Jan. 15, 1924.

1,480,674

S. E. DIESCHER

DRILLING WELLS

Filed March 7, 1921

2 Sheets-Sheet 1

FIG. 1.

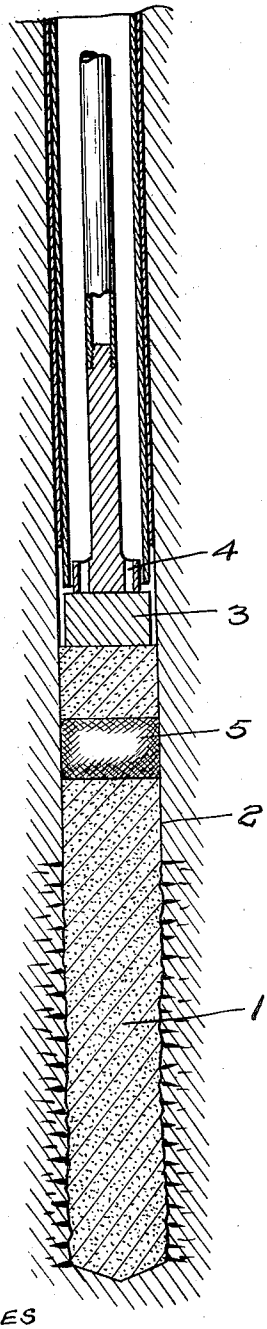
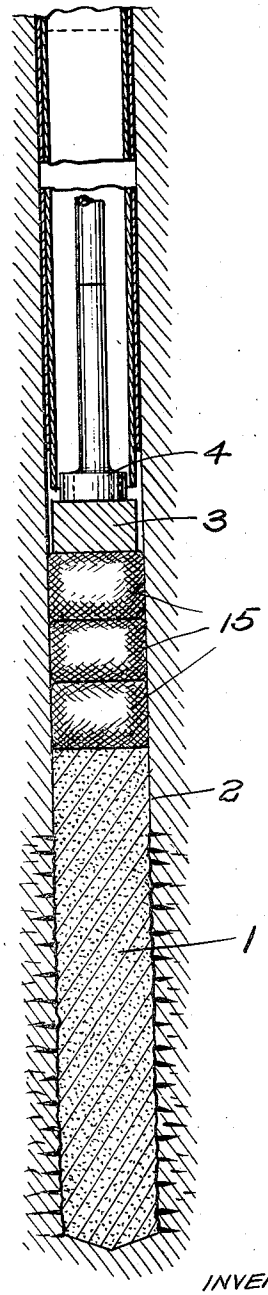


FIG. 2.



WITNESSES

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FIG.3.

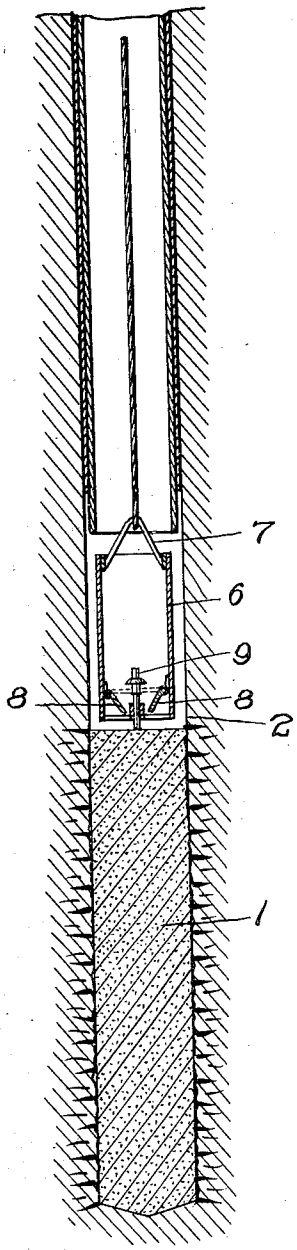


FIG.4.

