Nov. 5, 1929. H. M. GREENE 1,734,670

MEANS FOR CEMENTING OIL, GAS, AND WATER WELLS

Filed Sept. 5, 1923

Fig. 1

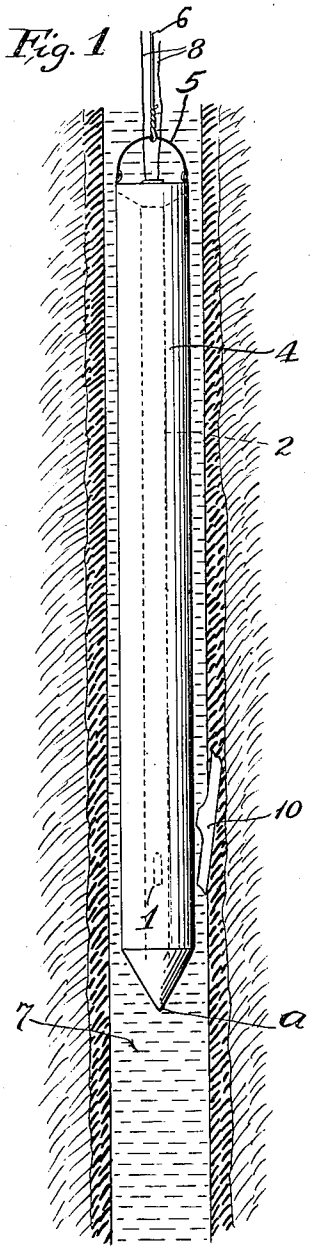


Fig. 2

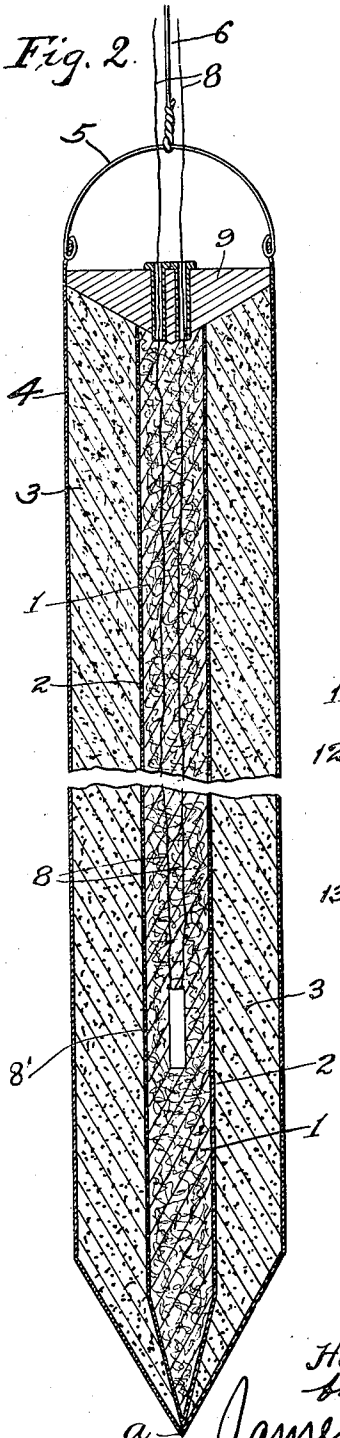
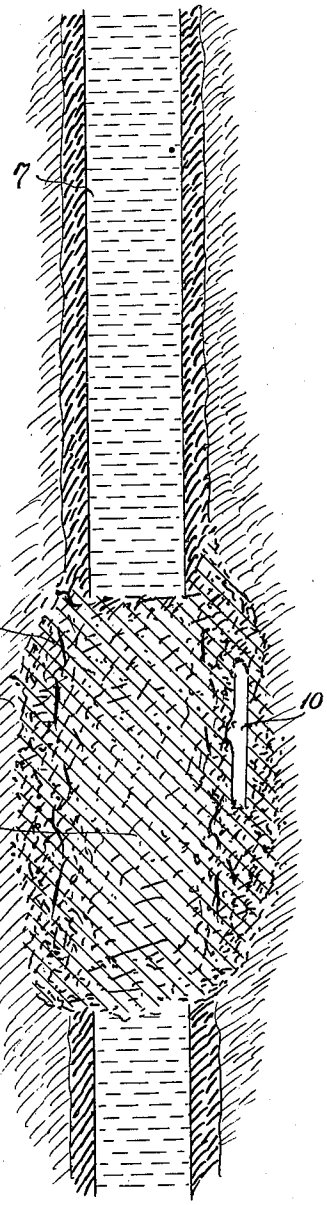


