Dec. 3, 1940. D. SCARAMUCCI 2,223,388

CEMENTING HEAD

Filed Oct. 28, 1939

Fig. 1.

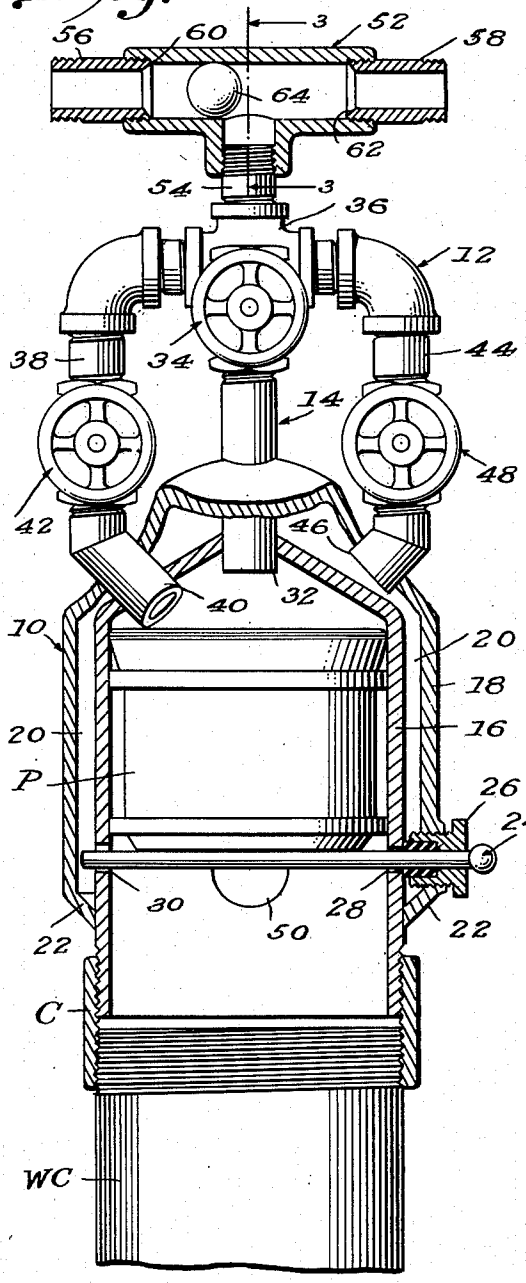
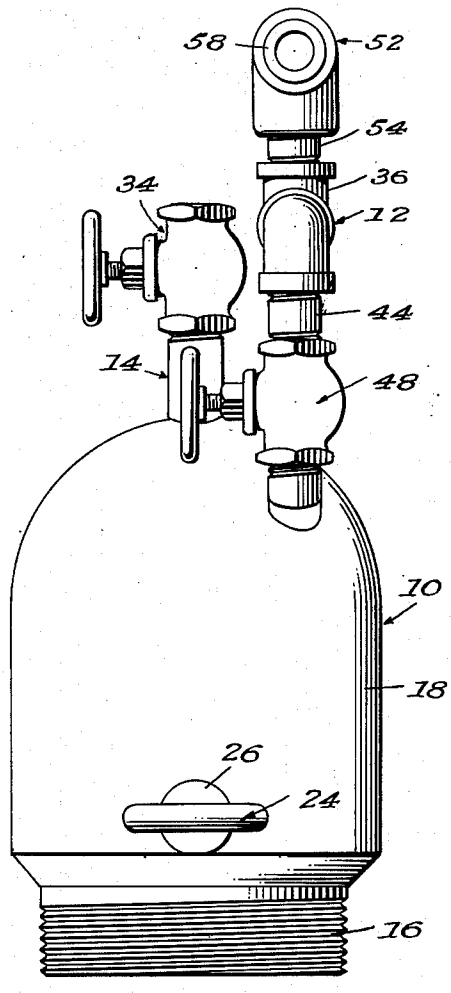


Fig. 2.



