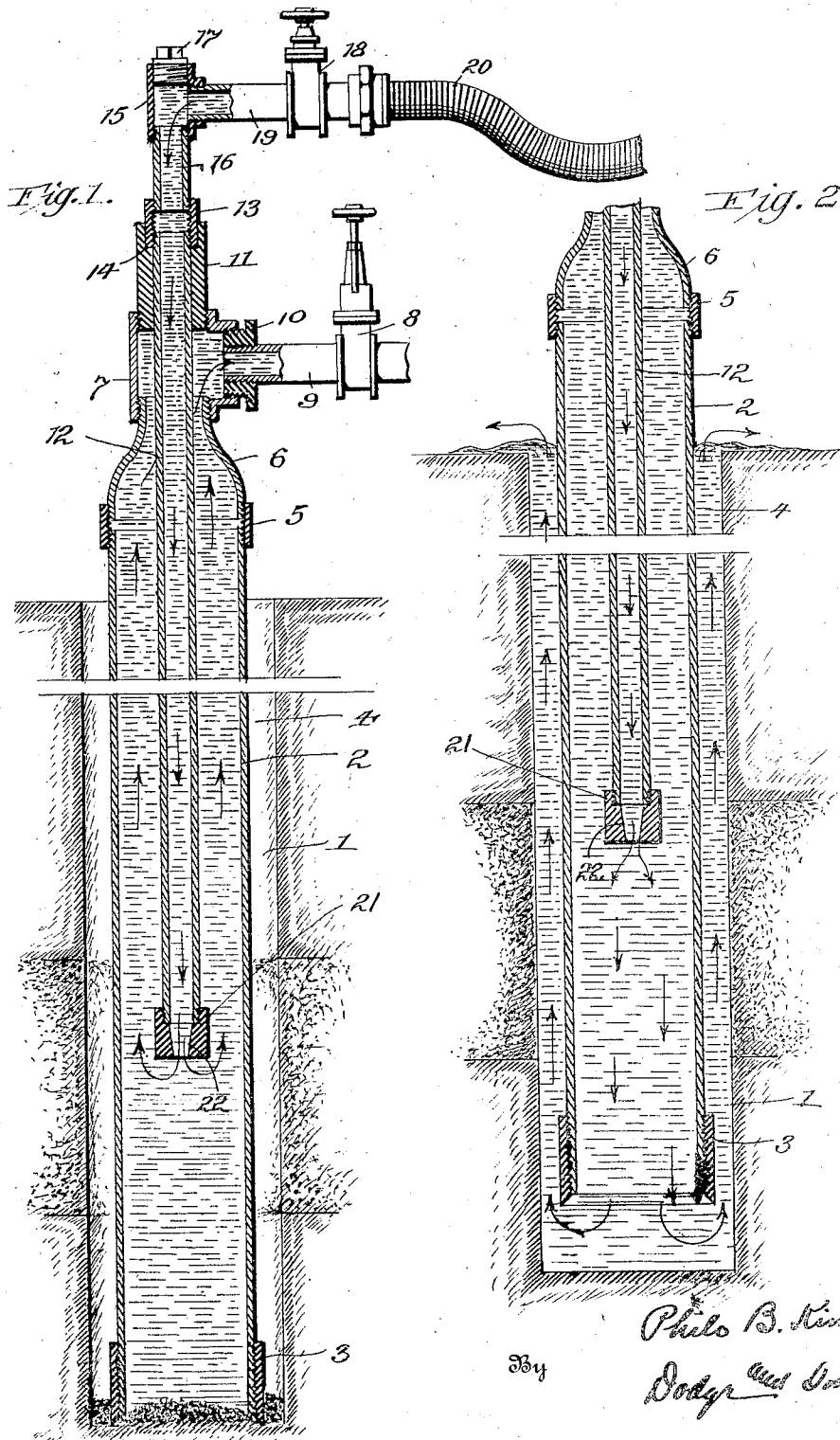


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CEMENTING WELLS.
APPLICATION FILED JAN. 4, 1921.

1,381,645.

Patented June 14, 1921.