Fig. 3



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UNITED STATES PATENT OFFICE

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MEANS FOR CEMENTING OIL, GAS, AND WATER WELLS

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In the operation of drilling wells, it frequently becomes necessary to cement the walls of the hole for the purpose of shutting off water strata or other openings in the formation, and also for the purpose of holding in place at the side of the hole obstructions such as drill bits or other tools, or portions of casing which have been lost in the well and not recovered, but which have been crowded aside, and are likely to fall back from the walls into which they have been crowded.

To accomplish the purposes of this invention by methods and means heretofore used, has been a tedious and more or less ineffective and unsatisfactory operation and has involved much delay and expense, and failures to accomplish the purposes have been likely to result, and often has resulted in the loss of the hole.

An object of this discovery and invention is to avoid such difficulties and failures and to minimize the expense of cementing wells.

In carrying out this invention I lower into the well an appropriate closed sheet metal case containing a central cartridge of explosive having near its lower end a detonator and surrounded by an appropriate charge of cementitious material extending a considerable distance above the level of the detonator, and placing such cartridge in the well with the detonator approximately at the level where the wall of the well is to be plastered and then igniting the detonator and thereby exploding the cartridge, so that the cementitious material directly around the detonator will be driven out with great force to disrupt the sheet metal case and plaster the wall immediately surrounding the cartridge at that level, with the cementitious material and the disrupted portions of the container, while the force of the explosion in the upper part of the case will not compact the cementitious material at the upper end of the case, but will rupture the case so that the cementitious material will descend by gravity to plug the hole and support the plaster on the wall with a filling that may be conveniently drilled out; and to allow this to be effective, I close the top of the sheet metal case with a downwardly reduced plug, held in place by gravity so that the force of the explosion at the upper part of the case will be less effective to compact the cement than at the locus of the detonator.

An object of this invention is to accomplish the purposes easily, quickly and certainly and to insure the proper closing of lateral openings in the wall, and the perfect retention in the wall of the obstruction which it was necessary to get rid of.

An object is to enable the operator to cement in place any obstruction that has been crowded into the side of the wall, and to cement the wall with great ease and expedition.

The torpedo is preferably of a greatly elongated form, say for instance about thirty feet, more or less, long for a six or eight inch hole and when the explosion has occurred, the perimeter of the applied cement will be compacted into the wall together with portions of the disrupted sheet metal case and the core of the cement body will be formed of cement that has settled into place by the force of gravity and by return of the liquid forced up by the explosion; and such core is comparatively soft and easily bored through while the compacted shell is firmer and is held in place by the core that has settled into place. I thus avoid much of the labor and time of boring through the cement in continuing the operation of drilling the well after the cementing has been effected.

An advantage is that by the employment of my new method, the cement shell is compacted more closely than has heretofore been possible, and it is practicable to bore through the core sooner after the cement has set than is practicable by the former methods.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detail description and the appended claims.

I will now describe my newly discovered and invented method of and means for cementing wells as illustrated by the accompanying drawing, in which

Figure 1 is a sectional view of a well with a torpedo in place ready for exploding.

Fig. 2 is an enlarged axial section of the torpedo shown in Fig. 1.

Fig. 3 is an illustrative view of the cemented well after the cement has set and before it has been bored.

