June 18, 1940. C. E. BURT 2,204,658

WELL CEMENTING DEVICE

Filed Dec. 12, 1938

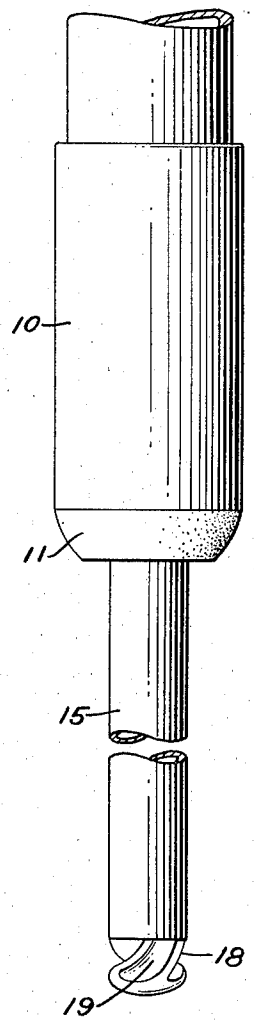


Fig. 1.

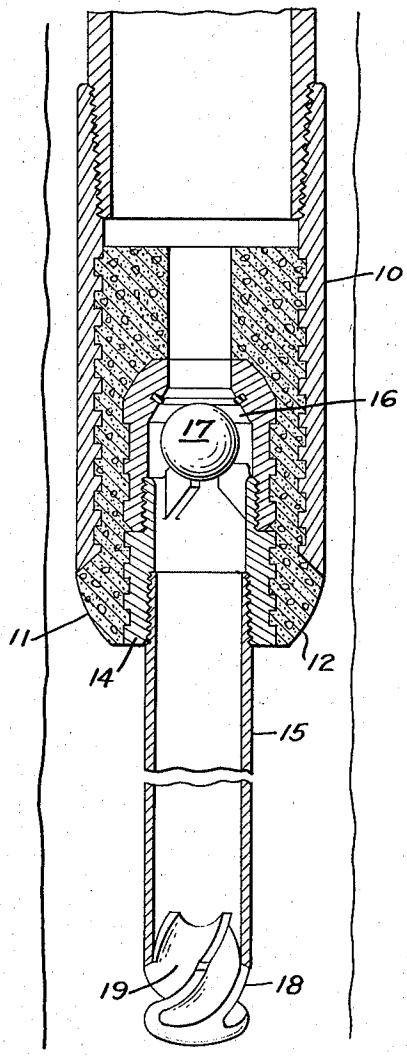


Fig. 2.

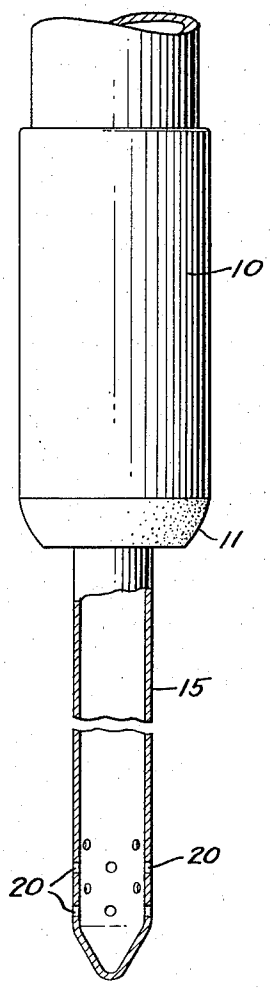


Fig. 3.

INVENTOR.
Clarence E. Burt
BY
Oscar A. Mellin
ATTORNEY

Patented June 18, 1940

2,204,658

UNITED STATES PATENT OFFICE

2,204,658

WELL CEMENTING DEVICE

Clarence E. Burt, Los Angeles, Calif., assignor to Baker Oil Tools, Inc., Huntington Park, Calif., a corporation of California

Application December 12, 1938, Serial No. 245,241

6 Claims. (Cl. 166—9)

This invention relates to tools and equipment utilized during the drilling of oil wells.

It is the principal object of my present invention to provide a simple and efficient apparatus for use in cementing operations in properly forming a cement plug in an open well bore a proper distance below the lower terminal of the well casing.

In practicing my invention, I provide a tubular member such as a casing shoe for attachment to the lower end of a well casing. I also provide a tail pipe or tube which is comparatively small in diameter with respect to the diameter of the well casing and which is connected at its upper end to the shoe by means of a connector means which also serves as a guide for the lower end of the casing. This tail pipe or tube extends downwardly a considerable distance and is provided with a nozzle at its lower end; the nozzle, the tube and the connector means being preferably of drillable material. When the casing is lowered into position in the well bore, it is desirable to form a comparatively long solid cement plug in the bore directly below the same. By means of the arrangement that I have just described, cement may be discharged at the lower end of the tail pipe to form this plug and after the cement has set and it is desired to proceed with the drilling, the connector means, the tail pipe and the plug may be readily drilled through.

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:

Fig. 1 is a view in elevation of an apparatus embodying the preferred form of my invention and showing it in position in a well bore.

Fig. 2 is a central vertical sectional view through my apparatus disclosing its construction.

Fig. 3 is a view similar to Fig. 1 with the exception that a different type of nozzle is provided at the lower end of the tail pipe.

Referring more particularly to the accompanying drawing, 10 indicates a tubular member, such as a casing shoe, which is adapted to be connected to the lower end of a well casing, as in standard practice. Cast or otherwise secured into the casing shoe 10 is a cementitious plug 11, the lower end of which is rounded as at 12 so as to be guide-shaped and thereby guide the lower end of the casing past the joints in the casing. Fixed centrally within this concrete or cementitious plug 11 is a concentrically located sleeve 14 which is interiorly threaded at its lower end to receive a tail pipe or tube 15. The upper end of this tube 15 is threaded into the sleeve 14 as illustrated so as to seure it thereto and thereby attach it to the casing shoe 10. The length of the tail pipe 15 may be such as desired or such as is necessary to form a cement plug of the desired length in the well bore.