2 SHEETS—SHEET 1.



Inventor

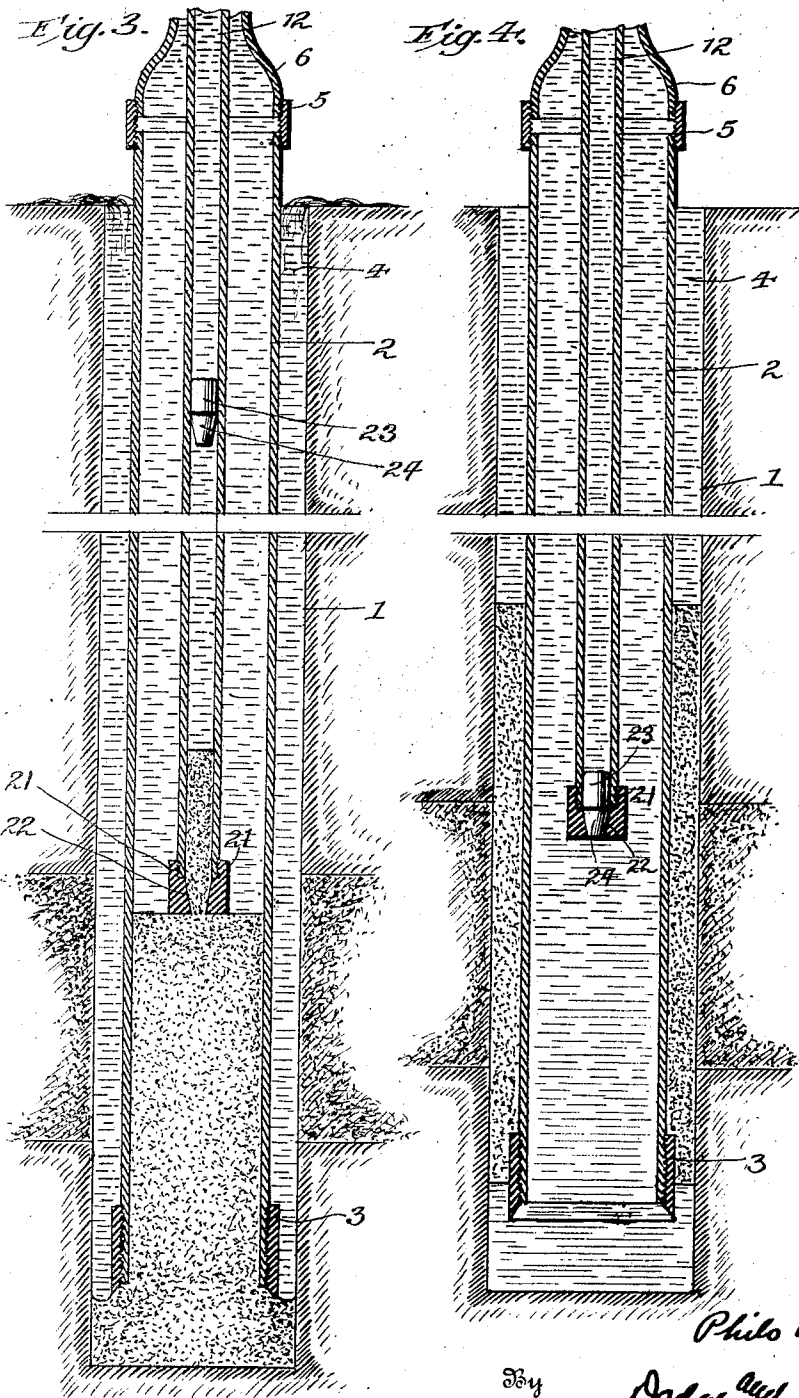
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UNITED STATES PATENT OFFICE.

PHILO B. KINNIEAR, OF SALT CREEK, WYOMING, ASSIGNOR OF ONE-HALF TO DAVID W. LEWIS, OF SALT CREEK, WYOMING.

CEMENTING WELLS.

1,381,645.

Specification of Letters Patent. Patented June 14, 1921.

Application filed January 4, 1921. Serial No. 435,043.

To all whom it may concern:

Be it known that I, PHILO B. KINNIEAR, a citizen of the United States, residing at Salt Creek, in the county of Natrona and State of Wyoming, have invented certain new and useful Improvements in Cementing Wells, of which the following is a specification.

The present invention relates to the art of cementing wells, either water, gas or oil, and comprises the use of a method and means whereby the cement may be accurately placed between the metal well casing and the walls of the well hole so as to completely shut off a water stratum, or any other stratum the product from which is undesirable.

The apparatus necessary for this improved method of cementing calls for relatively few special parts, and is readily assembled and placed in position in the metal well casing.

