

898,517.

Patented Sept. 15, 1908.  
 2 SHEETS—SHEET 1.

Fig. 11.

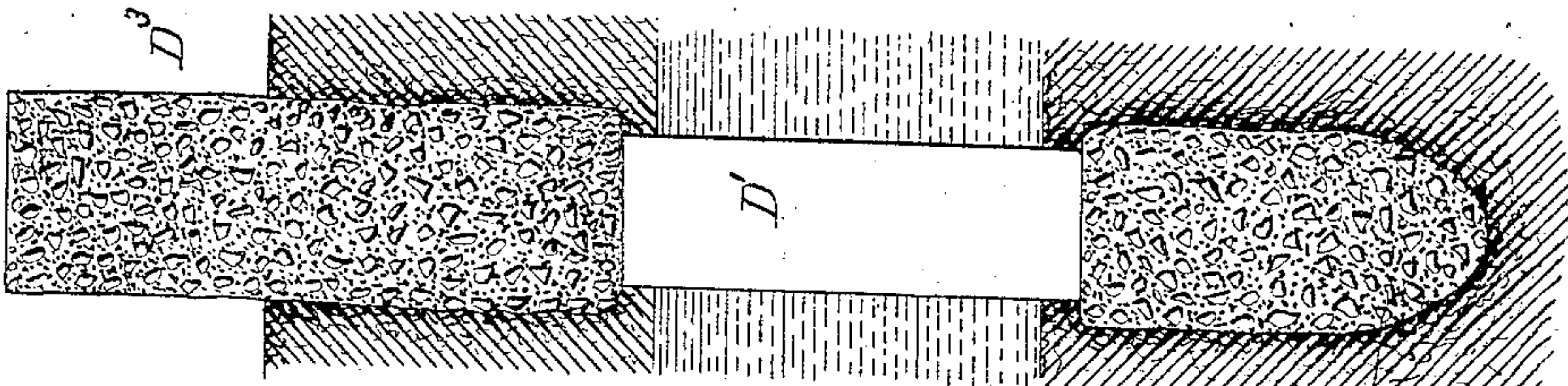


Fig. 4.

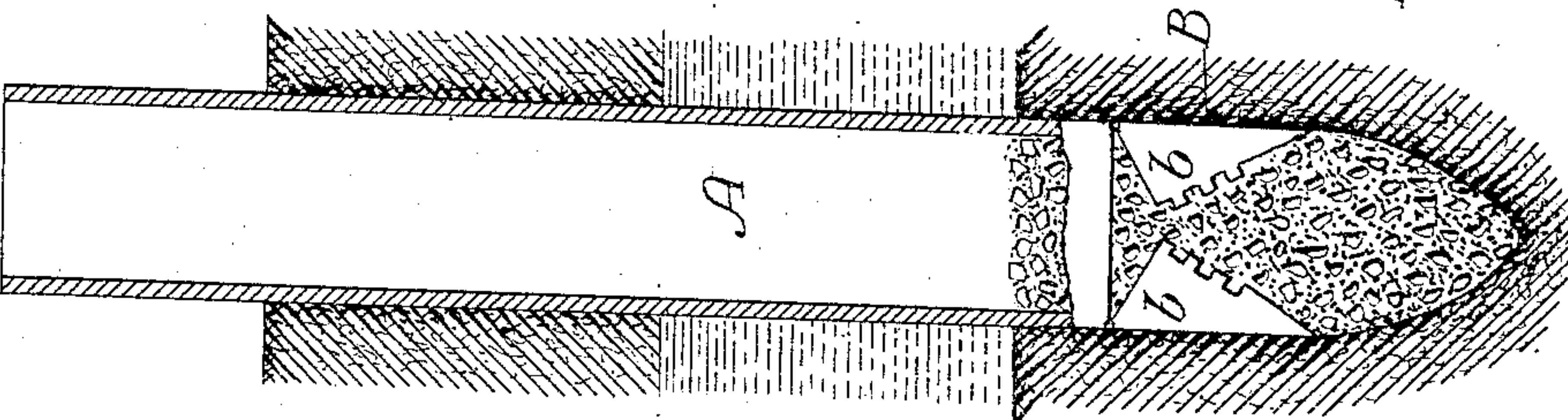


Fig. 3.