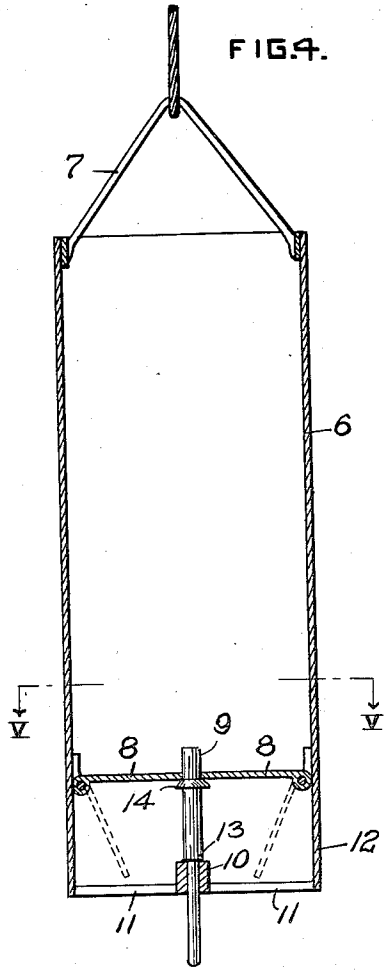
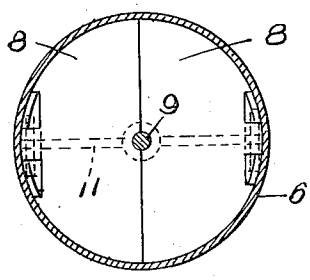


FIG.5.



WITNESSES

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UNITED STATES PATENT OFFICE.

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DRILLING WELLS.

Application filed March 7, 1921. Serial No. 450,170.

To all whom it may concern:

Be it known that I, SAMUEL E. DIESCHER, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Drilling Wells, of which improvements the following is a specification.

In the drilling of oil and gas wells, strata are frequently encountered of such a porous, open or friable character, that the walls of the well will cave in, and further such strata are sometimes reservoirs of water which will be discharged into the wells under more or less pressure. It is customary in such cases to extend the casing beyond such strata and if water flows from such strata to insert packing between the casing and the wall of the well at suitable points. If the caving in of the wall of the stratum is considerable and continuous, the insertion of the casing and packings is difficult and slow. And further, as the protective casing must be inserted through casing previously placed in position above the troublesome strata, a considerably smaller drill must be used in sinking the well below the protective section of casing. It sometimes happens in drilling wells that several such strata are encountered, especially if the well is to be sunk to a considerable depth, e. g., three or four thousand feet, and for each stratum a casing is inserted, thus necessitating the use of a smaller drill. Hence, in order that the well may be of sufficient size when the oil or gas stratum is reached, a very large drill must be used in drilling the upper portion of the well, thus adding to the cost of the well.

It has also been proposed to charge concrete into the bore of a well and after it has hardened to drill through the concrete crevice. This method is ineffective as the concrete would not penetrate the crevices and fissures of the stratum against the counter pressure of the water therein. It has also been proposed to pour concrete around a boring rod and subject it to pressure to force the concrete into the crevice or fissure, then force the surplus concrete from the bore. The boring rod is then withdrawn, but as the removal of the bore rod takes place while the concrete is plastic, it will operate as the piston of a pump and reduce the pressure in the portion of the bore of the well below the rod, thereby permitting the counterpressure of the water in the crevice or fissure to displace any concrete which may have penetrated the crevice under the previously applied pressure. In neither of the above methods would the concrete have entered the stratum sufficiently far to form part of the substance of the stratum.

