

May 25, 1926.

M. J. TRUMBLE

1,585,801

METHOD OF AND EQUIPMENT FOR PLACING CONCRETE CASINGS IN WELLS

Filed Oct. 1, 1923

2 Sheets-Sheet 1

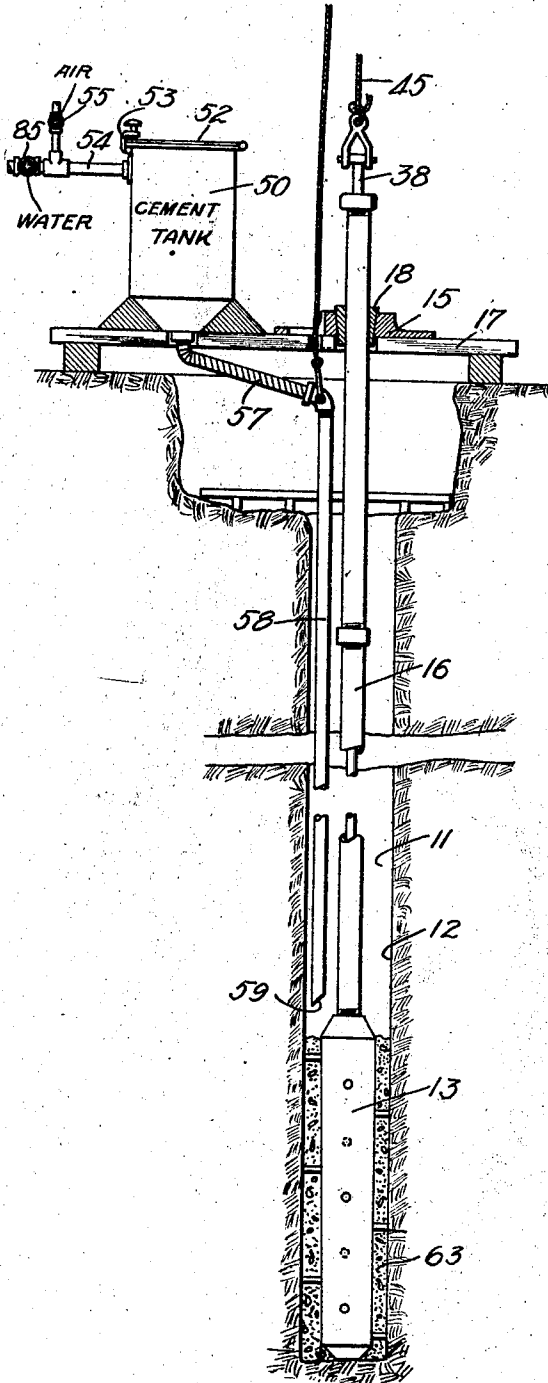


Fig. 1.

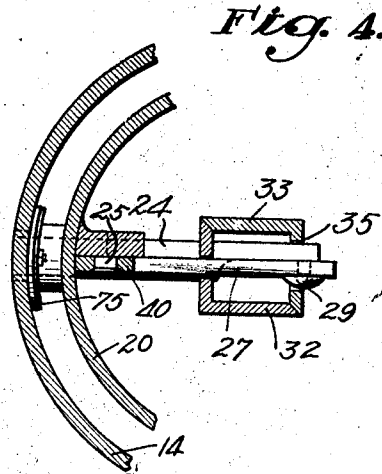


Fig. 4.

INVENTOR:
MILON J. TRUMBLE,
By *Graham & Lewis*
ATTORNEYS.

May 25, 1926.