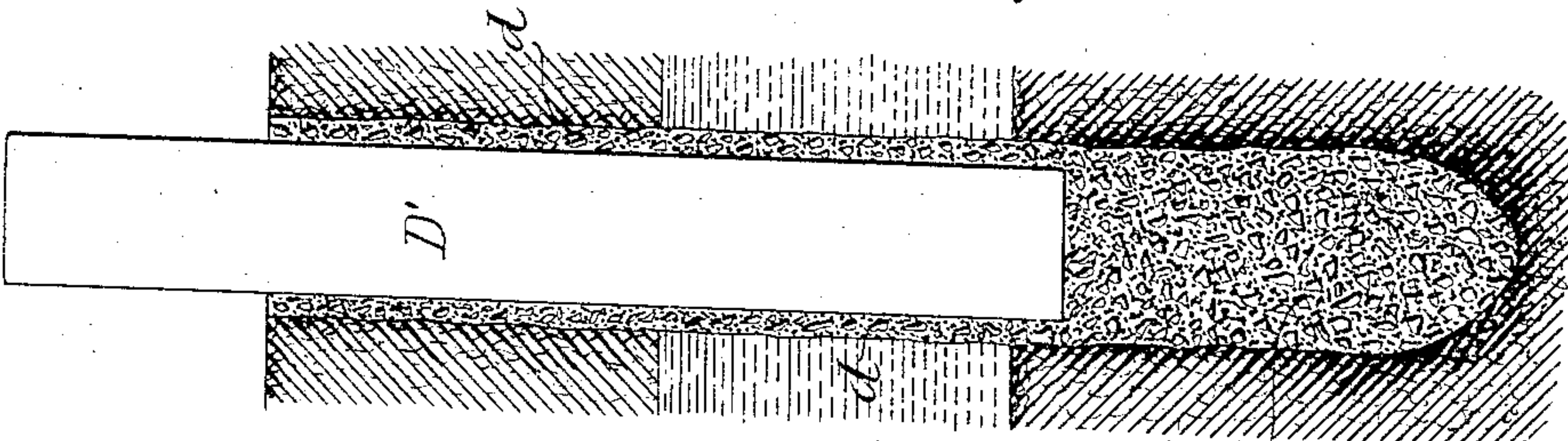


Fig. 2.