It has also been proposed to close the crevices, etc., in the walls of a well by introducing concrete in a fluid condition into the well, through lines of pipe extending down from the top of the well and then providing a seal between this pipe and the wall of the well or casing, at a point above the body of concrete. This body of concrete is then subjected to fluid pressure by means of pumps at the top of the well with the object of forcing the concrete into the crevices. The line of pipe is made up of sections of about thirty feet in length, screwed together and when the stratum to be treated is from 1500 to 2000 or more feet from the surface the labor and time required together with that of placing the seals in position, is very considerable. After the pipe line has been inserted in the well and the seals placed in position, cement mixed with water or the body of gravel and sand and a stream of milk of concrete is then forced down through the pipe. In order that the column within the pipe may exert any pressure on the cement, it must be filled up to a considerable height, and also the cement must be forced up between the pipe and the wall of the well. As the concrete will harden quite rapidly, there will inevitably be a coating made on the interior of the pipe during the charging of the concrete, which coating would become very hard before the line of pipe could be removed, as is necessary to resume boring operations, and the pipe would have to be cleaned out before it could be used again.

The object of the invention described herein is to form a solid impervious retaining wall which will be vertically co-

extensive with the porous or friable stratum and will be formed in part by the material forming the stratum. The invention is hereinafter more fully described and claimed.

In the accompanying drawings forming a part of this specification, Fig. 1 is a section of a well drilled into a porous and friable or water carrying strata and illustrating the method of sealing and reinforcing the wall of the well; Fig. 2 is a similar view illustrating the preferred method when a water bearing stratum is encountered; Fig. 3 illustrates the manner of charging the concrete or cement when a water bearing stratum is encountered; Fig. 4 is a sectional elevation of a form of tremie employed for placing the concrete or cement in the well and Fig. 5 is a transverse section of the same, the plane of section being indicated by the line V—V, Fig. 4.

In the practice of the invention the well is drilled in the usual manner until the drill enters or passes through the porous friable stratum. As better results can be attained by treating the troublesome stratum in sections, the drill is withdrawn after it has penetrated such stratum for a distance of fifteen or twenty feet, more or less, dependent on the tendency of the material of the stratum to cave in.

Concrete consisting of sand and a suitable binder, preferably cement, and having such plasticity of fluidity that it can be forced into the pores or interstices in the stratum, is poured into the well until the column 1 of concrete will extend above the strata such a distance that the quantity in the portion above the level of the upper surface of the stratum 2 will equal and preferably exceed the amount it is desired to force into the strata adjacent to the bore of the well. After the concrete has been placed in the well, it should be subjected in such manner to sufficient pressure or force to cause the cement or concrete to penetrate the pores or interstices of the stratum. Pressure or force can be conveniently applied by placing a block 3 of wood or malleable metal such as lead on top of the column of concrete and then subjecting such block to blows of the drilling mechanism, a suitably shaped hammering head 4 being substituted for the drill. If a malleable block is employed, the blows on the block will cause it to expand and form a sufficiently tight joint with the wall of the well to prevent the escape of concrete above the block. But if a wooden block is employed, it is preferred to place a bag 5 filled with sand, concrete or other material adapted to cause the bag to spread when subjected to blows or pressure and bear against the side of the well. As the string of drilling tools usually weighs about three thousand pounds or more, and is dropped some three or four feet, more or less, the plastic cement being incompressible will be forced a substantial distance into the strata. The string of tools is then withdrawn and the concrete allowed to harden or the tools may remain in the well until the cement has hardened. After the concrete has hardened, drilling is resumed with a drill of the size previously used and all of the concrete in the bore of the well removed by drilling, leaving a solid impervious wall formed by the concrete and the material of the stratum.

If the strata is of considerable thickness, other sections are treated in the manner above described.