M. J. TRUMBLE

1,585,801

METHOD OF AND EQUIPMENT FOR PLACING CONCRETE CASINGS IN WELLS

Filed Oct. 1, 1923

2 Sheets-Sheet 2

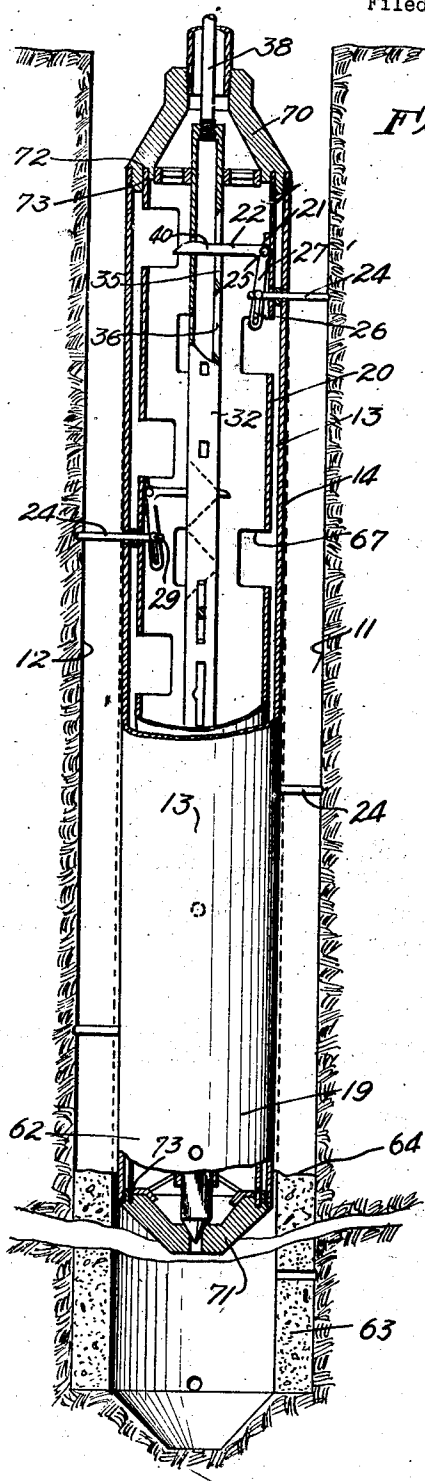


Fig. 2.

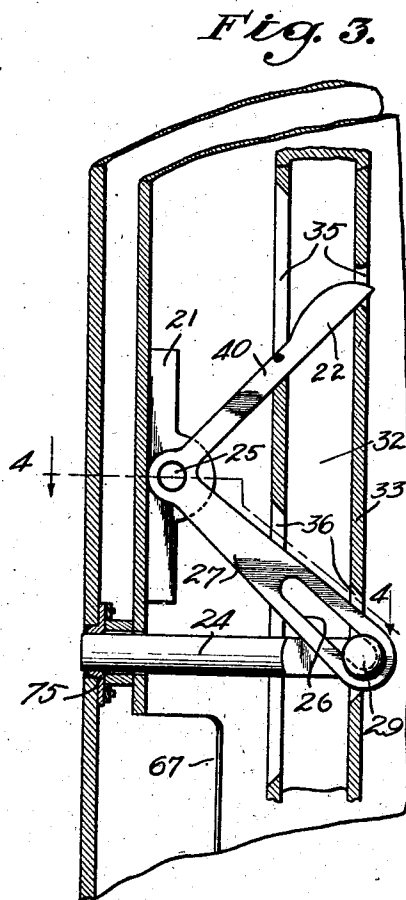


Fig. 3.

INVENTOR:
MILON J. TRUMBLE,
By *Graham & Lewis*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

MILON J. TRUMBLE, OF LOS ANGELES, CALIFORNIA.

METHOD OF AND EQUIPMENT FOR PLACING CONCRETE CASINGS IN WELLS.

Application filed October 1, 1923. Serial No. 665,887.

This invention relates to a method and apparatus for lining wells and earth bores with a wall for supporting the subterranean structure.

Such walls are commonly termed casings and it is wide practice to employ a large diameter pipe which is screwed together in the form of a continuous tubular member. In California, where rotary drilling is extensively practised, the hole is generally of large diameter, it being customary to use sixteen to twenty inch bits in starting the hole and reducing the diameter as conditions may require. The installation of such casings is quite expensive and adds considerably to the expense of drilling a well. Where steel casing is used, the cost ranges from eight and fifteen dollars per linear foot.

It is an object of the invention to provide means whereby a well may be lined with a concrete wall of three or four inch thickness which is sufficient to sustain the stresses encountered. The cost of lining a well in this manner is very economical as compared to the use of steel casings. A distinct advantage in the use of concrete as a casing for a well is that the concrete is a non-corrosive material and will not rust with use in the manner common to steel casing. It will be readily recognized, therefore, that for permanence, the use of concrete is highly desirable.

It is a further object of the invention to provide a core member which may be placed in a well and moved through consecutive over-lapping positions while the concrete or other cementitious material is poured therearound, thus forming a continuous annular wall within the well. Means are provided for centralizing the core within the well, such means being adapted to form perforations in the concrete wall if desired.

It is a further object of the invention to apply the concrete in separate batches which are forced down to their point of application by compressed air.

The especial advantages of the invention and further objects thereof will be made evident hereinafter.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is an elevational view illustrating the employment of my invention.

