A. G. WILLARD.

TOP CLOSURE FOR OIL WELL CASINGS.

APPLICATION FILED MAY 2, 1910.

1,220,998. Patented Mar. 27, 1917.

Fig. 1

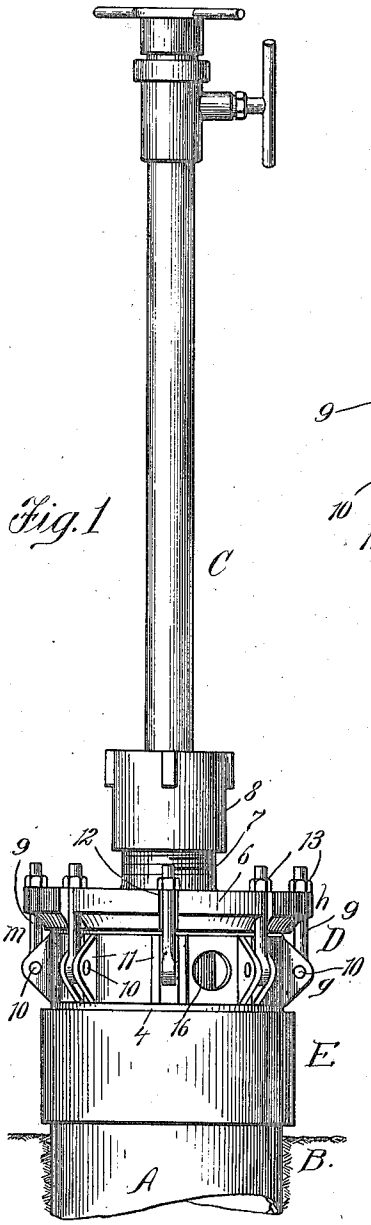
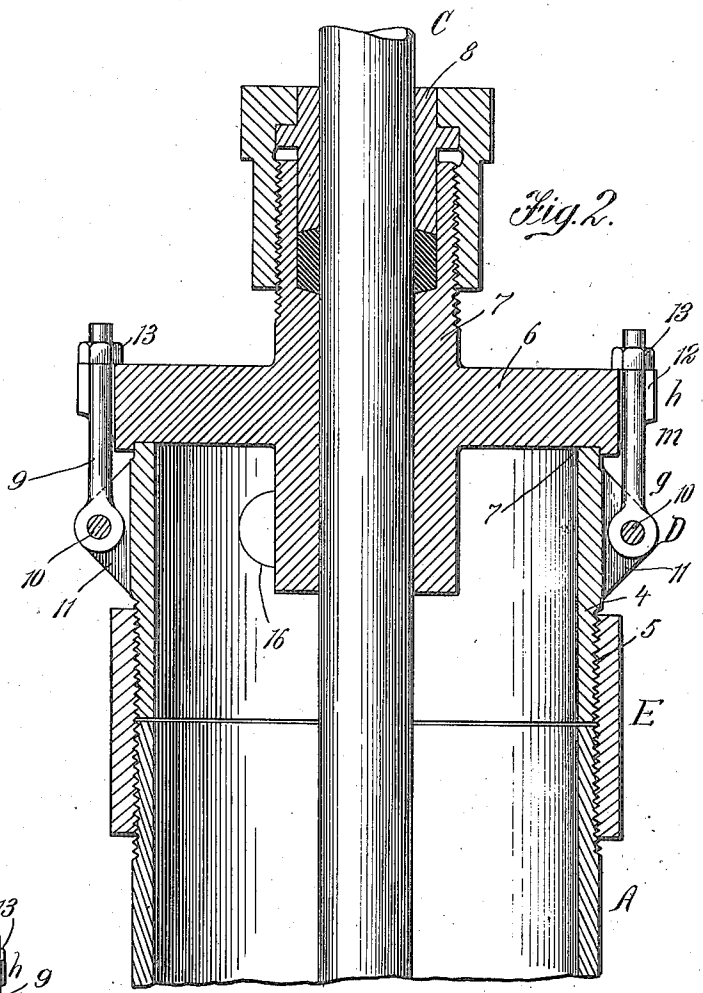


Fig. 2.