In case the stratum is charged with water or water flows through the stratum into the well, the concrete is placed in position by a tremie in a manner similar to that practiced in building concrete foundations in water. A suitable construction for the purpose is shown in Figs. 3, 4, and 5 and consists of a bucket 6 having a bail 7 and having its lower end closed by semicircular plates 8 hinged to the opposite sides of the bucket; these sections are held in closed position by a post 9 movably mounted in a sleeve 10 provided with radial arms 11 secured to lugs 12 projecting below the lower end of the bucket. The post which is made of such a length that when in normal position, i. e., with its shoulder 13 resting on the sleeve, the upper portion will extend above a line passing through the pivotal points of the semicircular sections 8 and its lower end will project below the sleeve. When in closed position the bottom sections will rest on shoulders 14 on the post. When the bucket is charged with concrete and is lowered into the well the lower end of the post will bear first on the bottom of the well and as the bucket continues to move down the sections will be forced up, their adjacent edges moving apart until the shoulders 14 will pass above the sections. The bucket is then drawn up from leaving its charge in the well. Repeated charges are thus placed in the well until the column of concrete extends above the upper surface of the strata, whereupon pressure or force is applied to the column of concrete in the manner above described. As the anvil block may not form a sufficiently tight joint, additional packing may be employed as for example, two, three or more bags 15 of canvas or gunny cloth are filled with concrete or other suitable material and lowered down onto the concrete as shown in Fig. 2 and the anvil block placed on these bags.

As the water may extend up above where the stratum is to be treated holes *a* should be formed through the hammer head, to prevent its movement being retarded by the water.

In case the column of concrete should ex-

tend up into the casing, which is not sufficiently strong to resist the lateral thrust when the concrete is subjected to impact, heavier tubing 14 may be lowered into the well and retained in position during the application of pressure to the concrete, and is then withdrawn so that drills of the size previously employed may be used in extending the well.

It will be understood by those familiar with the art, that by proceeding in this manner, it will not be necessary to constantly diminish the size of casing as the well becomes deeper, and it will not be necessary to put in the numerous strings of casing necessary where such stratification as described, are encountered. It may be that where the nature of a stratification shows that there may be a water bearing crack or fissure not materially otherwise suitable for quick drilling, then in this event the treatment is the same as where the entire strata is friable or water bearing.

It is characteristic of methods disclosed in the prior art that it has been attempted to cause the cement or other material to penetrate crevices in the walls of a well by liquid pressure which was gradually built up by the operation of a pump, and such pressure being transmitted through a body of liquid to the cement. In the method herein described the pressure or force is applied locally and directly to the cement, and the pressure acts first on the cement and is then transmitted to the superincumbent liquid which acts as a tamping material confining the explosive force of the blow mainly to the body of cement.

I claim herein as my invention:

1. The method herein described of rendering the wall of a well permanent and impervious to water which consists in filling the bore of the well with concrete in a fluid state to a suitable distance above the porous or friable portion, arranging an expansible packing in the bore above the concrete, applying force directly to the packing to cause an expansion of the packing to prevent the upward flow of a material portion of the concrete, and cause the lateral flow of the concrete into the crevices or openings in the wall of the well and forming a bore through the hardened body of concrete in the previously formed bore.

2. The method herein described of rendering the wall of a well permanent and impervious to moisture which consists in filling the bore of the well to a suitable distance above the friable or porous portions of the wall with concrete in a fluid condition, arranging an expansible packing above the body of concrete, subjecting the packing and the column of concrete to blows or impacts of the string of tools employed in boring the well, thereby causing such an expansion of the packing as will prevent the upward escape of a material quantity of the concrete and causing the lateral flow of the concrete into the crevices or openings in the wall of the well and forming a bore through the hardened body of concrete in the previously formed bore.

3. The method herein described for rendering the wall of a well impervious to water and permanent, which consists in filling the bore of the well with concrete in a fluid state to a suitable distance above the porous or frangible portion thereof and causing the concrete to penetrate the crevices or openings in the bore of the well by blows or impacts of a string of tools employed in boring the well and forming a bore through the concrete in the previously formed bore.

In testimony whereof, I have hereunto set my hand.

SAMUEL E. DIESCHER.