Aug. 4, 1931. B. S. MINOR 1,817,201

CEMENT HEAD FOR OIL WELLS

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Fig. 1.

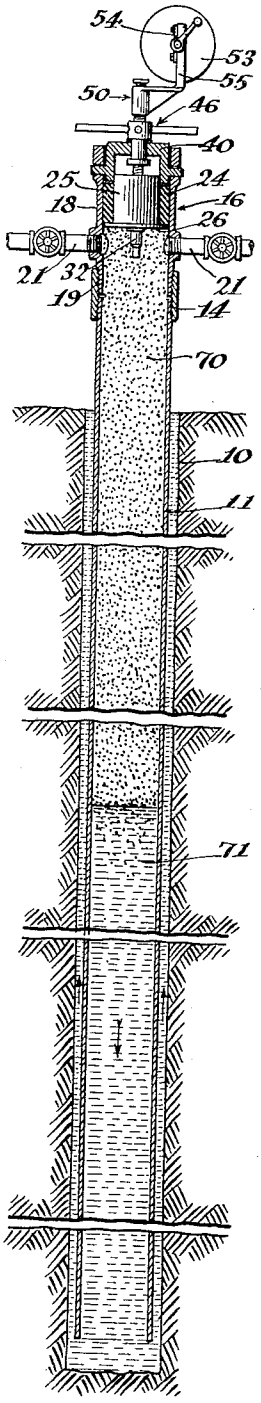

Fig. 2.

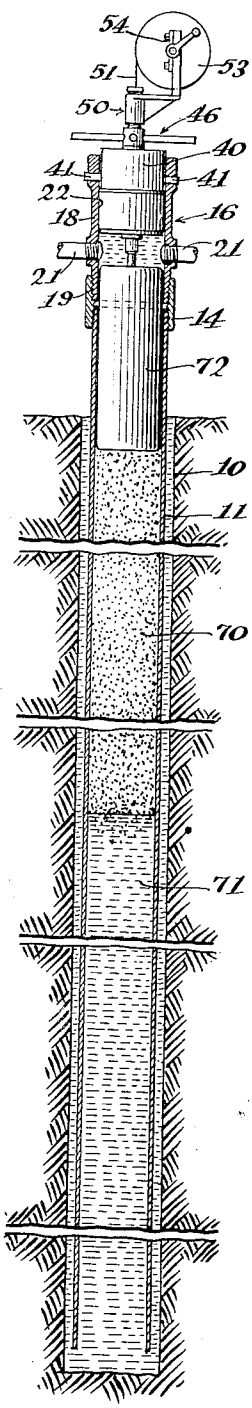

Fig. 3.

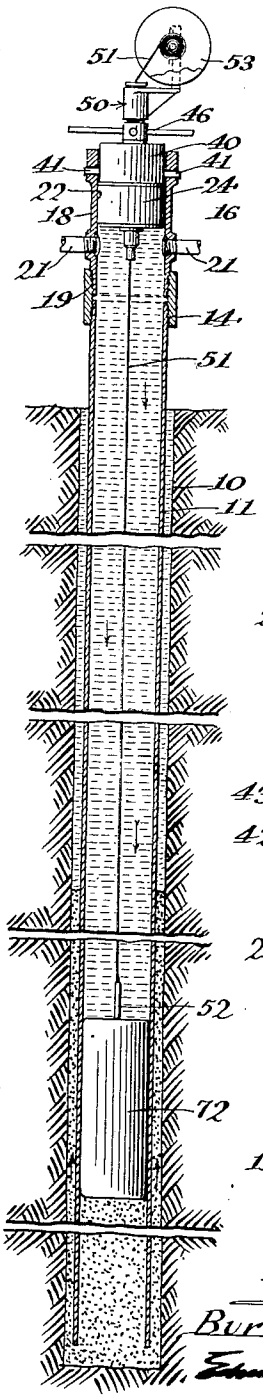

Fig. 4.

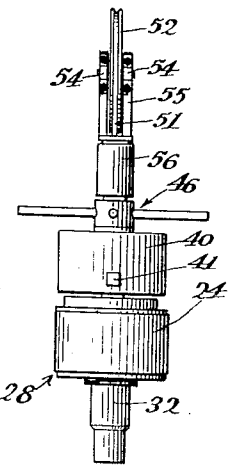

Fig. 5.