It will be noticed that the interior of the casing shoe 10 is provided with a valve chamber 16 and a back-pressure valve 17 so that the casing may be floated into place in the well bore. Likewise, the provision of the back-pressure valve 17 enables cement or fluid to be discharged downwardly through the casing shoe 10 and into the tail pipe 15, but prevents the back flow of fluid upwardly into the well casing through the casing shoe 10.

At the lower end of the tail pipe 15 is a nozzle 18, and in the present instance I have shown two types of nozzles. In Figs. 1 and 2 I have shown a whirler type of nozzle which is secured in the lower end of the imperforate tail pipe. This nozzle is formed with spirally arranged passageways 19 so that cement or other fluid discharged downwardly through the tail pipe will be caused to swirl as it is ejected. In cementing operations, this has a particular advantage in that it evenly distributes the cement slurry around the bore and prevents channeling of the cement so that a proper cement plug will be formed.

In Fig. 3 I have shown the tail pipe as having a nozzle which is provided with a plurality of radially directed ports 20.

I prefer that the concrete plug 11, the tail pipe 15 and the nozzle 18 be formed of drillable material. For example, the connector means or plug 11 may be formed of concrete, bakelite or drillable aluminum, if so desired, and I prefer that the tail pipe 15 be formed of a suitable aluminum alloy which is easily drilled up. The nozzle 18 may be formed of like material.

In Fig. 2 I have shown the casing shoe as provided with a back-pressure valve 17. However, this is not necessary as a plain guide type of shoe may be employed in lieu thereof.

In operation of the device, it is constructed as illustrated and described and the casing is lowered into the well bore. Circulation may be maintained downwardly through the casing and through the tail pipe during the lowering operation, and after the casing has been positioned, cement may be pumped downwardly through the casing and it will pass through the casing shoe 10 into the tail pipe 15 and be discharged through the nozzle 18.

In the event a nozzle such as is illustrated in

Figs. 1 and 2 is provided, the cement will be ejected in a circular or spiral fashion to insure equal distribution of the cement in the bore and thereby prevent channeling. If the nozzle provided is the type shown in Fig. 3, the cement will be ejected radially from all sides of the tail pipe so that equal distribution will be provided.

After the cementing operation is complete, a solid cementitious plug will be formed in the bore below and surrounding the casing shoe. It is desirable in some localities that this plug be solid for a distance at least fifteen feet below the casing and in such instances the tail pipe is of a length enabling this to be accomplished. The tail pipe 15 will be incorporated in this plug as it will be cemented solidly therein and likewise its interior will be filled with cement.

If it is desired to drill through the cement plug, the drill may readily advance through the casing shoe, drilling up the connecting member 11 and may advance further by drilling up the cement and the tail pipe and the nozzle at the lower end of the latter.

While I have shown 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 claims.

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

1. In combination, a cylindrical member adapted to be connected to the lower end of a well casing, an elongated tube of a diameter considerably less than the cylindrical member to extend coaxially from the lower end thereof, and means secured to the cylindrical member and tube to connect the same and to close the annular space between the exterior of the tube and the cylindrical member, a whirler nozzle at the lower extremity of said tube.

2. In combination, a cylindrical member adapted to be connected to the lower end of a well casing, an elongated tube of a diameter considerably less than the cylindrical member to extend coaxially from the lower end thereof, means secured to the cylindrical member and tube to connect the same and to close the annular space between the exterior of the tube and the cylindrical member, a nozzle at the lower end of the tube, said nozzle having discharge ports extending downwardly in spiral fashion.

3. In combination with a cylindrical member adapted to be connected to the lower end of a well casing, an elongated tail pipe of a diameter considerably less than the cylindrical member to extend coaxially from the lower end thereof, a guide member secured to the cylindrical member and to which said tail pipe is secured, said guide member closing the annular space between the interior of the tail pipe and the cylindrical member, a nozzle at the lower end of said tail pipe, said nozzle having a plurality of discharge passageway formed downwardly therethrough, said passageways being spirally formed so as to tend to discharge the fluid in a whirling fashion.

4. In combination with a cylindrical member adapted to be connected to the lower end of a well casing, an elongated tail pipe of a diameter considerably less than the cylindrical member to extend coaxially from the lower end thereof, a guide member secured to the cylindrical member and to which said tail pipe is secured, said guide member closing the annular space between the interior of the tail pipe and the cylindrical member, a nozzle at the lower end of said tail pipe, said nozzle having a plurality of discharge passageways formed downwardly therethrough, said passageways being spirally formed so as to tend to discharge the fluid in a whirling fashion, said guide means, said tail pipe and said nozzle being formed of drillable material.

5. In combination, a casing shoe adapted to be secured to the lower end of a well casing, an elongated tail pipe of a diameter considerably less than the casing shoe to be suspended coaxially therefrom, a concrete plug cast in said casing shoe and having a guide-shaped nose extending from the lower end thereof, a sleeve secured within said concrete nose, a threaded connection between said sleeve and said tail pipe, and a fluid discharging nozzle formed at the lower end of said tail pipe.

6. In combination, a well casing having a drillable reducer at its lower end, an elongated drillable tube or extension of a smaller diameter than the casing and secured to the drillable reducer and suspended from the casing thereby, a float valve in the drillable reducer above said tube, and cementing outlets in said tube at a substantial distance below the lower end of the well casing.

CLARENCE E. BURT.