Aug. 12, 1930. J. W. MacCLATCHIE 1,772,871

WELL CEMENTING

Filed Oct. 22, 1928

Fig. 1.

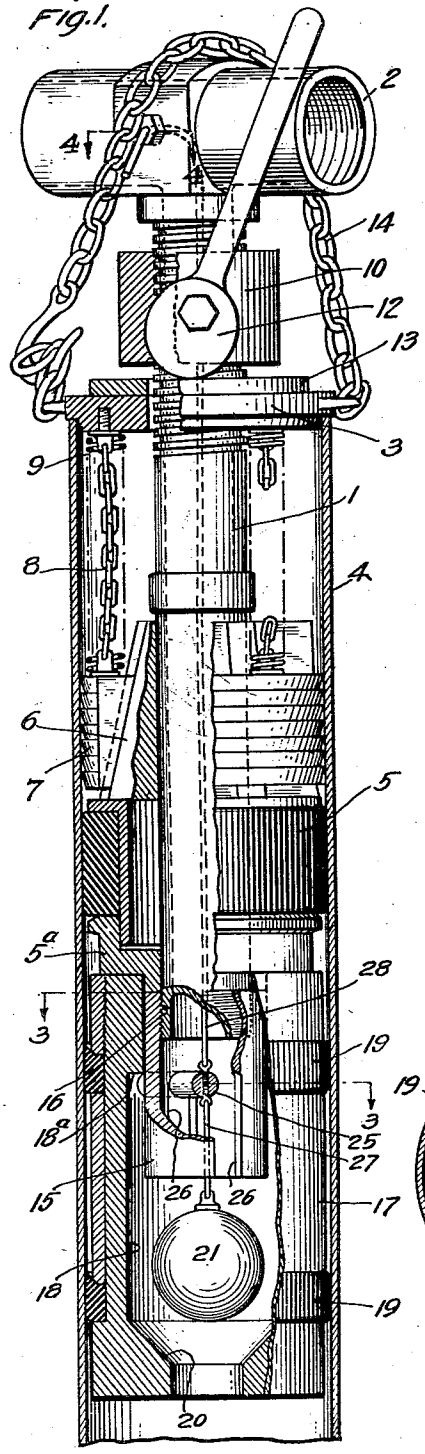


Fig. 2.

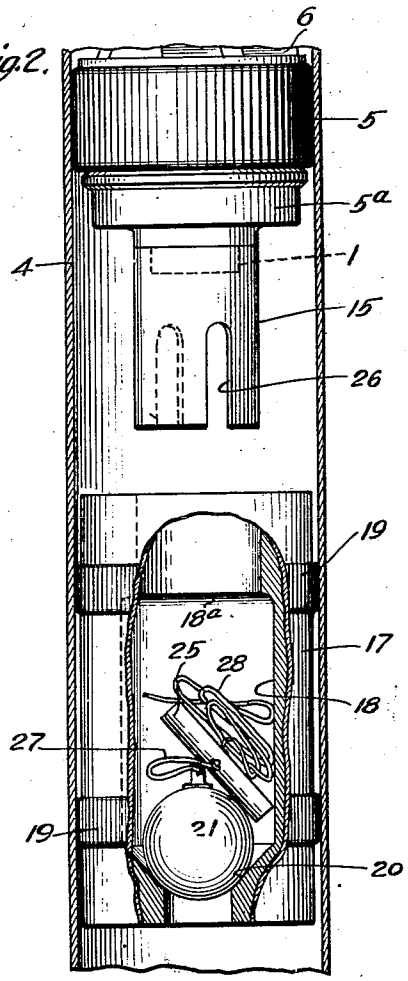
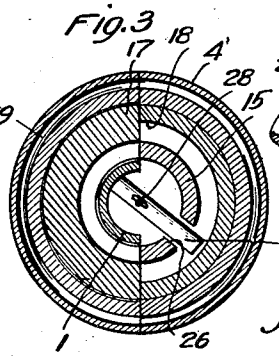


Fig. 3



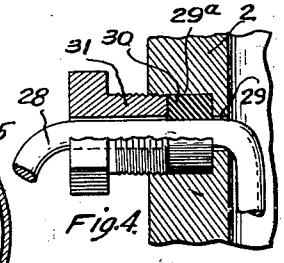


Fig. 4.

