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METHOD OF CEMENTING OIL WELLS.

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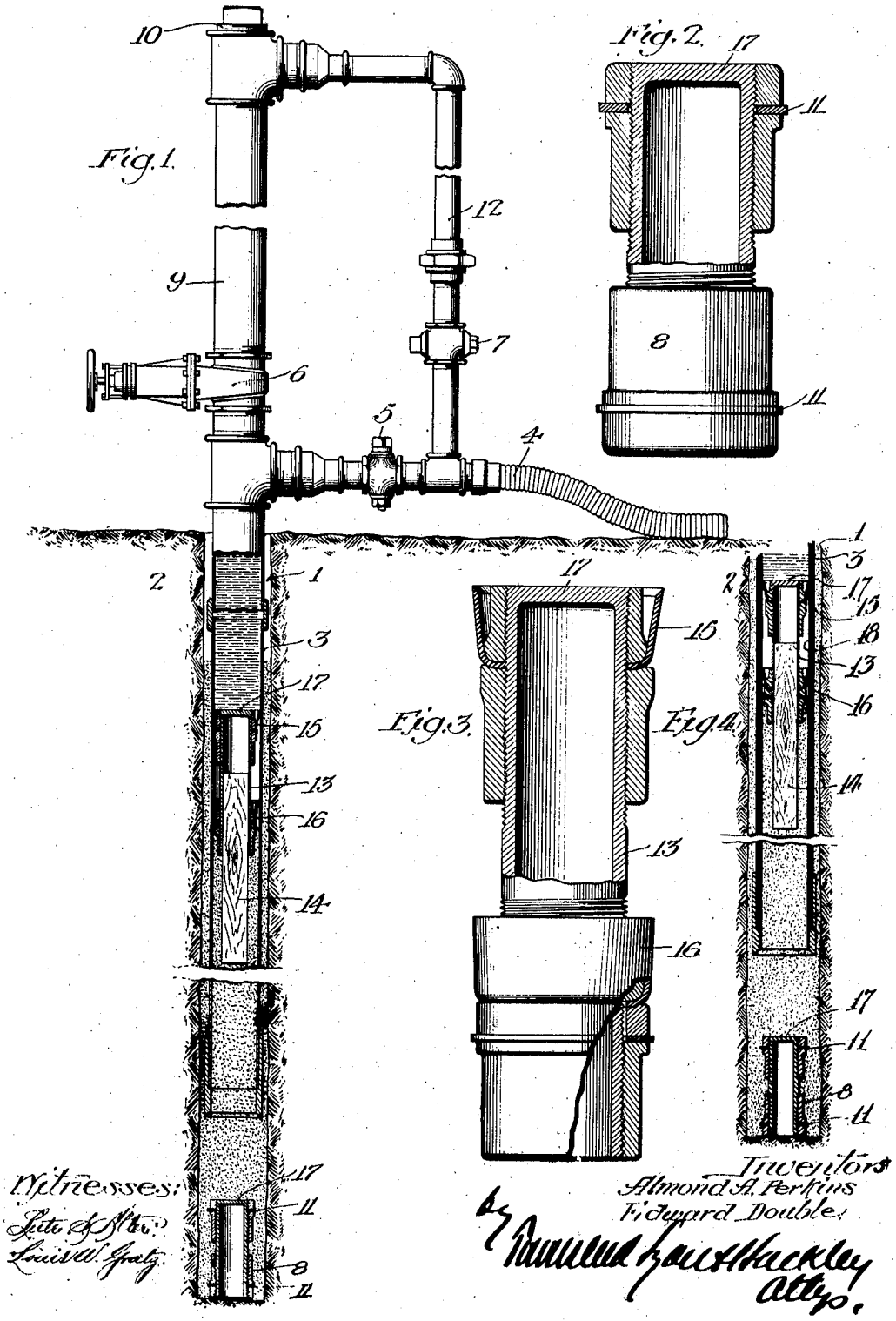
1,011,484. Patented Dec. 12, 1911.



