulder.

While I have shown the preferred form of my invention, it is to be understood that various changes can be made therein without departing from the spirit of the invention as defined in the appended claims.

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

1. In combination with a well casing, a tubular member secured thereto and forming a part thereof, a valved float plug fitted to said member and enabling the passage of fluid downwardly through the said member but not in the opposite direction, valve means for said valved float plug capable of being made effective after the casing has been positioned in the bore to prevent the passage of fluid downwardly through said plug, said member having cementing ports formed through the side thereof above said plug, valve means for said ports preventing the flow of fluid into the casing from the exterior thereof, said valves opening to permit the discharge of cement from the interior of the casing only after the fluid pressure therein exceeds a predetermined value.

2. In combination with a well casing, a tubular member fitted thereto and forming a part thereof, a plug secured in said tubular member and having a fluid passageway formed coaxially therethrough, a valve seat formed intermediate the ends of said passageway, an upwardly seating valve in said passageway cooperating with said seat to permit fluid to flow downwardly through said passageway but not in the opposite direction, a valve seat formed adjacent the upper end of said passageway, a ball valve member adapted to be dropped into the casing after the same is in place in a well bore to seat on said last-named seat to prevent the flow of fluid downwardly through said passageway, said tubular member having ports formed through its side at a spaced distance above said plug, and normally closed check valve means opening in response to fluid pressure in the tubular member after the said ball valve member is seated to enable fluid to discharge outwardly through said ports.

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