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UNITED STATES PATENT OFFICE

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WELL CEMENTING

Application filed October 22, 1928. Serial No. 313,997.

This invention relates to the cementing of wells, and has for its object to provide convenient means for lowering a cementing plug into the bore of a well in back of a predetermined quantity of cement without the necessity of first removing the cementing head.

It is a further object of the invention to provide a cementing plug adapted for reception and support on a cementing head so as to normally offer no obstruction to free flow of cement into the well, but readily released and forced downwardly in the well in back of a predetermined quantity of cement so as to completely separate the cement from the pressure flow which is then introduced through the cementing head for forcing the plug to the bottom of the well.

It is a still further object of the invention to provide for releasably suspending the cementing plug from a usual cementing head, with a valvular control in the plug normally held open by the releasable retaining means so as to insure free flow of the cement; and the vavular control is adapted to automatically close upon release of the retaining means so that the plug will completely close the bore of the well and may be forced downwardly in back of the cement by the usual pressure flow.

It is a still further object of the invention to provide retaining means for the plug and its valvular control which is readily accessible for release without disturbing the cementing head or opening it for escape of pressure.

Further objects of the invention will be readily understood from the following description of the accompanying drawings, in which:

Fig. 1 is a side elevation, partly in axial section, of the cementing plug suspended from a usual cementing head.

Fig. 2 is a similar view showing the plug released from the cementing head and being forced downwardly in a well.

Fig. 3 is a transverse section on the line 3—3 of Fig. 1.

Fig. 4 is a transverse section on the line 4—4 of Fig. 1.

The improved cementing plug is adapted for use in connection with a usual cementing head adapted to form a closure for well casing and having a pipe for supplying cement and the like extending through the closure means with its depending end opening into the bore of the casing; and the invention contemplates the suspension of a cementing plug from the depending end of the supply pipe with a readily accessible control providing for release of the plug so that it may be forced downwardly through the well casing in back of a predetermined quantity of cement. In the present instance the plug is shown suspended from the supply pipe of a cementing head such as is described and illustrated in my U. S. Patent No. 1,616,978, of February 8, 1927, although it will be readily apparent that the plug may be used in connection with the supply pipes of various types of cementing heads.

In the drawings I have shown a cementing head comprising a supply pipe 1 having the usual T 2 and extending downwardly through a closure plate 3 which is adapted for mounting on the end of well casing 4. Packing 5 adapted to engage the wall of the well casing is mounted on a support 5^a which is in turn mounted on the depending end of the supply pipe, and a tapering mandril 6 cooperating with slips 7 is mounted on the packing so that elevation of pipe 1 will expand the packing and anchor the slips for securing the cementing head in the well casing. The slips 7 may be suspended by chains 8 from the closure plate 3, and springs 9 preferably tend to depress the slips for returning them to inoperative position when the expansion resulting from elevation of the mandril is released.

The pipe 1 may be raised and lowered for locking and releasing the cementing head by means of a nut 10 threaded onto pipe 1 above closure plate 3, and a cam 12 is preferably pivoted to the nut so that when an approximate adjustment has been made by screwing down the nut, the locking engagement may be quickly completed by turning the cam so as to engage a washer 13 which is mounted on closure plate 3. A chain 14 adjustably secured to plate 3 and extending over the T 2 may be employed for maintaining the parts

in assembled relation and handling the assembled head.

The cementing plug which is adapted for suspension from the depending end of supply pipe 1 is preferably mounted on a sleeve 15 which may be suspended from pipe 1 by threaded connection 16, and the sleeve 15 may thus provide the means for fixing the packing support 5ª relative to pipe 1, in lieu of the nut which is preferably threaded onto the pipe when the cementing plug and its sleeve 15 are not to be employed. The cementing plug is shown at 17, and has a hollow bore 18 adapted for reception over sleeve 15 so that the plug abuts against support 5ª, with cup-packing 19 preferably provided on the exterior of the plug for engagement with the bore of the well casing. The bore of the plug preferably forms a valve seat 20 at its lower end, and a valve shown as a ball valve 21 is slidable in the bore of the plug for engaging or disengaging the valve seat so as to close or open the bore of the plug.