Reference is had to the accompanying drawings illustrating the invention, and wherein:—

Figure 1 is a fragmental elevation, partly in section, of a well with the well casing and cementing apparatus in position, the view being taken at the time the casing has been filled with water through the inner tube and the water is flowing from the outlet at the upper end of the casing.

Fig. 2 a fragmental sectional view, the upper part of the cementing apparatus being omitted, showing the well casing raised from the bottom of the well and the water flowing upwardly through the space between the well casing and the walls of the well hole and over the ground.

Fig. 3, a view similar to Fig. 2, taken after the cement has been introduced into the cementing tube and well casing, and the desired quantity of water pumped in above the cement, the cementing plug being shown in position preparatory to forcing the cement into the desired position outside the casing; and

Fig. 4, a view similar to Figs. 2 and 3, the cementing plug having been pumped through the cementing tube into the lower cementing head and the cement forced into position outside of and around the casing so as to completely shut off the water stratum.

In cementing a well by my improved method, the well hole 1 is drilled in the usual manner and well casing 2 sunk therein until

the casing shoe 3 rests on the bottom of the well. The well hole 1 being of greater diameter than casing 2, which is located centrally of the hole, there is provided an annular space 4 surrounding casing 2 into which the cement is to be forced from within the casing so as to shut off the undesirable stratum shown in the several figures of the drawings.

In Fig. 1 the cementing apparatus is shown in position in the well casing 2. Attached to the upper end of casing 2 by means of coupling member 5 is a swage nipple 6 having a T coupling 7 secured to its upper end. The horizontal outlet of the coupling 7 is provided with a suitable valve 8, secured to the coupling by means of a nipple 9 and a bushing 10, while to the upper end of coupling 7 there is secured the upper cementing head 11 which, as will appear later, receives and supports the cementing tube within casing 2.

Located centrally within casing 2 is the metal tube 12 through which the water and cement are pumped into the casing. Tube 12 is supported in casing 2 by means of a collar 13 screwed to its upper end and resting on a shoulder 14 provided in the upper end of the upper cementing head 11 for this purpose. Sufficient clearance is provided between the outer face of collar 13 and the inner face of cementing head 11 above shoulder 14 to allow for a thin layer of loose hemp or other suitable packing.

A smaller T-coupling 15 is connected to the upper end of collar 13 by a short nipple 16, the upper opening of the T being normally closed by a plug 17. The horizontal outlet of T 15 is provided with a valve 18, connected to T 15 by a nipple 19, and from the other side of which suitable piping 20 leads to a pump (not shown) for forcing the water and cement into the casing. The lower cementing head 21 which is a special fitting is screwed on to the lower end of tube 12, the cementing head being threaded interiorly at its upper end and the lower end of tube 12 correspondingly threaded exteriorly for this purpose. A taper seat 22 is provided in cementing head 21, the purpose of which will appear later.

In carrying out my improved method of cementing, the apparatus is first rigged up as shown in Fig. 1 with the casing shoe 3 resting on the bottom of the well. Valves

18 and 8 being open, water is then pumped into casing 2 through pipe 20, tube 12, and their connections until casing 2 and swage nipple 6 are filled with water, which then flows out at valve 8, as indicated by the arrows, carrying with it such loose clay or other earthy matter as may have accumulated in the bottom of the well. When the water has circulated in this course for a sufficient period, casing 2 is raised off the bottom of the well, valve 8 closed, and the water allowed to circulate under casing 2, upwardly through the annular space 4 and out over the ground, as indicated by the arrows in Fig. 2. When the circulation is good and all the cavings in cleaned out of the well hole, casing 2 is let down on the bottom of the well and tested for tightness. If there is no leakage around the bottom of the casing shoe 3, or elsewhere, then the cementing can be started.