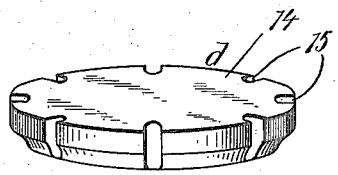


Fig. 3.

Witnesses

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TOP-CLOSURE FOR OIL-WELL CASINGS.

1,220,998. Specification of Letters Patent. Patented Mar. 27, 1917.

Application filed May 2, 1910. Serial No. 559,012.

To all whom it may concern:

Be it known that I, ARTHUR G. WILLARD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Top-Closures for Oil-Well Casings, of which the following is a specification.

This invention relates to improvements in oil well apparatus, and more particularly to apparatus utilized in drilling oil wells. Specifically the invention relates to top closures for oil well casing. As is well known, casing is lowered into the oil well as the drilling operation advances, and through this casing the drilling rig is operated. The top or upper end of the casing is capped or closed with a circulating head which may include a cap having a vertical opening through which the drilling rig may be operated, or a plain cap may be employed. Customarily, the entire means for capping or closing the top of the casing must be removed in substituting either of the types of caps above specified, one for the other; and, furthermore, the entire cap with its attaching means, must be removed from the upper end of the casing to permit introduction or withdrawal of the drilling rig.

According to the present invention, I provide a closure or cap for the upper end of the casing which comprises separable members one of which may remain permanently attached to the upper end of the casing, and the other of which may be removed at will, to permit the substitution of parts above referred to, or to permit the introduction or withdrawal of the drilling rig; there being provided means for detachably connecting the two members. The permanently attached member, or relatively permanently attached member, is formed for connection of pumping means, or liquid supply means, which are utilized to flush the well, in the drilling operation, for the purposes well understood in the art.

By the provision of a casing cap or closure organized as described, I am enabled to more conveniently control working conditions incident to the drilling operation, and also to speedily cap the well when desired, as, for instance, when lowering the casing after stopping the pumping operation.

The invention consists in the novel provision, construction, combination, association and relative arrangements of parts, members and features, all as hereinafter described, shown in the drawing, and finally pointed out in claims.

In the drawing:—

Figure 1 is a side elevation of a portion of a well drilling rig and of a well casing within which latter the former is operatively disposed; the improved casing cap means or closure being shown in association with the other features;

Fig. 2 is a vertical sectional view, upon an enlarged scale, central of the showing in Fig. 1, parts being broken away and omitted for clearness of illustration; and,

Fig. 3 is a perspective view of an element of the invention utilized in substitution for an element shown in Fig. 1.

Corresponding parts in all the figures are designated by the same reference characters.

Referring with particularity to the drawing, A designates the upper or topmost section of a well casing, the same being shown in Fig. 1 as introduced within a well produced through earth formation B. This casing A is lowered within the well section by section as the well is formed. C designates a portion of a drilling rig which extends downwardly within the casing, of which A is a section, and D designates the improved casing closure or cap means organized according to the invention; *d* in Fig. 3 designating an element used in substitution for an element shown in Fig. 1. E designates a casing joint such as is employed for uniting serially the sections of the casing; such casing joint being shown in the present instance as uniting the upper section A with the features of the invention, which latter are removed to permit the addition of successive sections as the casing is lowered.

It will be understood that the portion of the rig designated C is specifically part of a

