

W. W. PEDDER.
 PROCESS FOR DRILLING AND CEMENTING WELLS.
 APPLICATION FILED DEC. 6, 1909.

975,065.

Patented Nov. 8, 1910.

Fig. 1.

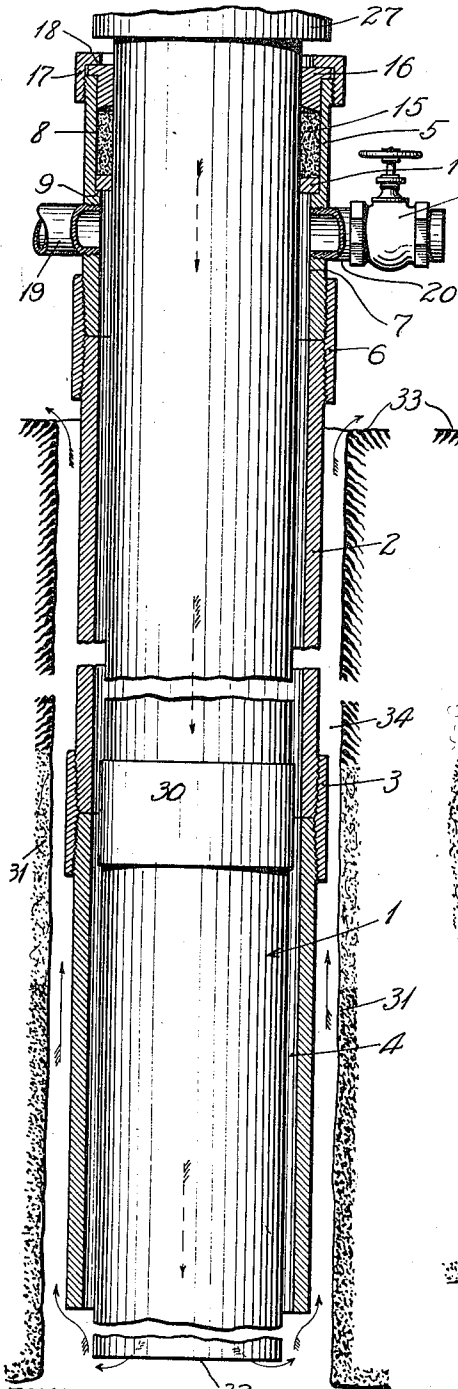


Fig. 2.

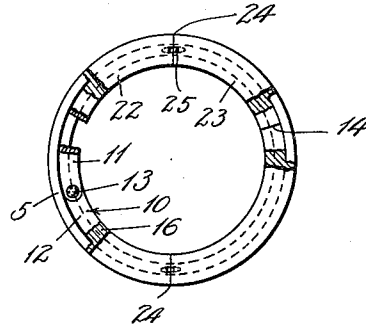


Fig. 3.

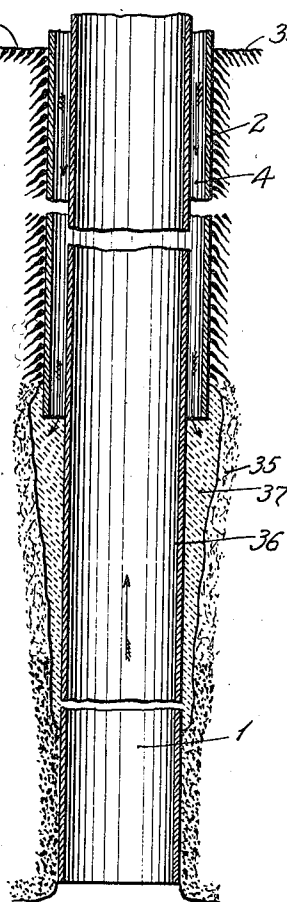
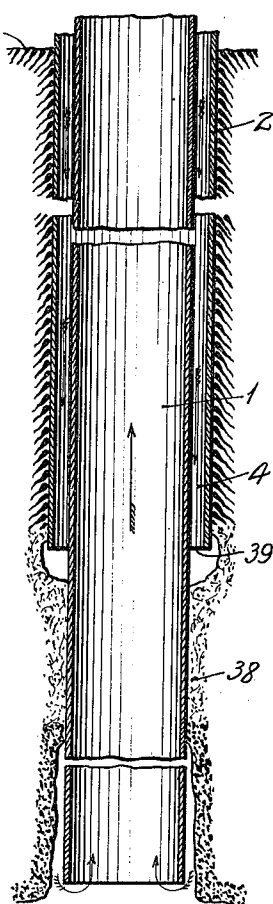


Fig. 4.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILMER W. PEDDER, OF LOS ANGELES, CALIFORNIA.

PROCESS FOR DRILLING AND CEMENTING WELLS.

975,065.

Specification of Letters Patent.

Patented Nov. 8, 1910.

