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J. Q. LITTLE

1,854,518

CEMENT BARREL

Filed May 28, 1930

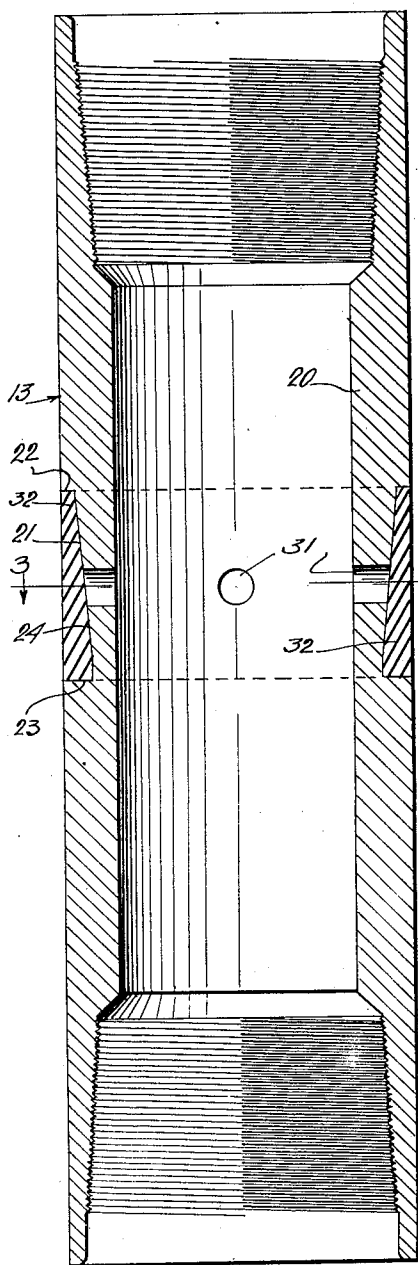


Fig. 2.

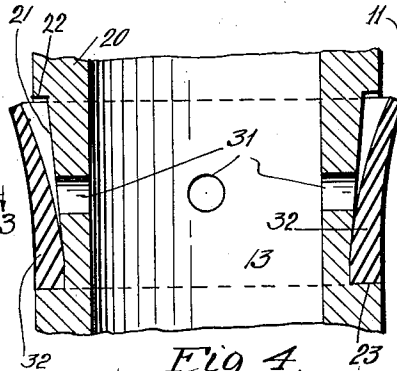
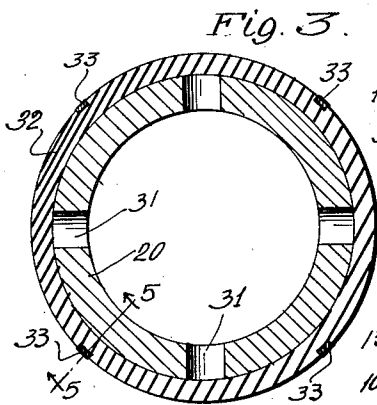


Fig. 4.

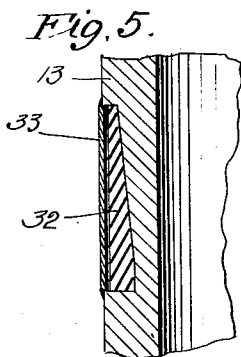


Fig. 5.

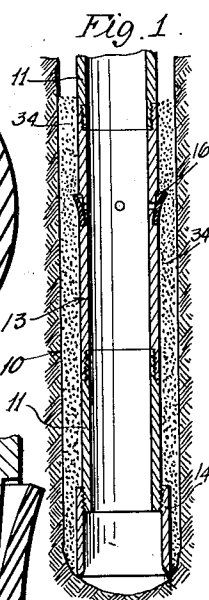


Fig. 1.

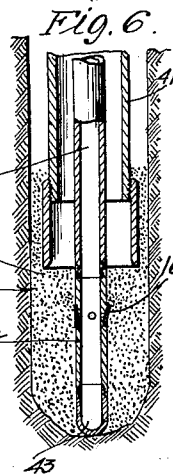


Fig. 6.

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CEMENT BARREL

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This invention has reference to the art of cementing casing in deep well drilling, and relates particularly to improvements in devices for discharging cement laterally through the walls of the casing or supply tubing.

There are many situations in which it is desirable to discharge cement through passages in the side walls of a supply tube or in the casing itself rather than out of the bottom end thereof. One of these is the case in which the cement may initially be discharged from the lower open end of the tubing or casing, but in which discharge from the lower end may, during the course of the operation, become obstructed due to any one of various causes, or it may be that it is desired to rest the tubing or casing on the bottom of the hole and discharge the cement at a point higher up.

In such situations it is now practice to include in the casing at the point at which the casing is to be cemented a "cement barrel", or in other words a section of tubing having lateral cement discharge passages, which are preferably provided with outwardly opening check valves so that the discharge cement cannot back up into the casing.

In other situations, the cement barrel may be made up in a string of tubing lowered within the casing, the cement barrel being lowered to discharge below the lower end of the casing.

Certain devices of this general type involving mechanical valving arrangements have appeared in the art, but have involved serious short-comings because of lacking the mechanical simplicity which is necessarily required of such devices.

It is therefore the primary object of the present invention to provide a cement barrel having check valves of the greatest simplicity, to the ends of reducing mechanical complications and disorders in use, as well as cost of manufacture.

It is a further object of the invention to provide a check valve in the barrel which when in normal closed position will be flush or in smooth alignment with the exterior surface of the casing.