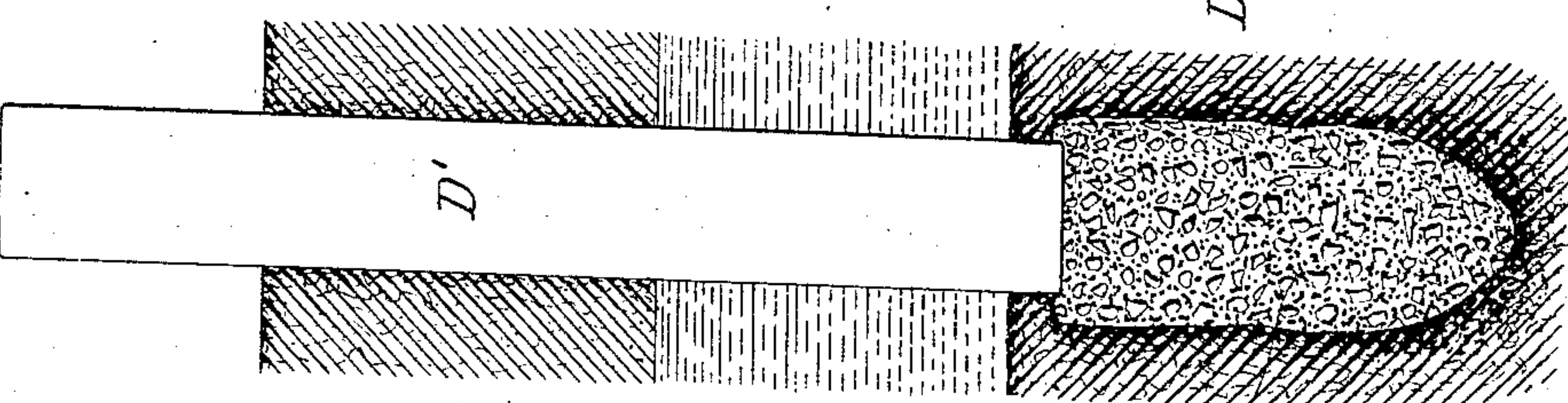
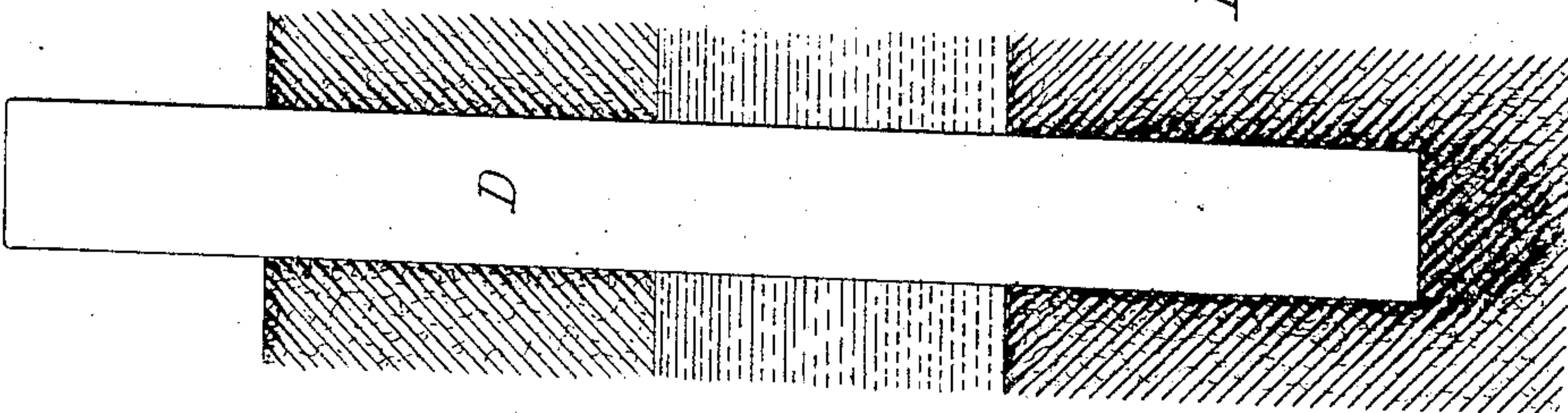


Fig. 1.



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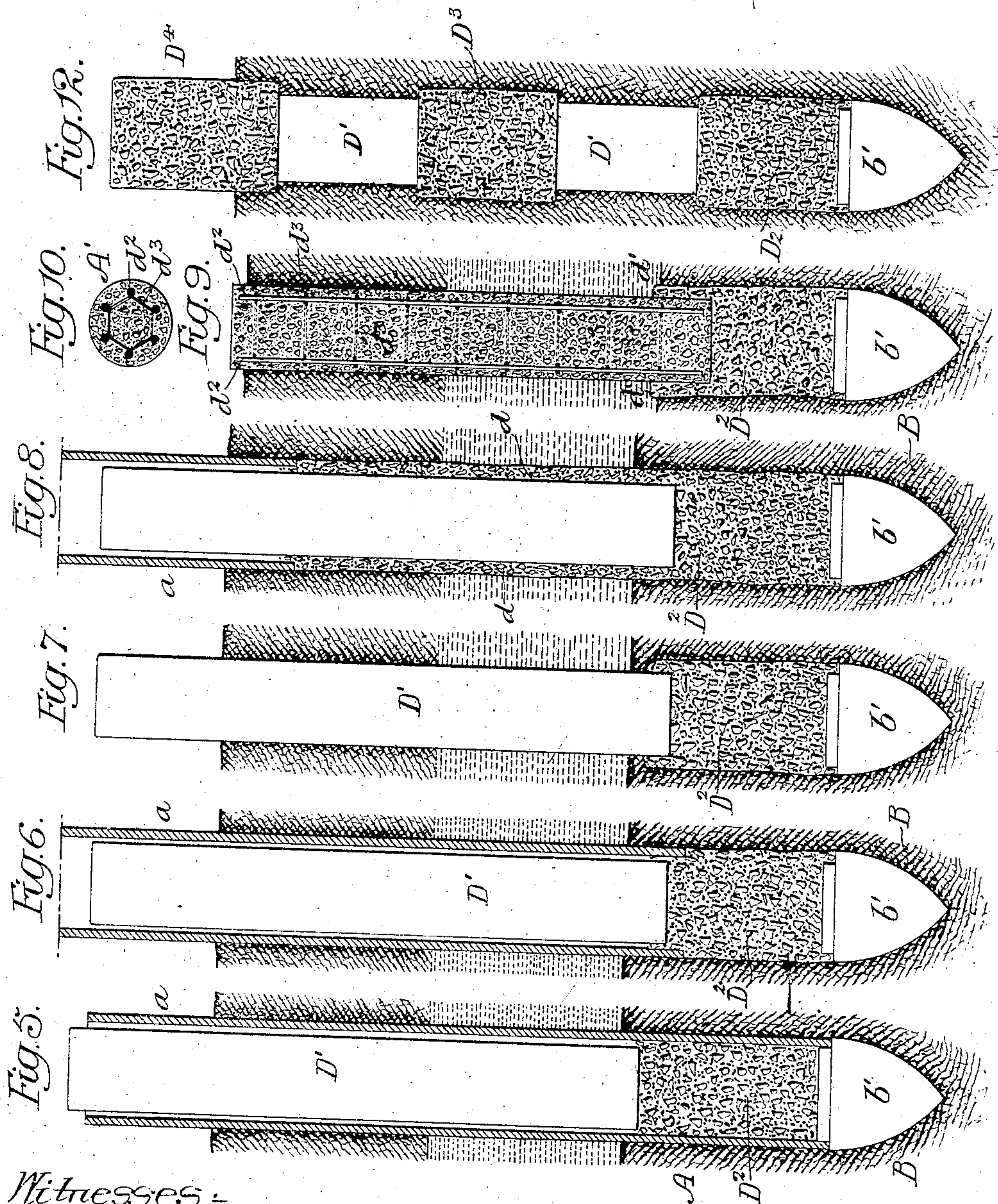


