March 24, 1942. L. A. COURTER 2,277,510

CEMENTING HEAD

Filed Jan. 2, 1941

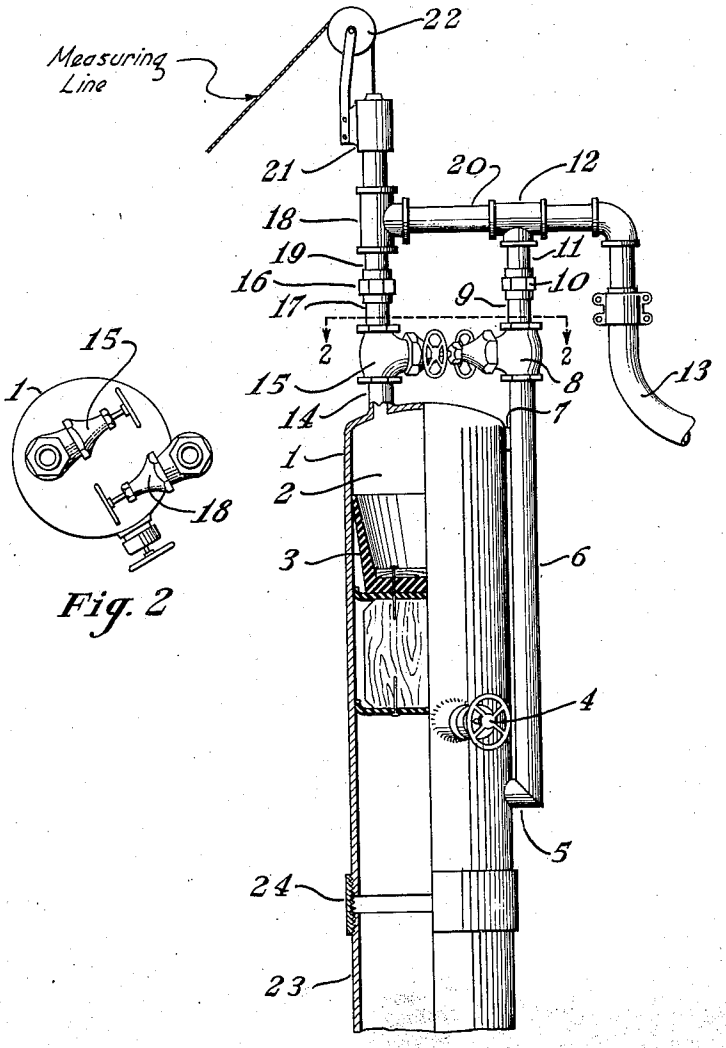


Fig. 1

Fig. 2

INVENTOR

LEO A. COURTER

BY Griswold & Burdick

ATTORNEYS

Patented Mar. 24, 1942 2,277,510

UNITED STATES PATENT OFFICE

2,277,510

CEMENTING HEAD

Leo A. Courter, Seminole, Okla., assignor to The Dow Chemical Company, Midland, Mich., a corporation of Michigan

Application January 2, 1941, Serial No. 372,791

7 Claims. (Cl. 166—14)

The invention relates to a well head especially useful in cementing operations of the type wherein a quantity of a neat cement slurry is placed about a well casing string to seal it in the well bore.

It is now becoming conventional practice in proven oil fields where the drilling program requires that a large number of wells be completed as rapidly as possible to start the drilling operation with a rotary rig which is usually capable of making hole at a much more rapid rate than is the case if conventional cable tool equipment is employed. The drilling with the rotary equipment is usually continued until a depth is reached at which the last string of metal casing, commonly referred to as the oil string, is to be cemented in place. An attempt is then made to place neat cement slurry behind the oil string while the rotary equipment is held available until reasonable assurance is had that the placement of the cement will be successful. As soon as the cement slurry has been successfully placed behind the casing it is desirable to close in the well and move the speedier and more expensive rotary equipment to another location and immediately start drilling another well thus eliminating the undesirable feature of keeping the rotary rig idle while waiting for the cement to harden to the extent that drilling into the producing formation can be resumed. Thereafter the comparatively short distance into the producing formation is usually drilled with the slower and less expensive cable tools. In this manner a rotary rig can be kept busy at more nearly continuous drilling thus enabling a single rig to drill the greatest number of wells in the shortest possible time.

In carrying out a cementing operation under the conditions outlined above it is necessary to provide a cementing head which will permit the withdrawal of the rotary table over the head after placement of the cement slurry and at the same time serve to close in the well so that pressure conditions in the well will not change and disturb the cement as it sets up.