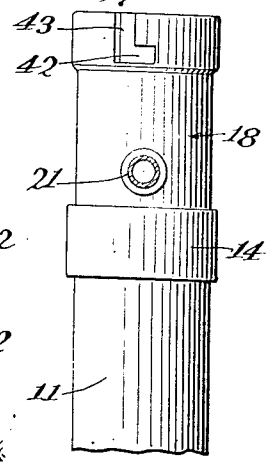

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Fig. 6.

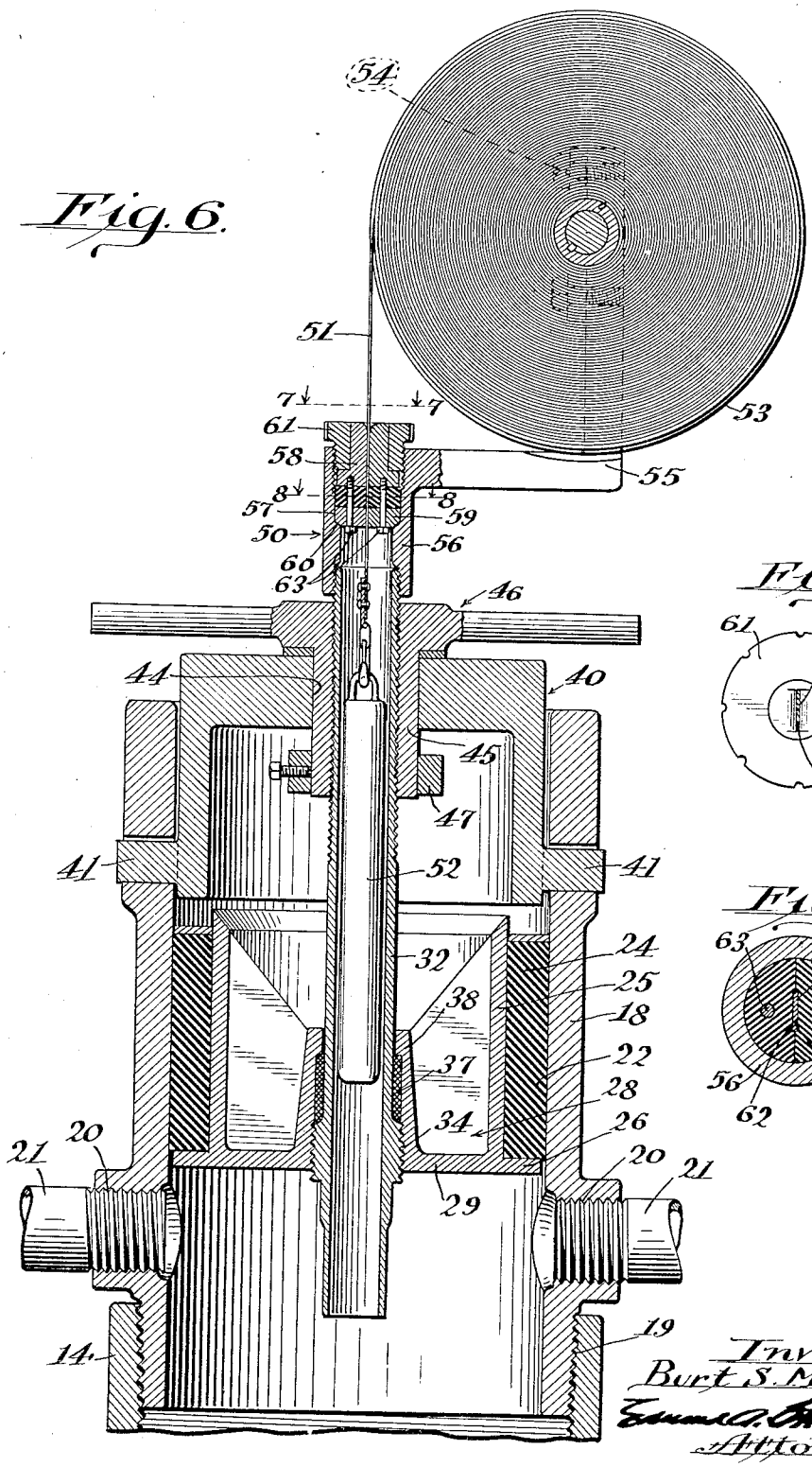


Fig. 7.