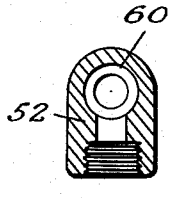


Fig. 3.

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CEMENTING HEAD

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8 Claims. (Cl. 166—1)

The present invention pertains to cementing heads for attachment to the upper end of a string of well casing to facilitate a cementing operation.

The most common cementing method in use today is known as the "Perkins process" and involves forcing a cement slurry down through the well casing between two spaced plug members which serve to prevent contamination of the slurry by the drilling or circulating fluid present in the casing below the cement and pumped thereinto above the uppermost cementing plug. Owing to the great depth of wells of this nature and to the inherent characteristics of the cement, it is essential that the cement slurry be pumped into position adjacent the foot of the well in the least time possible. If the cementing head is arranged to accommodate the upper cementing plug during the pumping of the cement slurry into the casing, considerable time can be saved in applying said upper plug to the top of the cement.

Primarily, the object of this invention is to provide a cementing head having streamlined compactness in order to facilitate the fastening and handling of the elevators, which suspend the string of well casing, by eliminating all connections ordinarily projecting laterally of the cementing head and hampering use of the elevators. A further important object of the invention resides in the provision of a cementing head having a manifold arrangement of fluid connections which will permit cement to be pumped into the well casing and followed immediately with the circulating fluid so as to avoid interruptions or delay incidental to making the necessary pipe connections.

By combining with a cementing head having novel manifold connections a further connection for receiving a measuring line, which is employed to determine the position of the upper cementing plug within the casing, an additional useful object of this invention is attained.

Other novel features of improvement contributing to the efficiency of the cementing operation and the handling of the well casing string will be apparent and readily understood from reading the following detailed description of the preferred embodiment of the invention in connection with the accompanying drawing, in which

Fig. 1 is a vertical, front elevation of a complete cementing head assembly, showing certain of the parts in section;

Fig. 2 is a vertical side elevation of the cementing head assembly of Fig. 1; and

Fig. 3 is a vertical cross-section on the line 3—3 of Fig. 1, showing a detail of the invention.

Referring to the drawing, the numeral 10 indicates generally the cementing head and cementing plug container which is threadedly connected to a well casing upper section WC by means of a collar C.

A fluid manifold 12 is attached to the upper end of the head 10 somewhat off center from a vertically extending and axially arranged measuring line connection 14.

It will be noted that the head 10 comprises an inner head member 16 in which an upper cementing plug P of ordinary form may be loosely fitted. A domed, outer, or jacket-forming head member 18 surrounds the inner head 16 so as to provide an annular space 20, the bottom of which is closed by the inwardly extending edge 22 of the outer head 18, which edge is suitably secured so as to provide a fluid-tight connection.

Above the bottom edge 22 and supporting the lower end of the upper cementing plug P is a plug release plunger 24 sliding within a packing assembly or gland 26 mounted in one side of the lower portion of the outer head 18. The inner head 16 is provided with opposite openings 28 and 30 in alignment with the passage through the packing assembly 26 for supporting the plunger 24 loosely across the inner head member 16. Only the end of the plunger 24 adjacent the packing assembly 26 extends through the outer head 18.

In Fig. 1, it will be seen that the lower end portion 32 of the upwardly extending measuring line connection 14 projects centrally through the upper ends of the outer head 18 and inner head 16. A gate valve 34 is attached to the outer end of the measuring line connection 14 so as to receive the measuring line and its stuffing box (neither of which is shown).

Attention is next directed to an inverted T connection 36 forming a part of the manifold 12. From the left-hand end of the connection 36, as viewed in Fig. 1, a fluid connection 38 extends outwardly and downwardly through the outer head 18 and the inner head 16 so that its open, lower end 40 communicates with the space within the inner head 16 above the plug P. Intermediate the T connection 36 and the lower open end 40, the cement connection or branch 38 is provided with a gate valve 42.