The invention, then, consists in the device hereinafter more fully described and particularly pointed out in the claims, the following description and accompanying drawing serving to illustrate means for putting the invention into effect.

In the drawing Figure 1 is a side elevation of the improved cementing head partly in cross section. Figure 2 is a plan view taken along lines 2—2 of Figure 1.

The cementing head comprises a dome shaped tubular housing 1 defining a chamber 2 in which a cementing plug 3 is releasably held by means of a slidable pin assembly 4 in the conventional manner. A short nipple 5 communicates with the interior of the housing and extends from the side of the housing 1 at a point below the cementing plug 3. A conduit 6 extends at right angles to the nipple 5 and is attached thereto as by means of a miter weld. Pipe 6 extends upwardly and closely alongside of the housing 1 and may be further supported by the housing by welding it to the housing as at 7. The pipe 6 is preferably attached to the nipple 5 in such a manner that the clearance between the housing and the pipe will be a minimum, thus making for compactness of the assembly. In this manner ample clearance is provided as the rotary rig is withdrawn over the head. A short distance above the top of the housing the pipe 6 is provided with a valve 8 so attached as to allow the valve stem to project inwardly over the dome of the housing 1. A short nipple 9 threadedly engages the valve 8 and a conventional pipe union 10. Above the union a second short pipe nipple 11 threadedly engages the union and a conventional pipe T 12. One inlet branch of the T 12 communicates through suitable connections with a cement hose 13 through which the neat cement slurry, mud, or water may be introduced into the cementing head. The other inlet of the T 12 communicates indirectly with the cementing head through the dome of the housing above the cementing plug by means of suitable connections. Such connections consist of a nipple 14 one end of which engages the dome or top of the housing while the other end engages a valve 15 positioned so that the valve stem extends in opposite, but substantially side by side relation to the valve stem of valve 8. A second union 16 of conventional design is provided above the valve 15 and is connected thereto by means of a pipe nipple 17 in a manner similar to that of valve 8 and pipe union 10. One inlet of a conventional pipe T 18 is connected to the union 16 by means of a nipple 19, while the second inlet communicates with the pipe T 12 through a pipe 20. A packing gland 21 is associated with the other inlet of the pipe T 18 and serves as a support for a measuring line assembly 22 which may be employed from time to time to determine the position of plug 3. The lower end portion of the housing is threaded and thus is readily adapted to be attached to the threaded end of a well casing 23 as by means of a collar 24.

In Figure 2 the preferred positions of the valve stems of valves 8 and 15 is more clearly shown.

The operation of the device will be more clearly appreciated from the following description of a cementing operation employing the device just described.

Upon completion of the well to the desired level with the rotary tools the casing string is run into the well and mud circulation established outside of the casing in the customary manner. A conventional bottom cementing plug (not shown) is placed in the casing 23 and the portion of the cementing head assembly below the unions 10 and 16 is attached to the top section of the casing, while the casing is suspended in slips or cable operated elevator assembly (not shown) provided for the purpose. The unitary structure above the unions may then be readily attached to the rest of the cementing head while the casing is still suspended in the elevator without interfering with the elevator bails since such connection can be made without rotation of the unitary structure carrying the cement or mud hose and the measuring line. Cement is started into the well through pipe 6 and open valve 8 while valve 15 is maintained in a closed position. After the desired quantity of cement has been introduced into the casing in the above manner the valve 8 is closed and valve 15 is opened. At the same time the slidable pin assembly 4 is manipulated to release the top cementing plug 3 and mud, water, or the like is pumped into the casing through cementing head. The mud entering the cementing head under pressure on top of the plug 3 forces the plug downwardly into the casing causing the cement below it to be displaced out of the casing and up into the annular space between the casing and the well bore. After the plug has been displaced to the desired position, as determined by running the measuring line until it contacts the plug, the well may be shut in by closing valve 8. With the valves 8 and 15 closed and the casing positioned at the desired depth the unions 10 and 16 may be broken and the measuring line assembly and cement hose are removed. Thereafter the casing may be clamped in position and the rotary table lifted over the cementing head while the well is closed in. The hole in the rotary table through which the casing is lowered into the well is of such a size that it readily allows the rotary table to be withdrawn over the cementing head and projecting pipes 5 and 6.