The desired amount of cement is first pumped through tube 12 into the lower part of casing 2 and well hole 1 directly on top of the water, a certain amount of which it displaces, the water flowing out over the ground around the outside of casing 2, as shown in Fig. 3. After all the cement has been pumped into tube 12, a measured quantity of water is pumped in on top of the cement. Plug 17 in the upper end of T coupling 15 is then removed and a wooden plug 23, having a lower tapered portion 24 corresponding to taper seat 22 in lower cementing head 21, placed therein, plug 17 replaced, and plug 23 pumped through tube 12. When plug 23 reaches taper seat 22 in the lower cementing head 21, as shown in Fig. 4, such a tight joint is formed that circulation is stopped, this being indicated by the laboring of the pump, which is then stopped by the operator, or the stopping of the pump itself. Casing 2 being filled with water and valve 8 closed while the cement is being pumped into place, the cement will not rise in the lower portion of casing 2 any higher than the level of the lower edge of cementing head 21, and thus will only find accommodation for itself by flowing under casing shoe 3 into annular space 4 into which space the cement will be forced to a height depending on the amount of water between the top of the cement and plug 23. The amount of this measured quantity of water, which can be estimated from the size of casing 2 and the distance between the lower edge of casing shoe 3 and the lower edge of the lower cementing head 21, may, of course, be varied at will, so that the cement can either be left partly within the casing or driven entirely out, as desired.

The well casing 2 can now be let down on the bottom of the well and tested for tightness. If no leak shows, the cementing tube may be removed.

It will be seen that a distinct advantage of the present method, and the apparatus used to carry it out, over other proposed methods is the economy effected in the amount of cement used; since, as the operator may cause the volume of cement to be driven to any definite position desired by varying the measured quantity of water above the cement, he is required to use only so much cement as is estimated will be necessary to cover the objectionable stratum.

What is claimed is:—

1. The method of cementing wells and the like, which comprises forming an annular space adjacent the walls of the well hole; forming an annular chamber within said annular space; introducing fluid into said chamber; closing the annular chamber from the atmosphere; pumping cement to the bottom of said chamber; pumping a measured quantity of fluid on top of the cement; placing a separating member on said measured quantity of water, means being located in the lower portion of said annular chamber for stopping said separating member; and pumping fluid into the annular chamber until the separating member reaches the stopping means.

2. The method of cementing wells and the like which comprises introducing fluid into the casing; introducing cement into the casing, said casing having definitely located arresting means therein; introducing a measured quantity of fluid into the casing above the cement; and again pumping fluid into said casing, said fluid being separated from the measured quantity of fluid by a suitable barrier, until said barrier is stopped by the arresting means.

3. The method of cementing wells or the like which comprises establishing a circulation of water down the casing and up the space outside thereof; introducing cement into the casing on top of the water; introducing a measured quantity of water into the casing on top of the cement; introducing water into the casing, separated from said measured quantity of water by a barrier; and pumping water into said casing until the downward movement of said barrier is arrested by definitely located means within the casing.

4. The method of cementing wells and the like which comprises definitely locating in the well casing a tube provided with arresting means; closing the upper end of the casing against the atmosphere; introducing water into the casing through said tube; introducing cement into the casing above the water; introducing a measured quantity of water into the tube above the cement; and pumping water into the tube, separated from said measured quantity of water by a suitable barrier, until said barrier is stopped by the arresting means.

5. In apparatus for cementing wells and the like, the combination with a well casing, of a cementing tube adjustably mounted within the casing; and having arresting means at its lower end; coupling means serving to support the tube within the casing and to close the upper end of the casing from the atmosphere; and a plug adapted to pass through the tube and cooperate with said arresting means to seal the lower end of the tube.

6. In apparatus for cementing wells and the like, the combination of, a cementing tube adapted to be located within a well casing; coupling means for supporting said tube in the casing, said coupling means also serving to close the upper end of the casing outside the tube; a cementing head located on the lower end of said tube and having a tapered passage therethrough; and a plug adapted to pass through the tube, said plug having a tapered end intended to cooperate with the tapered passage in the cementing head to seal the lower end of the tube.

7. In apparatus for cementing wells and the like, the combination of, a cementing tube having a constricted opening at its

lower end; means for supporting said tube in a well casing, said means further serving to close the upper end of the casing outside the tube; and a plug adapted to pass through said tube and form a seal at the lower end of the tube with said constricted opening.

8. In apparatus for cementing wells and the like, the combination of, a cementing tube having an outlet in the upper portion thereof; a valve for said outlet; a removable plug in the upper end of said tube; a cementing head on the lower end of said tube, said head having a tapered passage therethrough; means for supporting said tube in a well casing and to close the end of the casing outside said tube, said means having an outlet therein; a valve for said outlet; and a plug adapted to pass through the tube, said plug having a tapered portion intended to cooperate with the tapered passage in the cementing head to seal the lower end of the cementing tube.

In testimony whereof I have signed my name to this specification.

PHILO B. KINNIEAR.