How these objects are accomplished, as well as other objects and features of the invention, will be fully understood from the following detailed description of a present preferred embodiment of the invention, reference for this purpose being had to the accompanying drawings, in which:

Fig. 1 is a view showing my cement barrel made up in a string of casing lowered within a well bore;

Fig. 2 is a longitudinal section through the cement barrel;

Fig. 3 is a transverse section taken on line 3-3 of Fig. 2;

Fig. 4 is a fragmentary view taken from Fig. 2 but showing the valve in open position;

Fig. 5 is a section taken on line 5-5 of Fig. 3; and

Fig. 6 shows the cement barrel made up in a string of tubing lowered within a casing in a well bore.

The numeral 10 designates generally a well bore, and the numeral 11 a casing lowered therein, and made up in casing 11 at a point at which it is desired to cement the casing in a cement barrel 13. The lower end of casing 11 is here shown carrying a shoe 14 resting on the bottom of the well hole. Valved discharge passages in the side walls of the barrel 13 are designated at 16 in Fig. 1.

These valved passages are shown more particularly in Figs. 2, 3, 4 and 5. As there shown, the body 20 of the barrel is cut with an annular groove or recess 21 providing opposed upper and lower annular shoulders 22 and 23, respectively, the cut preferably being made deepest at the lower end of the recess so that the lower shoulder 23 is wider than the upper shoulder 22, and with the wall surface 24 that defines the recess between shoulders 22 and 23 extending vertically for a short distance from shoulder 23 and then inclining outwardly to meet the upper shoulder 22, the recess thus formed providing a seat for a valve member presently to be described. The wall of the barrel is then drilled approximately in the middle of wall surface 24 with radial, cement-discharge passages 31. Fitted in recess 21 against the inclined seat-

ing surface 24 of the body is a resilient ring 32 of rubber or the like, that tapers upwardly in opposition to the taper of the seating surface 24, and the outer surface of which is normally flush with the outer surface of the barrel. Straps 33 (see Fig. 5) spaced between passages 31 are welded top and bottom to the barrel at the edges of the groove 21 for the purpose of normally confining the rubber ring fully seated within its groove.

In operation, liquid cement under pressure is forced down casing 11 and from within body 20 out through the passages 31 and against the inner surface of the resilient ring 32. The upper portion of the ring, being thinner than the lower portion thereof, flexes outwardly between straps 33 due to the pressure of the cement and allows the cement to escape through the openings thus provided, while the lower, thicker portion of the ring, being less flexible, keeps its seat within the groove 21, as indicated in Fig. 4. When the pressure is taken off of the cement within the casing, the resilient ring springs back into its fully seated or closed position, squeezing the cement out of its seat as it does so, and thereby shuts off the discharged cement outside of the casing from backing up through the discharge passages due to the external pressure. The device is here shown with the thin edge of the resilient ring up, which arrangement results in directing the discharged cement in an upward direction, although it will be obvious that these relations may be reversed.

In Fig. 1 is shown a typical use of the cement barrel, the lower end of the barrel being shown carrying a shoe through the lower end of which cement may in some cases be discharged, but the shoe being shown resting on the bottom of the hole and the lower discharge passage therefore being shut off. With the lower passage shut off, however, sufficient pressure may be put on the cement to force it out through the resilient valve of barrel 13, from which it then flows to fill in as indicated at 34. It is to be understood, however, that the cement barrel need not necessarily be at the lower end of the casing, but may be made up at any point therein required, and further that a number of cement barrels may be made up in the casing to cement in at as many points as may be desirable.

Fig. 6 shows a cement barrel 13a made up in a string of tubing 40 lowered within a casing 41. The lower end of the barrel 13a is here shown closed as by means of a bull nose plug 43. The cement is in this case forced out of the resilient valve 16 and fills in around the lower end of the casing as indicated at 44.

It will now be recognized that I have provided an extremely simple and inexpensive valve for a cement discharge barrel, and one which when in normal closed position is flush

or in smooth alignment with the surface of the tubing or casing in which it is made up.

It will be understood the drawings and description are to be considered merely as illustrative of and not restrictive on the broader claims appended hereto, for various changes in design, structure and arrangement may be made without departing from the spirit and scope of said claims.

I claim:—

1. A device of the character described, embodying a tubular body adapted for being made up in a pipe string, said body having in its outer surface an annular recess, and having a discharge passage leading from its inside bore through the side wall defining said recess, and a vertically tapering resilient ring seated in said recess.

2. A device of the character described, embodying a tubular body adapted for being made up in a pipe string, said body having in its outer surface an annular recess, the side wall defining said recess being inclined, and having a discharge passage leading from the inside bore of the body through said side wall to said recess, and a resilient ring tapering oppositely to the incline of the recess side wall seated in said recess.

3. A device of the character described, embodying a tubular body adapted for being made up in a pipe string, said body having in its outer surface an annular recess, and having a discharge passage leading from its inside bore through the side wall defining said recess, and a resilient ring seated in said recess and adapted to be flexed radially outwardly under pressure exerted through said discharge passage from inside the tubular body.

4. A device of the character described, embodying a tubular body adapted to being made up in a pipe string, said body having in its outer surface an annular recess, and having a discharge passage leading from its inside bore through the side wall defining said recess, and a resilient ring seated in said recess, there being a difference in flexibility between the upper and lower portions of said ring such that the more flexible portion of the ring is adapted to be flexed radially outwardly under pressure exerted through said discharge passage from inside the tubular body whereby said discharge passages are uncovered, while the less flexible portion of the ring retains its seat in said recess.

In witness that I claim the foregoing I have hereunto subscribed my name this 6th day of May 1930.

JOHN Q. LITTLE.