A similar right-hand connection 44 leads from the opposite end of the T member or connec-

tion 36 and through the outer head 18, with an open lower end 46 arranged to discharge into the jacket space 20. Similarly, a gate valve 48 is inserted in the right-hand or circulating fluid connection 44 between the T connection 36 and the lower end portion 46.

Each of the valves 34, 42 and 48 is mounted externally of the head 10 and the valves are closely adjacent each other in closely spaced parallel planes for convenience in manipulation. Of considerable importance is the fact that the manifold 12 and its various fluid connections have approximately the same overall diameter as the head 10.

To provide communication between the jacket space 20 fed by the circulating fluid connection and the portion of the inner head below the cementing plug P, a plurality of relatively large openings 50 (only one of which is shown) extend through the inner head member 16 just above the bottom closing edge 22 of the outer head member 18.

The intermediate or upwardly extending leg of the T connection 36 is joined to a double check valve 52 by means of a short conduit 54, in the manner illustrated best in Fig. 1. At one end of the check valve 52 a cement truck connection 56 is provided, and at the opposite end a similar connection 58 serves to supply circulating fluid from a slush pump. The inner ends of the connections 56 and 58 are formed and disposed to constitute opposed seats 60 and 62 respectively for optional cooperation with a check ball 64 within the valve 52. Other forms and arrangements of double check valves which are conventional in nature may obviously replace the ball type 52.

The operation of the cementing head, the parts of which have been described in detail is as follows: After attachment to the well casing WC of the head 10 with the upper cementing plug P included in the manner illustrated, and with the valve 48 open and the valves 34 and 42 closed, cement slurry will be pumped in through the valve connection 56 displacing the check ball 64 to the right of Fig. 1 into a closing position on the seat 62 of the circulating fluid connection 58. From the lower end portion 46 of the manifold connection 44, the slurry will discharge into the annular space 20 provided by the jacketed head construction and downwardly through the openings 50 into the head and casing below the plug P. This by-pass of cement slurry will continue until a sufficient quantity has been pumped into the well casing WC. Then, and without appreciable delay, the supplying of cement slurry will be discontinued, the valve 48 in the cement line connection 44 will be closed, the valve 42 opened, and the check ball 64 forced to the left into engagement with the seat 60 as circulating fluid is forced through the check valve 52 from the connection 58. The circulating fluid from the valve 52 will pass downwardly through the manifold connection 38 and out the lower end portion 40 thereof. However, previous to the supplying of pressure circulating fluid in this manner to the inner head member 16 above the plug P, the latter will have been released for downward movement by lateral withdrawal of the plunger 24. The circulating fluid supplied will act on the top of the upper cementing plug P to force the cement down through the casing, until the operator by use of the measuring line passing through the connection 14 has determined that the cement has reached its required position, and stops the flow.

In summary, it is observed that the cementing head assembly which this invention provides possesses the advantage of having all of its attachments compactly joined and arranged for efficient use, that the arrangement specified is the first which avoids substantial interference with the casing elevators, and that, so far as is known, the disposition of the double check valve on the cementing head rather than on the derrick floor is a distinct advance in the art.

Since other equivalent modifications and variations in detail will be prompted by the disclosure which has been made, the present invention is to be limited only to the scope and spirit of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A cementing head assembly which includes spaced inner and outer head members connected together so as to provide a space which is closed at the bottom of the outer head member, said inner head member being adapted to receive a cementing plug in its upper portion and the space being in fluid communication with the inner head member below the portion which receives the cementing plug; a fluid connection extending from without the outer head and opening into the space; and a further fluid connection leading from outside the head members to within the inner head above the portion adapted to receive the cementing plug.

2. A cementing head assembly which includes spaced inner and outer head members connected together so as to provide an annular space which is closed at the bottom of the outer head member, said inner head member being adapted to receive a cementing plug in its upper portion and the annular space being in fluid communication with the inner head member below the portion which receives the cementing plug; a fluid connection extending from without the outer head and opening into the annular space; a further fluid connection leading from outside the head members to within the inner head above the portion adapted to receive the cementing plug; and a measuring line connection extending from outside the outer head member to within the inner head member.