string of tools used in a standard drilling rig, such portion reciprocating vertically through the well casing A and through the closure or cap D organized in accordance with the invention. This closure D is to be arranged as low as possible and, as shown, at the upper end of the casing directly above the orifice of the well hole in order that the walking beam or other actuating member for the string C may have sufficient play. It is an object of the invention to provide such a closure D for permitting a supply of liquid to the well hole as it is being produced, in connection with the standard drilling rig and the reciprocating string thereof. Complicated or bulky structures for permitting such liquid circulation, and located at a material elevation above the mouth of the hole, will not answer the purposes of the present invention. It is an important object of the present invention to provide such a cap member or closure D as may be applied to the upper section of the well casing, immediately above the orifice of the well hole, by the use of the standard collar or joint whereby the several sections of the casing are detachably connected together. This makes the invention a practicable and practical thing for application to standard drilling rigs without any alterations of the same whatsoever. And, such application of the invention at the top of the casing directly above the orifice of the well hole permits of the reciprocation of the drilling string and in no manner interferes therewith. No closure and circulating head or cap as applied at present to rotary drilling rigs will, as far as I am informed, answer the purposes of the present invention, as none such is capable of application and employment in accordance with the conditions and for the purposes set forth.

A particular form, construction and combination of parts, members and features embodying the invention, is as follows:—The casing closure or cap means D, as shown in Figs. 1 and 2, comprises two members, *g* and *h*, which are detachably united by securing means *m*. The member *g* consists of an annulus or tubular part 4 which is of the same internal diameter as the upper casing section A, and has a threaded connection, as at 5, with and within the joint E. This joint also screws onto the section A. The member *h* comprises a cap or plate 6 which is formed to closely fit and rest directly upon the upper rim of the annulus 4, as at 7, relating now to the form of construction shown in Figs. 1 and 2, in contradistinction to the form *d* shown in Fig. 3. The plate or cap 6 is provided with a central vertical tubular sleeve or bearing 7 projecting both below and above the plate or cap 6, and provided at its upper end with a stuffing box 8. The drilling rig C, or part thereof, as shown, is mounted to play vertically through the sleeve or bearing 7. The securing means *m* may be of any preferred form, being shown as consisting of a plurality of swinging bolts 9 which are pivotally connected at their lower ends, as at 10, in connection with pairs of spaced cheeks 11 upon the annulus 4, and are adapted to be received within recesses 12 formed in the outer periphery of the plate or cap 6. Nuts 13 are applied to the bolts 9 above said cap or plate.

The element *d* shown in Fig. 3 consists of a cap or plate 14, continuous in formation, and provided with peripheral recesses 15 similar to the recesses 12; said plate or cap 14 being formed and adapted to replace the plate or cap 6, when the drilling rig C is withdrawn from the casing, and to receive the bolts 9 and nuts 13 in the same manner as shown in Figs. 1 and 2 in the employment of the plate or cap 6 with its bearing or sleeve 7. The member *g*, consisting of the annulus 4, is provided with a lateral opening 16 through which connection may be made with any suitable pumping or similar means adapted for introducing liquid to the interior of the casing.

The operation, method of use and advantages of the improvements in oil well apparatus constituting the invention will be readily understood from the foregoing description, taken in connection with the accompanying drawing and the following statement:—

With the parts assembled as shown in Figs. 1 and 2, the drill rig C may be actuated so as to cause it to play through the sleeve or bearing 7 in the cap or plate 6 which latter seals the upper end of the casing so that liquid introduced through the opening 16 in the annulus 4 will descend in the casing and serve to flush the well in assisting the drilling operation, in the well-known manner. Furthermore, should a sudden flow of oil occur during the drilling operation, the cap or plate 6 will prevent overflow or spouting and loss of the same. With either the cap or plate 6 or the cap or plate 14 in position upon the annulus 4, the entire casing may be suitably reciprocated vertically, in the customary manner, to cause agitation of the liquid introduced within the casing through the opening 16, and a consequent positive scouring or washing of the well to free the same from cuttings and obstructions. When it is desired to withdraw the drilling rig from the casing, it is only necessary to release the bolts 9 from the cap or plate 6, permitting the latter to be withdrawn with the drilling rig. And, after introducing the drilling rig within the casing, the cap or plate 6 may be passed on to the

same and secured to the annulus 4 by the bolts 9 and nuts 13, re-assembling the member g which is relatively permanently attached to the casing, together with the detachable member h.

When it is desired to positively seal the upper end of the casing, after the drilling rig has been withdrawn therefrom, the member d is substituted for the member h, the bolts 9 and nuts 13 of the securing means m co-acting with the plate or cap 14 in the same manner as with the plate or cap 6.