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UNITED STATES PATENT OFFICE.

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METHOD OF CEMENTING OIL-WELLS.

1,011,484. Specification of Letters Patent. Patented Dec. 12, 1911.

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To all whom it may concern:

Be it known that we, ALMOND A. PERKINS and EDWARD DOUBLE, both citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Method of Cementing Oil-Wells, of which the following is a specification.

Difficulty is often experienced by water entering oil wells between the ground and casing, thence working into the casing, and the main object of the present invention is to provide a method of cementing the wells whereby the water may be prevented from escaping from the ground into the well, and briefly the method consists of inserting a suitable cement in the space between the casing and the ground and filling such space with cement so that water is completely excluded from the well, and the casing being surrounded by this sleeve of cement makes it impossible for water to get into the casing. We introduce the cement by hydraulic pressure as will be hereinafter described in detail, and a further important object is to convey the cement into place without allowing the cement to come in contact with or be diluted by the water which is used for forcing the cement in.

A further object of the process is to make it possible to dispense with the employment of extra pipes for introducing the cement as has heretofore been necessary and to enable the well to be easily drilled deeper after the cement has hardened.

The accompanying drawings illustrate one form of apparatus which may be employed in carrying out the invention, and referring thereto:—

Figure 1 is a vertical longitudinal section through a well, the view having been contracted in length. Fig. 2 is a side elevation, partly in section, of the bottom packer. Fig. 3 is a side elevation, partly in section, of the top packer. Fig. 4 is a view similar to Fig. 1, showing a modified form of casing in which a double tube 18 is used.

In order to facilitate an understanding of our process, we have illustrated a well and shown the distribution and relation of the materials to each other at different steps of the process, and referring to the drawings 1 designates the well, 2 the ground, and 3 the casing, leaving a space around the casing. Before inserting the cement, we prefer to establish a water circulation by admitting water through a pipe 4 past a valve 5, valves 6 and 7 being closed, and forcing the water down through the casing 3 and up through the space outside the casing so that the water overflows at the top. The reason for first establishing the water circulation is that there may be earth or rock in the space outside of the casing which would clog and prevent the cement from passing up to the proper height. Cementing could not be accomplished if this space were clogged. The circulation of water which is first established will not only indicate if the space is clogged but, if such is the case, will usually remove the obstruction. As soon as this circulation of water has been established, a suitable barrier comprising the bottom packer 8 is inserted into the pipe 9 above the valve 6, plug 10 having been removed, and after packer 8 has dropped to the gate 6, the plug 10 is reinserted. The packer 8 has packing rings 11 which fit the casing 3 closely. The water circulation having been established and the packer 8 having been inserted in the pipe 9, valve 5 is closed, valve 7 is opened, and gate 6 is opened, and water is forced under pressure through the pipe 4 up through the pipe 12 into the pipe 9 above the packer 8 and forces the packer 8 downward. As soon as the packer 8 is below the gate 6 and pipe 4, valve 7 and gate 6 are closed and valve 5 opened and the water in that portion of pipe 12 below valve 7 and that in pipe 4 is allowed to run out through pipe 4, and then cement is forced in through pipe 4 directly to casing 3 on top of the packer 8, and then the incoming cement pushes the packer 8 ahead of it and as the cement and packer move down the packer forces the water in front of it down the casing 3, causing water to flow up through the space outside the casing and overflow at the top of the well. During this downward progress of the cement, the packer 8 prevents the cement which is above the packer from mixing with the water which

is below the packer and which is being forced out by the packer, and thus the cement is introduced into place without being diluted by the water. When the packer arrives at the bottom of the casing, all of the water will have been expelled from the casing, and the only water in the well is that which is outside of the casing. The packer continues down for a short distance farther until it rests on the bottom of the well, by which time some of the cement will have commenced to rise up through the space outside of the casing.