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 CONCRETE PILE AND PROCESS OF CONSTRUCTING THE SAME.  
 APPLICATION FILED MAY 31, 1906.

898,517.

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2 SHEETS—SHEET 2.



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## UNITED STATES PATENT OFFICE.

FRANK SHUMAN, OF PHILADELPHIA, PENNSYLVANIA.

## CONCRETE PILE AND PROCESS OF CONSTRUCTING THE SAME.

No. 898,517.

Specification of Letters Patent.

Patented Sept. 15, 1908.

Application filed May 31, 1906. Serial No. 319,576.

*To all whom it may concern:*

Be it known that I, FRANK SHUMAN, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Concrete Piles and Processes of Constructing the Same, of which the following is a specification.

My invention relates to the method of placing piles of concrete.

10 The object of my invention is to plant a previously molded concrete or reinforced concrete pile in the ground in such a manner that there will be no danger of cracking or weakening the concrete pile in the process of placing the same. This object I attain by making a  
15 hole by driving a hollow preparatory pile into the ground, this pile doing all the penetrating of the ground, then the previously molded concrete pile is lowered into the hollow pile, after which the hollow pile is withdrawn leaving the molded concrete pile in place. No blows whatever are given the molded pile and thus all danger of damaging the already set concrete of the pile is avoided.  
20 The preparatory pile may be provided with a detachable or valved point, as desired, and the opening may be first partly filled with cement grout or concrete to a certain depth and the molded pile mounted on this grout, forming what may be termed a composite  
25 pile.

Heretofore the method of planting concrete piles was to drive them into the ground with a powerful drop hammer, the same as a  
30 wooden pile, the blows being cushioned as much as possible by a cap of wood or saw dust, but it has been found that this cap does not prevent serious injury to the previously formed pile.

35 In the accompanying drawings:—Figure 1, is a view illustrating a molded pile set in the opening formed by the preparatory pile; Fig. 2, is a view showing the previously molded pile mounted upon a body of concrete grout; Fig. 3, is a view similar to Fig. 2, with the exception that the concrete grout fills the annular space left by the withdrawal of the shell of the preparatory pile; Fig. 4, is a view illustrating the method of making the base of  
40 the pile, using a preparatory pile with a valved or "alligator" point; Fig. 5, is a view showing a pile in which the preparatory pile has a detachable point; Fig. 6, is a view showing the shell of the preparatory pile partly withdrawn; Fig. 7, is a view showing the shell entirely withdrawn and the sur-  
45 rounding ground closed in upon the pile; Fig. 8, is a view showing the grout being poured into the space between the molded pile and the ground as the shell of the preparatory pile is being withdrawn; Fig. 9, is a sectional view of the molded pile showing one method of reinforcing it; Fig. 10, is a sectional plan view of the pile illustrated in Fig. 9; and Figs. 11 and 12, are views of modifications of my invention.