Fig. 2 is an enlarged partially sectioned

view showing the manner in which the core is employed within the well.

Fig. 3 is an enlarged fragmentary section showing in detail the construction of the projectile mechanism.

Fig. 4 is a section taken on a plane represented by the line 4—4 of Fig. 3.

In Fig. 1 of the drawing, a previously drilled hole 11 is shown. This hole has fairly regular surfaces 12 as a result of the mud-drilling practice now employed in rotary drilling. In the hole, is shown a cylindrical core 13 of a diameter somewhat smaller than the hole 11. This core 13 is supported from a spider 15 resting on the floor 17 by a pipe 16, clamps 18 being employed for gripping the pipe in designated positions.

As shown in Fig. 2, the core 13 is formed from an outer shell 14 which is slightly tapered towards its lower end 19 to facilitate removal from the wall of concrete which has just been cast therearound. An inner shell 20 is supported within the outer shell 14, this inner shell serving to support by means of brackets 21 the levers 22, which serve as means for moving projectile members in the form of pins 24 between extended and retracted positions. The levers are in the form of bell cranks and are pivoted at 25 to the brackets, slots 26 being formed in the arms 27 thereof by which engagement is made with pins 29 mounted upon the inner ends of the members 24. The pins 24 are arranged to extend radially from the core 13, as shown in Fig. 2, so as to serve as means for centralizing the core within the hole 11. Within the core there is placed an operating bar 32 formed preferably of a square tubular section 33, having openings 35 and 36 therein for receiving the arms of the operating levers 22. The member 32 is raised and lowered independently within the core by means of a vertical shaft 38, which may be pipe or rods joined together. When the member 32 is raised within the core, the member 22 will have the arm 40 thereof swung upwardly due to the upward travel of the opening 35 and the arm 27 will be swung inwardly so that the pin 24 will be held in retracted position. The core is lowered into the well with the pins in retracted position until the bottom thereof, or the point at which the casing is intended to start, is reached. The operating member 32 is then lowered by lowering the shaft 38, which may

be preferably swung from a cable 45, Fig. 1, thus causing the pins 24 to be extended outwardly into engagement with the wall 12 of the hole 11 and center the core therein.

5 With the core in place at the bottom of the hole, a concrete mixture, sufficient in quantity to form one section of the concrete casing, is placed in a cement tank 50, Fig. 1, having a cover 52 which may be closed in
10 tight relationship and clamped by means such as indicated at 53. The cover 52 is closed after the placing of the cement charge therein, and air under compression is introduced into the upper part of the tank
15 through piping 54 from an air valve 55. The pressure of the air forces the concrete down through a flexible hose 57 and a vertical concrete delivery pipe 58, whereupon it is delivered from the mouth 59 of the pipe
20 58 into the space between the core 13 and the wall 12. The concrete may then be allowed to set, thus to form a perforated casing section, whereupon the pins 24 are retracted by raising the member 32. Or, if desired, the
25 pins may be retracted as soon as the concrete has been poured into the space existing around the core 13, thus allowing the concrete to flow into the spaces occupied by the extended pins and to thus form a continuous structure. The core 13, after the concrete has set sufficiently to be self-supporting, is raised upwardly through a distance
30 nearly equal to the length thereof, so that the lower end 62 thereof will extend slightly below the upper end of the concrete wall section 63 just poured, as indicated at 64 in Fig. 2. The pins 24 may then be extended and another charge of concrete poured in the manner previously described, whereupon the
40 core, after retracting the pins, may be raised to the next consecutive position, continuing this sequence until the hole is lined throughout its entire depth. The inner shell 20 is preferably perforated, as indicated at 67, so as to provide hand holes through which the lever members may be installed or adjustments made. Both shell members 14 and 20 are preferably supported between an upper
50 head 70 and a lower head 71, a suitable channel formation as indicated at 72 being provided to receive the ends 73 of the inner shell member 20 for the purpose of holding it centralized within the outer shell. Suitable packing means, such as the cup washer 75 indicated in Fig. 3, may be employed to prevent the entrance of concrete into the shell 14 around the pins 24. As before mentioned herein, the concrete casing may be perforate or imperforate in structure, it often being necessary to employ perforated casing so that the liquid, for the reclamation of which the well has been drilled, may enter thereinto. In the casting
60 of such perforated portion of the casing, the pins are left extended until the con-