The torpedo comprises a charge 1 of explosive in an elongated container 2, embedded in a charge 3 of cementitious substance completely surrounding the explosive container 2 and contained in a sheet metal case 4 provided with a bail 5 to which a line 6 is attached for lowering the torpedo 1, 2, 3, 4 into the hole 7. 8 indicates the electrical conductors for exploding the explosive charge. The exploding medium being preferably a detonator 8'. The lower end of the case 4 is preferably pointed as at *a* to facilitate lowering the torpedo into the well. 9 is a flat top downwardly conical stopper for gravitationally closing the open top of the case 4, to protect the contents of the case as it is lowered, and adapted to be displaced upwardly by a comparatively moderate force from below. The detonator 8' is located at the lower end of the charges 1 and 3 so that the immediately initial force of the explosion will be directly applied outwardly at the lower end of the cement charge to compact it and drive it with fragments of the case to the wall of the hole near the bottom of the case, while the force of the explosion above the detonator is allowed to disrupt the container and to measurably dissipate upwardly so that the cementitious material above the level of the detonator is allowed to descend by gravity and to lodge within the compacted zone of cement and casing fragments and to form a plug of comparatively soft cementitious material that can be easily drilled.

In practical operation, if there is an obstruction as a fish-tail bit 10 in the well, the workmen will crowd the same to one side in the usual way, with tools lowered into the well for that purpose, and the tools, not shown, being then removed from the hole, the torpedo will be lowered into the hole to the level of the place at which the cement is to be applied.

The length of the cartridge will be determined by the length of the place in the walls of the hole at which the cement is to be applied. The hole may be filled to a greater or less extent with water or other liquid at the time the torpedo is lowered and when the torpedo has been brought to the appropriate place, it may be submerged in such liquid; and the explosion is effected by current turned on through the electric circuit in the usual way to explode the detonator, the explosion takes place and the cementitious substance is driven by the force of said explosion into the adjacent walls and will be in the form of a compacted shell 11 against the walls of the cavity 12, which will be of greater or less diameter according to the conditions of the work. The core 13 will be formed by the subsidence of the less compacted material and will be easy to bore through.

The cementitious substance may be of any practical character and I have successfully used a portion of cement sufficiently fluid to pack tightly by gravity in the case 4 and of such consistency and character that when the explosion occurs the adjacent walls of the hole will be forcibly plastered with the cement, thus providing at the place to be cemented a shell in a cavity of greater or less diameter depending upon the amount of the explosive charge and the density and irregularity of the walls of the hole.

The container 2 and case 4 are preferably made of sheet metal such as light galvanized sheet iron, the purposes being to make the container and case sufficiently strong to hold the explosive and cement charges in place until the explosion occurs and then to be readily ruptured at the level of the detonator and driven into the walls of the hole together with the cementitious substance.

By surrounding the cementitious material with an impermeable sheet metal casing, the material is confined sufficiently so that the explosion required to disrupt the case will cause the material to be driven in a compacted mass within the ruptured portion of the case and the case is spread apart by the force of the explosion to assist in forming a support resting on the walls of the hole to prevent loss of cementitious material; and the pointed lower end of the sheet metal case not only serves to center the case in its descent, but also to assist in closing the hole against the descent of cementitious material so that such material will make the comparatively soft core.

The cement may be ordinarily hydraulic cement, with or without chemical additions to cause it to set quickly. I have used in combination with the cement, a composition purchased in the open market, the object being to cause the cement to quickly harden, and in practical use with such material, I have been able to cement a hole and have it ready for further operations within two hours after the explosion.

I claim.

1. The well cementing cartridge set forth, comprising a sheet metal casing, an explosive charge in said casing; a detonator located at a lower portion of said explosive charge, and a charge of cementitious material surrounding the explosive charge at the level of the detonator and extending a considerable distance above the detonator so that when the detonator charge is ignited the force of the explosion at the lower end of the cementitious charge will operate to compact a lower portion of the cementitious material against the wall while the cementitious material

above the detonator will be freed to descend by gravity to close the hole with an easily drillable core inside the cementitious material compacted by the force of the explosion.

2. A cartridge for cementing the walls of a well, which cartridge comprises a sheet metal case having a conical bottom; an explosive charge central to the case; a detonator at the lower portion of the explosive charge; means to explode the detonator; a cementitious charge around the explosive and filling the case a considerable distance thereabove; a downwardly conical stopper seated in the top of the case; a bail secured to the case and a line attached thereto to lower the case into the well and means to ignite the detonator at the lower part of the explosive charge.

In witness whereof, I have hereunto set my hand at Whittier, California, this 28th day of August, 1923.

HASKELL M. GREENE.