3. A streamlined cementing head assembly adapted for mounting on a well and having, in combination, an inner domed head member adapted to receive a cementing plug; a similar outer head member spaced from the inner head member to form an annular by-pass for the upper portion of said inner head member and having its bottom edge connected to the inner head member in a fluid-tight manner, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a first fluid connection opening into the space formed between the head members; a second fluid connection opening into the inner head member above the portion occupied by the cementing plug; and double check valve means operatively connected to the first and second fluid connections adjacent the head members for controlling the flow thereto alternately of cement and circulating fluid respectively.

4. A cementing head assembly comprising an inner head member adapted to receive a cementing plug; an outer head member spaced from the inner head member to form a by-pass for the

upper portion of said inner head member; means for retaining a cementing plug temporarily in said upper portion of the inner head member, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a fluid manifold extending above and overlying both head members, said manifold having one connection opening into the space formed between the head members and another connection opening into the inner head member above the position occupied by the cementing plug; and valve means directly connected to the manifold and also overlying the head members arranged to permit the optional flow from two different fluid sources into one or the other of the manifold connections to the head members.

5. A streamlined cementing head assembly comprising an inner head member adapted to receive a cementing plug; an outer head member spaced from the inner head member to form a by-pass for the upper portion of said inner head member; means for retaining a cementing plug temporarily in said upper portion of the inner head member, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a fluid manifold extending above and overlying both head members, said manifold having one valved fluid connection opening into the space formed between the head members and another valved fluid connection opening into the inner head member above the position occupied by the cementing plug; and double check valve means also overlying the head members and arranged to permit the optional flow from two different fluid sources into one or the other of the manifold connections leading to the head members.

6. A streamlined cementing head assembly comprising an inner head member adapted to receive a cementing plug; an outer head member spaced from the inner head member to form a by-pass jacket for the upper portion of said inner head member; a plunger slidably supported by both head members for retaining a cementing plug temporarily in said upper portion of the inner head member, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a fluid manifold extending above and overlying both head members, said manifold having one fluid connection opening into the space formed between the head member and another fluid connection communicating with the inner head member above the position occupied by the cementing plug; and double check valve means also overlying the head members and arranged to permit the optional flow from two different fluid sources into one or the other of the manifold connections to the head members, the overall diameter of the manifold and check valve means being approximately that of the outer head member.

7. A streamlined cementing head assembly comprising an inner head member adapted to receive a cementing plug; an outer head member spaced from the inner head member to form a by-pass for the upper portion of said inner head member; means for retaining a cementing plug temporarily in said upper portion of the inner head member, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a fluid manifold extending above and overlying both head members, said manifold having one valved fluid connection opening into the space formed between the head members and another valved fluid connection opening into the inner head member above the position occupied by the cementing plug; double check valve means also overlying the head members and arranged to permit the optional flow from two different fluid sources into one or the other of the manifold conduits leading to the head members; and a centrally disposed, upwardly extending measuring line connection passing through the upper end portions of both head members.

8. A streamlined cementing head assembly comprising an inner head member adapted to receive a cementing plug; an outer head member spaced from the inner head member to form a by-pass for the upper portion of said inner head member; means for retaining a cementing plug temporarily in said upper portion of the inner head member, said by-pass being in fluid communication with the inner head member below the portion adapted to receive the plug; a fluid manifold extending above and overlying both head members, said manifold having a first fluid connection opening into the space formed between the head members and a second fluid connection opening into the inner head member above the position occupied by the cementing plug; a valve intermediate the first fluid connection for closing the same; a valve intermediate the second fluid connection for closing the same; double check valve means also overlying the head members and arranged to permit the optional flow from two different fluid sources into one or the other of the manifold conduits leading to the head members; a centrally disposed measuring line connection extending above the outer head member; and a further valve for closing the measuring line connection, the fluid connection and measuring line valves each having independent operating means which are closely adjacent in parallel planes.

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