It will be noted that in all of the operations above set forth, only the members h and d are manipulated, the member g being continuously connected with the casing through the agency of the joint E. The connection means m also remain connected with the casing, together with the member g. It is therefore apparent that a great saving of time and enhanced convenience result from the employment of two separable members, such as g and h and g and d, together with the securing means m for uniting the two; for all that is necessary to unseal the casing, or to substitute one form of cap or closure for the other, is to throw off the swinging bolts 9 from the cap or plate 6 or 14, and remove the latter. The improvements therefore, as has been found in practice, greatly facilitate and expedite well-drilling operations and the various phases thereof. The annulus 4 being of the same internal diameter as the casing, it may remain in position, held to the casing by the joint E, when the closure member h or d is removed, as, for instance, for withdrawing of the string of boring tools. Ordinarily, the closure or circulating head is in one unit, and when withdrawn the pump connections are of necessity broken, and the closure is unscrewed from the joint at the top of the casing. In the present case, the lower member g, of the closure, remains in place, with the pump connections unbroken, and no unscrewing is necessitated, but only the convenient manipulation of the bolts 9 or equivalent securing means. The joint or collar E is always present at the top of the casing, in usual practice, and I utilize it to hold the lower member of the closure permanently upon the casing.

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

1. The combination, with a sectional well casing; of a circulating head and closure for the upper end of the casing, comprising two separable members, and securing means for detachably uniting the members; one of said members comprising an annulus, the other of said members comprising a cap or plate through which the drilling string is vertically reciprocated, and said securing means comprising swinging bolts pivotally connected with one of said members and adapted for connection with the other of said members; and a collar or joint detachably applied to the annulus and applied to the upper end of the casing exteriorly of both and constituting a securing means.

2. The combination, with a sectional well casing; of a circulating head and closure for the upper end of the casing, comprising two separable members, and securing means for detachably uniting the members; one of said members comprising an annulus adapted for connection with the casing, the other of said members comprising a cap or plate through which the drilling string is vertically reciprocated, and said securing means comprising swinging bolts pivotally connected with said annulus and adapted to enter recesses in the periphery of said cap or plate, nuts being provided to hold said bolts within said recesses; and a collar or joint detachably applied to the annulus and applied to the upper end of the casing exteriorly of both and constituting a securing means.

3. The combination, with a sectional well casing; of a closure for the casing, comprising an annulus adapted to be connected with the casing by a casing joint, and of the same internal diameter as the casing, a cap or plate adapted to be fitted to and seated upon the annulus and through which the drilling string is reciprocated, and securing means detachably uniting the annulus and the cap or plate.

4. The combination, with a sectional well casing; of a circulating head and closure for the upper end of the casing, comprising an annulus adapted to be connected with the casing by a casing joint or collar and of the same internal diameter as the casing, said annulus being perforated to accommodate pump connections, a cap or plate adapted to be fitted to and seated upon the annulus, and through which the drilling string is vertically reciprocated, securing means detachably uniting the annulus and the cap or plate, and said casing joint or collar exteriorly and detachably applied to said casing and said annulus.

5. A detachable closure for a sectional well casing having a tubular portion the internal diameter of which is the same as that of the casing; and detachable means applied exteriorly to the closure and the casing for detachably uniting the same; said tubular portion being provided with an opening accommodating pump connections.

6. The combination, with a sectional well casing which is lowered section by section within the well as produced and is provided at its upper end with a casing joint or collar threaded upon the uppermost section; of an annulus adapted to be connected with the

upper section of the casing by said casing joint or collar whereby the casing joint or collar separably over-laps the meeting ends of said upper section and said annulus and is threaded to both, said annulus being of the same internal diameter as the casing and being perforated to accommodate pump connections, a cap adapted to be fitted to and seated upon the annulus, and through which the drilling string is vertically reciprocated, and securing means detachably uniting the annulus and the cap.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR G. WILLARD.

Witnesses:
RAYMOND I. BLAKESLEE,
B. F. FLETCHER.