In carrying out my invention I make the opening in the ground by a preparatory hollow pile A (Fig. 4 or Fig. 5), having a point B made either of sections *b, b* hinged to the body A to form what I term "an alligator point", or the point may be simply a detachable member *b'* which remains in the ground when the shell is withdrawn and forms the footing or base upon which the concrete pile is mounted.

In Figs. 1, 2 and 3 of the drawings I have shown the opening made by a preparatory pile having a valved or "alligator" point. I have illustrated in the drawings an instance where the pile is to be driven through ground which is unstable, the upper strata, for instance, is of soft ground, then the second strata is of quicksand, and the third strata is firm ground, and the pile is driven through the soft ground and quicksand into the firm ground until it reaches hard pan. The preparatory pile, as remarked above, is hollow and I form in a suitable mold a pile D of concrete in any proportions desired, and this pile is preferably reinforced, as indicated in Figs. 9 and 10, with longitudinal metallic rods *d*<sup>2</sup> connected together by hoops *d*<sup>3</sup>, but it will be understood that the metallic reinforce may be of any shape or form desired. The molded pile is lowered through the shell of the preparatory pile, the preparatory pile being raised sufficiently to open the valved members so that the pile will rest directly upon the bottom of the opening. Then the preparatory pile is withdrawn and in this instance the surrounding ground will close in against the pile, or grout may be inserted in the annular space between the pile and the ground, as illustrated in Fig. 3. In some instances it is preferable to make a composite pile, especially where the pile is to be of any length and where the ground will permit. As shown, for instance in Fig. 2, the pile is made in two sections, D' being the previously molded pile and D<sup>2</sup> the pile formed by pouring thick cement grout or concrete into the



opening formed by the preparatory pile. This grout is poured into the opening as the preparatory pile is removed and, as shown in Fig. 2, the grout fills the opening in the firm ground and then the previously formed section D' of the pile is inserted through the hollow preparatory pile resting on the portion D<sup>2</sup> and extending through the strata of quicksand and soft ground.

Fig. 3 is a view similar to Fig. 2, with the exception that cement grout is poured into the annular space surrounding the molded portion D<sup>2</sup> of the pile as the shell of the preparatory pile is removed.

Figs. 5, 6, 7 and 8 illustrate the different steps in the process of making the improved pile, in this instance using a preparatory pile with the detachable point b' which is driven into the ground. The shell a of the pile is then partly filled with cement grout, as illustrated in Fig. 5, and the molded section D' of the pile is inserted, resting on the grout, as the shell is gradually withdrawn, as illustrated in Fig. 6, the grout will fill the entire opening as illustrated in Fig. 7, and the quicksand or other unstable ground will close in upon the pile. Instead of driving the preparatory pile it may be jetted down with a water stream in sand or other material where it cannot be driven to advantage.

In Fig. 8, I have shown a view in which grout is poured into the space between the section D' of the pile and the ground, as in Fig. 3, forming an annular shell of concrete increasing the molded section D' of the pile. In some instances this grout may only extend part way, as shown at d', Fig. 9, where the ground above is of such a character that it will close in upon the pile. It will be understood that the molded section D' of the pile may be round, polygonal, or any shape in cross section, and of any length desired, and it may be either a plain concrete pile or reinforced in any suitable manner. It will be understood that when the section D' is lowered onto the section D<sup>2</sup> the sections will be welded together as soon as the section D<sup>2</sup> sets, making in fact a homogeneous structure. Where the pile projects through a certain depth of water the molded pile is of such a length as to extend through this depth of water and through the unstable ground, while the base portion of the pile can be formed of concrete grout poured into the preparatory pile before the molded pile is set in position, dispensing entirely with coffer dams, which are indispensable when the pile is to be formed under water by the methods previous to my invention.

In Fig. 11, I have shown a modification in which a short section of molded pile is used which will extend through the very unstable ground, the pile being made in three sections in this instance, the first section D<sup>2</sup> being formed of thick cement grout or concrete,

then the previously formed section D' is placed on top of this, extending through the very unstable ground, then a third section D<sup>3</sup> is built by pouring thick cement grout or concrete into the opening above the previously formed pile, making a composite pile, as clearly shown in said figure.