Application filed December 6, 1909. Serial No. 531,508.

To all whom it may concern:

Be it known that I, WILMER W. PEDDER, 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 Processes for Drilling and Cementing Wells.

This invention relates to the drilling of wells and is particularly applicable in the drilling of deep wells such as oil wells or gas wells. In drilling wells of this kind it is customary to sink an outer casing to as great a depth as possible and then to sink successive inner casings which are concentric with the outer casing and enveloped thereby. These inner casings extend successively to greater depths, that is, the innermost casing will extend to the greatest depth, and intermediate casings to intermediate depths. In sinking the casings it frequently happens that the earth on the outer sides of the casings will adhere or "freeze" at certain points and this exerts a great resistance to the lowering or removal of the casings.

In accordance with the present invention, I transform the outer casing into a jacket as soon as it is in place upon the introduction of the first inner casing, and seal the upper end of the annular space between this outer casing and the inner casing which is being sunk. Water is then circulated down the inner casing and up the outer side of the inner casing. When this water arrives at the lower end of the outer casing, on account of the fact that the annular space is sealed above, it must pass up the outer side of the outer casing. In this way I maintain the entire length of the inner and outer casings free from earth adhesions on their outer side, and I proceed in the same manner to seal the inner cases or strings successively so that where a number of casings are employed all the annular spaces will be sealed above and the water must pass up the outer sides of the casings. Afterward I employ this annular space to conduct cement downwardly from above to any intermediate level to seal or cut off water strata from the orifice of the inner casing.

The invention consists in the process to be described more fully hereinafter and particularly set forth in the claims.

In the annexed drawing which fully illustrates my invention, Figure 1 is a vertical section showing the manner in which the apparatus is employed to keep the outer wall

of the strings of pipe clear to prevent its becoming "frozen" as the well is drilled. Fig. 2 is a plan and partial section showing the details of the stuffing box which constitutes a feature of the apparatus. Fig. 3 is a diagrammatic view illustrating the manner in which the apparatus is employed to cement around the pipe so as to seal or cut off a water stratum. Fig. 4 is a view similar to Fig. 3 and showing the manner in which the apparatus is employed to clear or scour a "frozen" part at an intermediate point or level of the string of pipe.

Referring more particularly to the parts and particularly to Fig. 1, 1 represents a string of pipe which is being sunk in forming a well. My apparatus comprises a string or shell 2 of pipe formed in sections connected by screw couplings 3 and forming a jacket around the inner string 1. This jacket is of sufficiently large diameter to form an annular jacket space 4 as indicated, surrounding the casing 1. At the upper end of the jacket 2 a stuffing box 5 is attached by means of a suitable coupling 6. The bore 7 at the lower portion of this stuffing box is of the same diameter as the bore of the jacket 2, but the upper portion of the stuffing box is provided with a counter bore 8 of larger diameter, so that an annular shoulder 9 is formed on the inner side of the stuffing box. On this shoulder 9 rests a packing ring 10 which ring is formed in two sections 11 and 12 connected by a pivot pin 13. Diametrically opposite to the pivot pin these sections 11 and 12 present abutting faces 14 as shown in Fig. 2. Above the packing ring 10 a space is formed in which I place a soft vegetable packing 15 and this packing is held in place by a gland 16 in the form of a bushing which is received in the mouth of the stuffing box as indicated. This gland is held in place by a nut ring 17 which is screwed on to the upper end of the stuffing box, and this nut ring presents an inwardly projecting flange 18 which extends over the upper face of the gland and retains the same, as will be readily understood. In order to enable cement or water to be introduced into the space 4 between the jacket and the pipe string 1, I provide pipe connections 19 and 20 at each side of the stuffing box and either or both of these connections may be provided with valves such as the valve 21. The jacket 2 is formed like an ordinary casing, that is, the sections are

added one by one as the well is sunk. Referring again to the stuffing box gland 16, this gland is split, that is, it is formed in two sections 22 and 23, the ends of which abut against each other at diametrically opposite points as at 24. At these points openings 25 are provided for lifting the gland out of the stuffing box by means of hooks. To the upper end of the pipe string 1 a circulating head 27 of any suitable construction is attached.

I shall now describe how to maintain the strings of pipe free from earth adhesion on the outer side in sinking a well in accordance with my process.