In the foregoing manner, using my improved device, it is possible to readily attach the cementing head assembly to the casing while the casing is suspended in the well by means of a conventional casing elevator assembly and to thereafter carry out a cementing operation, close in the well, detach the unitary structure above the unions and raise the rotary table over the top of the cementing head without in any manner disturbing the cement slurry placed around the casing string. Further, by the use of the improved device a single rotary rig can be employed in a more nearly continuous manner with resulting saving in time and equipment.

I claim:

1. In combination with a well casing and a plug adapted to move through the casing, a tubular housing closed at its upper end and attached at its lower end to the casing, said tubular housing being adapted to releasably support the plug, pipes communicating with the interior of the tubular housing at points above and below the supported plug, said pipes also communicating with each other and having a common inlet for the entry of fluid thereinto, a valve in each pipe above the top of the housing with the handles thereof projecting inwardly over the top of the housing and coupling means associated with each pipe above the valves adapted to detachably connect the portions of pipes above the valves from portions below the valves without rotation of said pipes.

2. A tubular cementing head adapted to be mounted on a well casing including a plug releasably supported in said tubular cementing head, a pipe communicating with the interior of said cementing head at a point below the supported plug and extending upwardly alongside of the housing, a second pipe communicating with the interior of the tubular head through the top of said head, said pipes also communicating with each other, and having a common inlet for entry of fluid thereinto, a valve associated with each pipe above the top of the housing with the projecting handle portions thereof extending inwardly over the top of the housing in opposite directions but in substantially side-by-side relation, and pipe unions in each pipe above the valves.

3. In combination with a well casing and a plug adapted to move through the casing, a tubular housing closed at its upper end and attached at its lower end to the casing, said housing being adapted to releasably support the plug, a pipe communicating with the interior of said tubular housing at a point below the supported plug and extending upwardly alongside of the housing, a second pipe communicating with the interior of the tubular housing through the top of said housing, said pipes also communicating with each other and having a common inlet for entry of fluid thereinto, a valve in each pipe above the top of the housing with the projecting handle portions extending inwardly over the top of the housing in opposite directions and in substantially side-by-side relation, and union means associated with each pipe above the valve adapted to detachably connect a portion of each pipe without the necessity of rotating said pipes.

4. Apparatus for use in cementing oil wells which includes a tubular housing closed at its upper end and adapted to be connected at its lower end to the well casing, a plug releasably supported in said housing, a pipe communicating with the interior of the housing at a point below the supported plug and extending upwardly alongside of the housing, a second pipe communicating with the interior of the housing through the top thereof above the supported plug, said pipes being in communication with each other and having a common inlet for the entry of fluids thereinto, a valve located in each pipe at a point above the top of the housing with the projecting handle portions of the valves extending inwardly over the top of the housing in opposite directions and in substantially side-by-side relation, and pipe union means located in each pipe above the valve.

5. In combination with a well casing and a plug adapted to move through the casing, a tubular housing closed at its upper end and attached at its lower end to the casing, said tubular housing being adapted to releasably support the plug, pipes communicating with the interior of the tubular housing at points above and below the supported plug, coupling means located in each of said pipes whereby the conduits may

be detachably secured to a fluid conveying means, and a valve located in each pipe above the top of the housing and below the coupling means with the projecting handle portions of said valves extending inwardly over the top of said housing in opposite directions and in substantially side-by-side relation.

6. Apparatus for use in cementing oil wells which includes a tubular housing closed at its upper end and adapted to be attached at its lower end to the well casing, said housing being adapted to releasably support a cementing plug, a pipe communicating with the interior of said tubular housing at a point below the supported plug and extending upwardly alongside of the housing, a second pipe communicating with the interior of the housing through the top of said housing, means for controlling the flow of fluid located in each pipe above the top of the housing, and pipe coupling means located in each pipe above said fluid flow control means, said coupling means being adapted to detachably connect said pipes to a fluid conveying means.

7. Apparatus for use in cementing oil wells which includes a housing defining a chamber, a cementing plug releasably supported in said chamber, a pipe communicating with the chamber through the housing at a point below the supported plug and extending upwardly alongside of the housing, said pipe being provided with a two-way inlet at its upper end, a second pipe communicating with the interior of the housing through the top thereof and having its other end connected to one branch of the two-way inlet of the first mentioned pipe, said second conduit having a portion thereof extending vertically, a measuring line operatively associated with the vertical portion of said second pipe and adapted to contact said plug whereby the position of the plug is determinable at any time, a valve in each pipe above the top of the housing with the projecting handle portions of the valves extending inwardly over the top of the housing in opposite directions but in substantially side-by-side relation, and pipe union means in each pipe above the valves for detachably securing portions of each pipe together.

LEO A. COURTER.