After an amount of cement has been forced into the casing which will be a sufficient quantity to substantially fill the space outside the casing, the introduction of cement is stopped and another barrier comprising a top packer is placed in the pipe 9, a wooden post 14 having been inserted in the packer 13 and projecting below the same. Although the pipe 9 is filled with water which had been retained on account of the gate 6 having been closed when the valve 5 was opened to let the water run out, this water which remains in the pipe 9 does not interfere with the introduction of the packer at this time, because the cup leather 15 of the packer extends upwardly and will permit the water to be displaced by the packer as the packer is inserted, so that the packer moves to the bottom of pipe 9 and the water therein assumes a position above the packer in the pipe 9. The gate 6 is then opened, valve 5 is shut, and valve 7 opened, and water is then pumped in through the pipe 4 and up through the pipe 12 and down through the pipe 9 on top of the packer 13, thus forcing the latter downward, and the packer 13 upon coming in contact with the cement which is within the casing 3 then forces the cement down ahead of it, thus causing the cement to be forced up outside the casing so that it fills the space between the ground and the outside of the casing. When the post 14 strikes the bottom packer 8, which already rests at the bottom of the well, further downward movement of the packer 13 is positively stopped, and the packer 13 is arrested while its upper portion, at least, is still within the casing. During the downward progress of the upper packer 13, the water is prevented by the packer from coming in contact with the cement, and after the top packer has arrived at the bottom the upper cup leather continues to prevent the water from escaping from the casing and mingling with the cement. The bottom cup leather 16 is passed out of the lower end of the casing so that all of the cement is forced out of the casing. The packers are left in this position to allow the cement to harden, which process quickly takes place, none of the water from within the casing being permitted to dilute it or retard its setting. From this it will be seen that our process is not necessarily limited to the novel steps for introducing the cement into proper position, but extends farther in scope to include the retaining of the cement in position, while it hardens, under the hydraulic pressure of the water outside of the casing above the cement, and the water inside of the casing above the cement, which is also novel. The water which is in the well is forced up out of the space outside of the casing as the cement is introduced and while a small portion of the cement which is first introduced comes in contact with this water and does become softened thereby to a certain extent, this cement lies at a considerable point above the zone which is to be covered by the cement. After the cement has hardened, the space around the casing, to the height desired, is completely filled with an impervious material constituting a permanent dam which absolutely prevents water from entering the well.

If it is subsequently desired to drill the well deeper the thin diaphragms 17 in the ends of the packers may be drilled through, and the wooden post 14 may be drilled through, and the well may thus be carried deeper without removing the packers. It is for this reason that the packers are made hollow and with thin diaphragms 17. If it is not expedient to insert the cement and packers through the casing they may be introduced through a tube inserted in the casing.

What we claim is:—

1. The method of cementing oil wells which consists of establishing a water circulation down the casing and up the space outside thereof, introducing concrete into the casing above the water and separated therefrom by a suitable barrier and forcing down the concrete to drive the water before it, and after sufficient concrete has been introduced introducing water into the casing above the concrete and separated therefrom by a suitable barrier and forcing the latter barrier down by water.

2. The method of cementing oil wells which consists of forcing cement down through the regular well casing by means of water pressure, the water being separated from the cement by a suitable barrier, forcing the cement up outside the casing, and holding the cement in position under the water pressure until the cement hardens.

3. The method of cementing oil wells which consists of forcing cement with a suitable barrier in front of it down through the regular casing and leaving the barrier at the bottom of the well and forcing the cement up outside the casing by water pressure within the casing above the column of

cement and separated from the cement by another barrier with a solid substance in front of it until the solid substance strikes the bottom barrier and arrests the top barrier in the bottom part of the casing, thereby preventing water above the cement from passing out of the casing into the cement, holding the cement in position until it hardens by means of the water pressure above it.

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