In forming a well an outer casing is sunk to a suitable depth by employing a circulating head in the usual manner. This outer casing forms the jacket 2 of my apparatus. After this outer casing is sunk by means of a circulating head in the usual manner the inner casing 1 is sunk to a desired depth so that its lower end extends to any depth below the lower end of the outer casing. In practice it is customary to add sections to the outer casing until the limit of tensile strength of the casing is reached, then the inner casing is sunk and sections are added in a similar manner to the limit of the tensile strength of the inner casing, in this way the inner casing may extend several thousand feet below the outer casing. After the outer casing has been sunk as far as possible and securely suspended, the stuffing box 5 is attached to its upper end as indicated in Fig. 1, and the inner casing or string 1 of the pipe is sealed at the mouth of the outer casing by means of the stuffing box as shown in Fig. 1. When a new section of the pipe string 1 is to be added, circulating head 27 is removed and, by means of a coupling similar to the coupling 30, another pipe section is added. The pipe is then sunk farther into the well and in order to enable the coupling (which is similar to the coupling 30) to pass the stuffing box, I remove the ring nut 17, the gland 16 and the packing 15 together with the packing ring 10. The shoulder 9 will of course permit the coupling to pass so that with these parts removed there is no obstruction which would tend to prevent the passing of the coupling into the interior of the jacket at the stuffing box. As soon as the coupling passes the shoulder 9 the parts of the stuffing box can be replaced so as to permit the drilling process to continue. In order to keep the pipe string clear from the earth 31 at each side, water is circulated down from the circulating head through the pipe string 1, and issues, as indicated by the arrows, from the mouth 32 at the lower end of the string. During this operation no water or any other substance is circulated in the jacket space 4, the valve 21 and other valves if necessary,

being closed to render this space inert. The water which issues from the mouth 32, therefore, cannot pass up in this space 4 but passes up to the ground level 33 at the outer side of the jacket. This upward circulation of the water at the side of the jacket is indicated by the arrows. In this way an enlarged chamber or clearance 34 is formed around the jacket. If this space is kept open the jacket can be removed at any time. After the well has been sunk to the desired depth, my apparatus may be utilized to cut off a water stratum by means of cement. In Fig. 3 I have illustrated the manner in which the apparatus accomplishes this purpose. Referring to this view, 35 represents a water stratum. In order to seal this stratum at the well 36, the jacket 2 is raised so that its lower end or mouth is disposed near the upper level of the stratum and I then introduce the cement into the space 4 through the pipe connections 19 and 20 in the stuffing box. This cement will gravitate down at the sides of the well and form an annular wall 37 surrounding the inner casing or string 1. In order to assist this movement of the cement, the water within the casing or string 1 is withdrawn by baling devices or by connecting the same with the suction side of the pump. This will have the effect, not only of drawing the cement down at the outer side of the inner casing below the mouth of the outer casing, but will draw the cement in so as to form an effectual seal cutting off the water from entering the lower orifice of the pipe or from the oil sands below the point of cementing. Before the cement sets the jacket is drawn up and kept free by water circulation or rotation, as before.

According to some methods for sinking wells of this class an outer casing is sunk without resorting to a water circulation on the outer side, and when this water circulation is omitted, this outer casing will fit tightly in the earth bore, that is, it will be "frozen" on its outer side in the earth. In the operation of sinking an inner casing within such an outer "frozen" casing my invention is applicable in order to free the inner casing, if earth adhesion or "frozen" points should occur in the inner casing below the lower orifice of the outer casing. I have illustrated the manner in which the apparatus is used for this purpose in Fig. 4. Referring to this view, 38 indicates the "frozen" earth which is supposed to be at an intermediate point on the outer side of the inner casing and of course below the lower orifice 39 of the outer casing. I introduce from above in the annular space 4, water under high pressure and this water exerts a downward pressure on the "frozen" point or earth adhesion so as to carry this earth downwardly to the lower orifice of the inner casing. This

water will force the earth downwardly in this way and if it should exert a tendency to rise around the outer side of the outer casing it will encounter a great resistance. The
5 earth and water should pass downwardly to the lower orifice of the inner casing, then passes into the interior of the inner casing and is raised in any suitable manner in the interior of the inner casing.

10 Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The process of drilling wells, which consists in sinking an outer casing into the
15 earth to a suitable depth, then sinking an inner casing within said outer casing to a greater depth whereby an annular space is formed between said inner casing and said
20 outer casing, circulating a fluid down said inner casing up the outer side thereof and up the outer side of said outer casing to keep the sides of said casings free from earth adhesions thus permitting the withdrawal of
25 the outer casing, flowing cement down said annular space from above to seal off a water stratum at any point between the ground

level and the lower orifice of said inner casing and withdrawing said outer casing before the cement sets.

2. The process of drilling wells which
30 consists in sinking an outer casing into the earth to a suitable depth, then sinking an inner casing within said outer casing to a greater depth whereby an annular space is
35 formed between said inner casing and said outer casing, circulating a fluid downwardly on the interior, and up the outer side of said outer casing to keep the side of said outer casing free from earth adhesions, flowing
40 cement down said annular space from above to shut off a water stratum at any point between the ground level and the lower orifice of said inner casing, and withdrawing said
outer casing before the cement sets.

In witness that I claim the foregoing I
45 have hereunto subscribed my name this 24th day of November, 1909.

WILMER W. PEDDER.

Witnesses:

F. D. AMMEN,
EDMUND A. STRAUSE.