crete has set to a self-supporting condition, whereupon the pins are retracted and the core raised as previously explained. The concrete wall having holes thus formed serves in the capacity of a well strainer inasmuch as it supports the walls of the hole and has openings therein for the entrance of liquids. In some instances it will be desirable to form a casing portion having other perforations in addition to those
75 formed during the casting of the casing, that is, to produce a casing portion in which there are a greater number of perforations per lineal foot, to form a screen having a greater intake capacity. Such a screen portion is cast by utilizing the pins as above set forth, such pins being then retracted
80 into the core as soon as the concrete has set to a self-sustaining degree. The core is then raised a distance less than the vertical spacing of the pins and the pins are subsequently extended and forced through the partly hardened concrete wall, this sequence being repeated as is necessary to produce a screen section of the desired intake capacity. Of course, it will be understood that in any event the screen portions will preferably be formed only in the liquid bearing strata, other portions of the casing being devoid of perforations. The concrete delivery pipe 58
95 may be frequently cleaned by flowing water from the valve 85 into the cement tank 50 and forcing this water under high air pressure through the pipe 58. This eliminates all complications which might arise from the clogging up of the concrete delivery pipe. Although this concrete casing may be employed at the bottom of a well and may be perforated in the manner hereinbefore described, it will be readily recognized that its use for walling off the upper portion of a rotary hole is of extreme value inasmuch as it forms a permanent casing and may be installed with comparatively very great economy compared with the cost of steel casing installations for this purpose.
100

I claim as my invention:

1. In equipment for lining wells with a cementitious casing, the combination of: a non-expansile core; projectile members carried by said core; and means for retracting said projectile members.
115

2. In equipment for lining wells with a cementitious casing, the combination of: a non-expansile core; projectile members carried by said core; and means for extending said projectile members.
120

3. In equipment for lining wells with a cementitious casing, the combination of: a non-expansile core; projectile members carried by said core; and means for extending and retracting said projectile members.
125

4. The method of forming a concrete casing in a well, comprising: placing a core in the bore; extending projectile members out-
130

wardly from said core into contact with the wall of said bore; pouring a cementitious mixture in the space between said core and said bore; retracting said projectile members; and moving said core upwardly to a consecutive position.

5. The method of forming a concrete casing in a well, comprising: placing a core in the bore; extending projectile members outwardly from said core into contact with the wall of said bore; pouring a cementitious mixture in the space between said core and said bore; retracting said projectile members; and moving said core upwardly to a consecutive position in which the end of the space then existent between said core and said bore is substantially closed by the end of previously cast casing section.

6. The method of forming a concrete perforated casing in a well, comprising: placing a core in the bore; extending perforation core members outwardly from said core into contact with the wall of said bore; pouring a cementitious mixture into the space between said core and said wall and around the perforation core members; retracting said perforation core members after the mixture has become self-sustaining; elevating the core a relatively short distance; and again extending the perforation core members to punch additional perforations through the cement casing wall previously cast.

7. In equipment for lining wells with concrete casing, the combination of: a core; means for suspending said core in the well; projectile members carried by said core, for centralizing said core in said well; means for projecting and retracting said projectile member; and means for delivering a cementitious mixture to the space between said core and the wall of said well, said projectile members being relatively spaced to permit passage of said mixture therebetween.

8. In equipment for lining wells with concrete casing, the combination of: a core; means for suspending said core in the well; projectile members carried by said core, for

centralizing said core in said well; means for projecting and retracting said projectile members; means for delivering a cementitious mixture to the space between said core and the wall of said well; and means for applying air under pressure to said delivery means for forcing said cementitious mixture to its point of application, said projectile members being relatively spaced to permit passage of said mixture therebetween.

9. In equipment for lining wells, the combination of: a shell of decreased cross section relative to the diameter of the well; means for suspending said shell; projectile members arranged for radial extension outwardly through said shell; means within said shell for radially moving said projectile members between extended and retracted positions; and means whereby said means for moving said projectile members may be operated from the ground surface.

10. In equipment for lining wells, the combination of: a shell of decreased cross section relative to the diameter of the well; a tubular member for suspending said shell; projectile members arranged for radial extension outwardly through said shell; means within said shell for radially moving said projectile members between extended and retracted positions; and means extending within said tubular member whereby said means for moving said projectile members may be operated from the ground surface.

11. In equipment for lining wells with concrete casing, the combination of: a core shell; relatively spaced projectile members arranged for radial extension outwardly through the side wall of said shell, means within the shell for moving each projectile member to and from extended position; means for suspending said core shell within the well bore; and means by which the first named means may be operated from the ground surface.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 22d day of September, 1923.

MILON J. TRUMBLE.