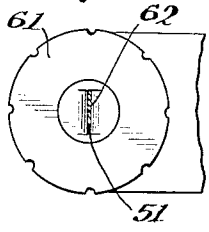
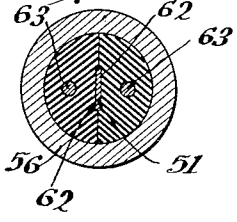


Fig. 8.



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UNITED STATES PATENT OFFICE

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CEMENT HEAD FOR OIL WELLS

Application filed May 17, 1930. Serial No. 453,190.

This invention relates to an apparatus employed to seal the upper end of a well casing during a cementing operation, and pertains more particularly to improvements in the aforesaid type of apparatus as disclosed in the United States Patent No. 1,735,330, issued to E. H. McMahan, on November 12, 1929.

While the apparatus described in said patent serves very effectively in sealing the upper end of a well casing, no provision is made for determing how much of the cement introduced into the casing has been excluded or forced therefrom upwardly between the walls of the casing and hole during a cementing operation.

During a cementing operation a plug or other barrier is employed to force the cement introduced into the casing therefrom into the space between the casing and well hole, the plug being forced downwardly by fluid pressure developed by the circulating pumps, it being necessary that the plug reach the bottom of the casing in order to complete a perfect cementing operation. This does not always occur as the plug occasionally encounters an obstruction or an abrupt bend in the casing.

It is, therefore, a chief object of this invention to provide a sealing device of the character stated constructed in such a manner that a measuring line may be passed therethrough for indicating the position of the plug in the casing in order that the amount of cement excluded therefrom into the well hole during a cementing operation may be accurately determined.

Other objects and advantages will be apparent from the following description, reference being had to the accompanying drawings, in which:

Fig. 1 is a central longitudinal section through an oil well with the improved sealing device in position on the casing, the view illustrating the first step in a cementing operation;

Fig. 2 is a view similar to Fig. 1 showing the cement plug resting on the body of cement introduced into the casing;

Fig. 3 is a view similar to Figs. 1 and 2 showing the cement partially excluded from the casing into the well hole with the measuring line in operative position;

Fig. 4 is a side elevation of the packing or sealing member of the improved sealing device;

Fig. 5 is a side elevation of the body member of the sealing device secured to the upper end of a well casing;

Fig. 6 is an enlarged detail section taken through the packing device;

Fig. 7 is a horizontal section taken on line 7—7 of Fig. 6; and,

Fig. 8 is a section taken on line 8—8 of Fig. 6.

Referring more specifically to the drawings, 10 designates a well hole in which has been lowered a casing 11 to a position for the usual cementing operation. Secured to the upper end of the casing is a coupling 14 to which is connected the sealing device generally designated at 16 constructed as follows:

The sealing device consists of a tubular body member 18 externally threaded at its lower end as indicated at 19 for engagement with the coupling and is provided with oppositely disposed threaded openings 20 into which are screwed pipes 21 through which fluid is admitted to force the cement into place in a manner later described.

Mounted within the bore 22 of the member 19 is a packing or sealing ring 24 formed of resilient material which encircles the cylindrical portion 25 and engages the flange 26 of a shoe 28, the shoe having a head 29 through which extends a tubular stem or mandrel 32, the stem having an enlarged diameter portion externally threaded as indicated at 34, the upper end 36 of which serves to compress packing 27 mounted in a box 38 formed integral with the head 29.

Disposed within the upper end of the body member is a cap 40 provided with oppositely disposed locking lugs 41 which rest in undercut recesses 42 communicating with vertically disposed slots 43 formed in the wall of the body member. An aperture 44 is formed in the top of the cap through which extends the hub 45 of an operating handle 46 screw threaded to the stem. A collar 47 is secured to the hub preferably by a set screw 48 and

serves to hold the cap and shoe in assembled relation.

A stuffing box generally designated at 50 is mounted on the upper end of the stem and serves to form a fluid tight joint around a measuring line 51, the measuring line being preferably in the form of a steel tape which is wound on a spool 53 mounted in bearings 54 carried by brackets 55 formed integral with the body portion 56. A weight designated at 52 is adapted to be connected to the measuring line.