In Fig. 12, I have shown a further modification, in which short previously formed pile sections D' are combined with sections D<sup>2</sup>, D<sup>3</sup> and D<sup>4</sup> made by pouring thick cement grout or concrete into the opening.

Thus it will be seen by the above described methods that I am enabled to place a previously formed concrete pile in the ground without the liability of shattering or weakening the pile and when once in place there is no liability of the pile being shattered or weakened by the dead weight placed upon it, as it is supported by the ground, or where the ground is of such a character that it will not hug the pile additional cement grout or concrete can be filled in the space between the pile and the adjoining ground.

I claim:—

1. The method of placing a concrete pile within the ground, said method consisting in driving a hollow preparatory pile into the ground, molding a concrete pile of a given diameter and when set inserting it in the hollow preparatory pile within the ground.

2. The method of placing a concrete pile within the ground, said method consisting in driving a hollow preparatory pile into the ground, molding a concrete pile of a given diameter and length, inserting the said previously molded concrete pile in the hollow pile within the ground, and then withdrawing the hollow preparatory pile, leaving the previously molded concrete pile within the ground.

3. The method of constructing concrete piles, consisting in driving a hollow preparatory pile, filling a portion of the opening thus formed with concrete or concrete grout, then mounting a previously molded concrete pile section within the preparatory pile and upon the concrete grout.

4. The method of constructing concrete piles consisting in making an opening with a hollow preparatory pile, pouring grout in the said opening to form a base section of a pile, inserting a previously molded concrete pile section in the preparatory pile and resting said section upon the base section prior to the setting of the base section, so that when the said base section is set it will be welded to the molded section, forming a unitary structure.

5. The method of constructing concrete piles consisting in forming an opening by a hollow preparatory pile, inserting a previously molded concrete pile into the preparatory pile, gradually withdrawing the shell of the preparatory pile, and filling the space be-



tween the molded pile and the walls of the opening with grout as the shell is removed.

6. The method of constructing concrete piles consisting in forming an opening by a hollow preparatory pile; filling the base of said opening with a body of concrete grout or concrete, mounting on this base a molded concrete pile section prior to the withdrawal of the preparatory pile, and gradually withdrawing the shell and filling the space left by the shell above the concrete base section with grout, so as to form a shell of concrete surrounding the molded pile section.

7. The method herein described of constructing concrete piles in unstable ground, said method consisting in driving a hollow preparatory pile through the unstable ground into firm ground, inserting in the hollow pile a previously molded concrete pile, and then withdrawing the preparatory pile, the said molded concrete pile extending through the unstable ground.

8. The method herein described of constructing concrete piles, consisting of driving a hollow preparatory pile through unstable ground into firm ground, filling the opening thus formed in the firm ground with concrete or concrete grout, placing a previously molded pile section in the hollow preparatory pile and resting the end of the said pile section upon the base section of concrete grout, then withdrawing the preparatory pile, the previously molded pile section passing through the unstable ground.

9. The method herein described of constructing concrete piles, consisting in making an opening by means of a hollow preparatory pile, placing a previously molded concrete pile section with reinforcing members em-

bedded therein within the preparatory pile, and withdrawing the preparatory pile, leaving the said pile section within the opening.

10. The method herein described of placing a concrete pile within the ground, said method consisting in driving a hollow preparatory shell having in the bottom thereof a detachable point (the whole constituting a hollow preparatory pile) into the ground, molding a concrete pile and allowing it to set, then placing said previously molded and set concrete pile within the hollow shell, and then withdrawing the hollow shell leaving the detachable point in the ground to form a footing for the previously molded concrete pile.

11. The method of constructing concrete piles consisting in driving a hollow shell, having at the bottom end thereof a detachable point (the whole constituting a hollow preparatory pile) into the ground, pouring into the same a portion of cement grout or wet concrete, then placing therein a previously molded and set concrete pile, and then withdrawing the hollow shell leaving the detachable point and the wet concrete in the ground to form a footing for a previously molded concrete pile.

12. A pile made in two sections, a base and a previously molded portion, the said molded portion being welded to the base on the setting of the base section.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FRANK SHUMAN.

Witnesses:

W. C. BURKHOLDER,

WILL. A. BARR.