During discharge of cement into the well the plug 17 is held in the position which has been described and which is illustrated in Fig. 1, with the valve 21 elevated from its seat for free flow of cement through pipe 1 and thence through the bores of sleeve 15 and plug 17 past the open valve and into the well casing, and when a predetermined quantity of cement has been introduced the plug and its valve are released so that the valve will close by gravity, and the pressure of water or the like which is then supplied through pipe 1 for forcing the cement to the bottom of the well, is thus directed against the released plug which closes the entire bore of the well casing, and the plug is thus forced downwardly through the well in back of the cement but separated therefrom by its closed valve.

The releasable retaining means for the plug and its valve preferably comprises a transverse rod 25 slidable longitudinally of sleeve 15 in slots 26 which open through the lower end of the sleeve, with the projecting ends of the rod adapted to engage a shoulder 18ª in the bore of plug 17 when the rod is held at its limit of elevation, thereby suspending the plug from the rod. The valve 21 is suspended from rod 25 by a flexible connection 27, and a second flexible connection 28 is fixed to the rod and extends upwardly through pipe 1 and thence outwardly through an opening 29 which may be provided in T 2. The parts are so arranged that when cable 28 draws rod 25 to the upper ends of slots 26 for suspending the plug from the rod, and the cable is then held taut as hereinafter described, the cable 27 will lift and hold valve 21 elevated from its seat as shown in Fig. 1; and when cable 28 is released the rod 25 is free to drop through slots 26, thereby seating valve 21 with the cables 27—28 slack in the bore of the cementing plug as shown in Fig. 2, and releasing the plug for lowering thereof through the well casing in back of the cement.

The means for holding or releasing cable 28 is readily accessible without disturbing the cementing head, and preferably comprises a clamping engagement at opening 29 which is so arranged as to prevent escape of pressure. For this purpose the opening 29 may be counterbored as shown at 29ª for reception of packing, preferably a hard rubber annulus 30, through which the cable 28 is adapted to extend, and a follower 31 is threaded into the counterbored opening so as to axially compress annulus 30 and thereby radially expand it for clamping engagement with cable 28 and packing engagement with the bore of the opening. By tightening the follower the cable 28 may be thus held taut for suspending the plug 17 from pipe 1 with its valve 21 open, and by unscrewing the follower the clamping engagement for cable 28 is released so that the cable may be drawn downwardly through pipe 1 for closing valve 21 and releasing the cementing plug. When all of the projecting end of cable 28 has been drawn through opening 29 into the bore of pipe 1, the operator is advised that the cementing plug has started down the well casing, and by then retightening follower 31 so as to so compress packing 30 as to completely shut-off its bore, escape of pressure is completely prevented.

I have thus provided extremely simple but practical means for suspending a cementing plug from a cementing head with the head mounted in operative position on a well casing and the plug offering no obstruction to free flow of cement or the like into the well; and the invention also provides for readily releasing the plug without removing the cementing head or permitting escape of pressure, with the released plug completely shutting off the bore of the casing so that the plug may be forced downwardly through the well in back of cement and completely separating the forcing fluid from the cement.

I claim:

1. In combination, a closure head for a well adapted to supply fluid to the well, a plug having a normally open bore and releasably suspended in the head below the point of said fluid supply for unobstructed flow of said fluid into the well, and means for closing said bore by releasing the plug.

2. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug having a normally open bore and releasably suspended from the pipe for unobstructed flow of said fluid into the well, and means for closing said bore by releasing the plug.

3. In combination, a closure head for a well adapted to supply fluid to the well, a

plug having a normally open bore and releasably suspended in the head below the point of said fluid supply for unobstructed flow of said fluid into the well, a valve controlling the bore of the plug, and means for releasing and closing the valve by release of the plug.

4. In combination, a closure head for a well adapted to supply fluid to the well, a cementing plug having an open bore, a valve controlling said bore, connecting means slidable in the bore of the plug and adapted to suspend the plug therefrom when the connecting means is at its limit of elevation relative to the plug, means for releasably suspending the connecting means at said limit of elevation, and means for suspending the valve from the connecting means so as to open and close the valve when the connecting means is suspended at its limit of elevation and is released respectively.

5. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a cementing plug having an open bore, a valve controlling said bore, connecting means slidable in the bore of the plug and adapted to suspend the plug therefrom when the connecting means is at its limit of elevation relative to the plug, suspension means extending upwardly and outwardly through the supply pipe for releasably suspending the connecting means at said limit of elevation, and means for suspending the valve from the connecting means so as to open and close the valve when the connecting means is suspended at its limit of elevation and is released respectively.

6. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a cementing plug having an open bore, a valve controlling said bore, connecting means slidable in the bore of the plug and adapted to suspend the plug therefrom when the connecting means is at its limit of elevation relative to the plug, suspension means extending upwardly and outwardly through the supply pipe for suspending the connecting means at said limit of elevation, means accessible from the exterior of the supply pipe for releasably engaging the suspension means, and means for suspending the valve from the connecting means so as to open and close the valve when the connecting means is suspended at its limit of elevation and is released respectively.

7. A cementing plug having an open bore, a valve axially movable in said plug for opening or closing said bore, and means for releasably securing the valve in position opening the bore, the plug when the valve is released for closing the bore having a free sliding fit for lowering the plug into a well.

8. A cementing plug having an open bore, a valve axially movable in said plug for opening or closing said bore, and suspension means for the plug adapted to hold the valve open until release of said suspension means, the plug when the valve is released for closing the bore having a free sliding fit for lowering the plug into a well.

9. A cementing plug having an open bore, a valve axially movable in said plug for opening or closing said bore, connecting means slidable in the bore of the plug and adapted to suspend the plug therefrom when the connecting means is at its limit of elevation relative to the plug, suspension means for said connecting means, and means for suspending the valve from the connecting means so as to open and close the valve when the connecting means is suspended at its limit of elevation and is released respectively.

10. In combination, a closure head for a well adapted to supply fluid to the well, a plug in the well adapted for passage of fluid downwardly past the same, and means for closing the plug against said passage of fluid, the closed plug having a free sliding fit for lowering into the well.

11. In combination, a closure head for a well adapted to supply fluid to the well, a plug in the well adapted for passage of fluid downwardly past the same, and means for closing the plug against said passage of fluid, the closed plug having a free sliding fit for lowering into the well upon release of the plug.

12. In combination, a closure head for a well adapted to supply fluid to the well, a plug releasably suspended in the well and adapted for passage of fluid downwardly past the same, and means for closing the plug against said passage of fluid by releasing the plug.

13. In combination, a closure head for a well adapted to supply fluid to the well, a plug in the well below the point of said fluid supply and adapted for passage of fluid downwardy past the same, and means for closing the plug against said passage of fluid, the closed plug having a free sliding fit for lowering into the well.

14. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, and means for closing the plug against said passage of fluid.

15. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, and means for closing the plug against said passage of fluid, the closed plug having a free sliding fit for lowering into the well.

16. In combination, a closure head for a well having a depending pipe adapted to sup-

ply fluid to the well, a plug releasably suspended in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, and means for closing the plug against said passage of fluid, the closed plug having a free sliding fit for lowering into the well upon release of the plug.

17. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug releasably suspended in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, and means for closing the plug against said passage of fluid by releasing the plug.

18. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, and suspension means for the plug extending upwardly through the depending supply pipe and outwardly therethrough for suspending the plug from the pipe.

19. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, means for closing the plug against said passage of fluid, and suspension means for the plug extending upwardly through the depending supply pipe and outwardly therethrough for suspending the plug from the pipe.

20. In combination, a closure head for a well having a depending pipe adapted to supply fluid to the well, a plug in the well, said plug having a bore adapted to receive the end of the depending pipe for passage of fluid downwardly through the plug into the well, suspension means for the plug extending upwardly through the depending supply pipe and outwardly therethrough for suspending the plug from the pipe, and means accessible from the exterior of the supply pipe for releasably engaging the suspension means so as to suspend the plug from the pipe.

In testimony whereof he has affixed his signature to this specification.

JOHN W. MacCLATCHIE.