Mounted within a bore 57 formed in the body portion is a plurality of packing rings consisting of a split ring formed of rubber disposed between upper and lower split metallic rings 58 and 59 respectively, the lower ring engaging a seat 60, the upper ring having a reduced diameter portion extending through an opening formed in a nut screw 61 threaded in the upper end of the body portion.

The cap and shoe together with operating handle and packing ring form a packing unit 52 when assembled as shown in Fig. 4 which is adapted to be connected to the body member to form a fluid tight seal at the upper end of the casing, this being accomplished by rotating the operating handle, the action of which will move the shoe upwardly on the stem, the packing ring then being further expanded by the hydraulic pressure within the casing.

In the cementing operation the body member 18 is screwed into the coupling 14 and the packing unit connected thereto, and an estimated amount of liquid cement indicated at 70 is introduced into the casing through the inlet pipes above the mud 71 therein as shown in Fig. 1. The packing unit is then removed and the usual wooden plug designated at 72 is inserted into the casing and placed on top of the cement as shown in Fig. 2. The packing unit is again connected to the body member, the lower end of the mandrel then engaging the plug and forcing it downwardly so that its upper face will be below the inlet pipes. The packing rings in the stuffing box are removed and the weight 52 connected to the measuring line and allowed to rest on the plug. The packing rings are returned to said stuffing box.

Fluid under pressure is then introduced into the casing above the plug forcing the cement 70 therebelow downwardly and upwardly between the wall of the well and casing (as shown in Fig. 3) which when hardened forms a fluid tight seal shutting off any water from the formation entering the casing.

During downward movement of the plug the measuring line will be unwound from the spool due to the weight connected thereto, hence the position of the plug in the casing may be accurately determined, which in turn will indicate how much of the cement has been displaced.

Although I am aware that measuring lines have been employed heretofore for the above stated purpose, no sealing devices of the character described are so constructed that a measuring line may be passed therethrough.

I claim:

1. A casing head sealing mechanism comprising a vented casing head, an expansible packing member mounted in said head above the vented openings, and screw operated means connected to the packing member for expanding the same, said screw operated means having an opening for the passage of a measuring line therethrough.

2. A casing head sealing mechanism comprising a vented body member adapted to be detachably secured to the upper end of a well casing, an expansible packing sleeve disposed in said casing above the vented openings, a mechanism engaging the sleeve for automatically expanding the same into water tight engagement with the wall of the vented body member on an introduction of water pressure below the same, and screw means connected to the mechanism for manually expanding the packing, said screw operated means having an opening for the passage of a measuring line therethrough.

3. A sealing device for sealing the upper end of well casing, comprising a tubular member having fluid inlet ports leading thereinto, a coupling member detachably secured to the upper end of said tubular member, a shoe member loosely mounted below said cap member, an expansible packing ring surrounding said shoe member and engaging said coupling member, and a shoe adjusting mechanism secured to said cap member for moving said shoe to expand said ring into fluid tight engagement with said tubular member, said shoe adjusting mechanism having an opening for the passage of a measuring line therethrough.

4. A device of the class described comprising a vented body member adapted to be secured to a well casing, a coupling member detachably connected to said body member, a shoe having a packer disposed below said coupling member, a stem connecting said shoe and coupling, and means for compressing said packer, said packer adapted to be first compressed by manually operating the compressing means, then further compressed by the well pressure, said stem having an opening for the passage of a measuring line therethrough.

5. A device of the class described comprising a tubular body member adapted to be secured to the upper end of a well casing and having openings therein for connection with fluid pressure supply pipes, a coupling member detachably connected to said tubular body member, an operating handle having an an-

ılar hub extending through an opening in
ıe top of said coupling member, a tubular
em screw threaded into said operating han-
le, a shoe connected to said tubular stem, a
ıcking ring encircling said shoe and engag-
ıg the bore of said tubular body member, and
stuffing box removably secured to the upper
ıd of said tubular stem for the passage of a
ıeasuring line therethrough, whereby the
nount of cement introduced into and ex-
elled from the casing may be determined.

In testimony whereof I affix my signature.

BURT S. MINOR.