No. 763,213. PATENTED JUNE 21, 1904.

F. SHUMAN.

METHOD OF FORMING CONCRETE PILES.

APPLICATION FILED FEB. 25, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

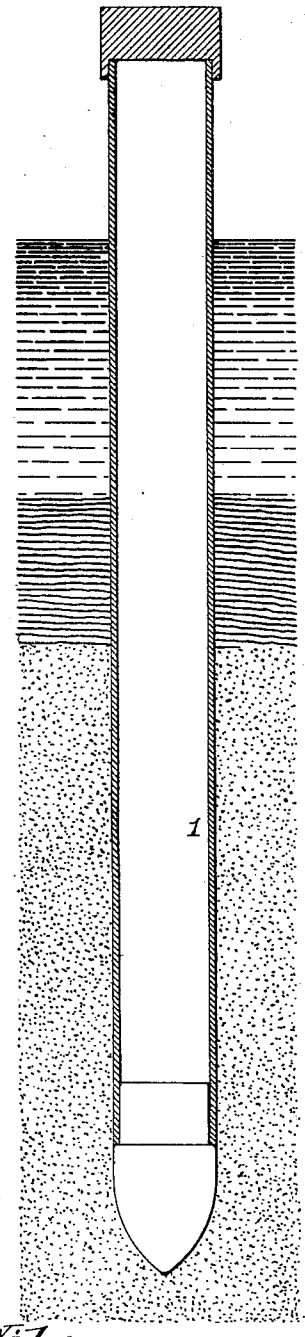


Fig. 2.

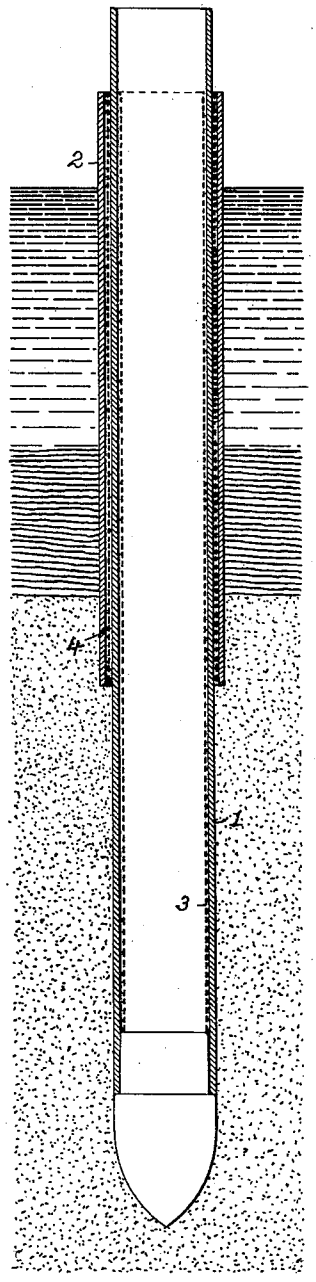
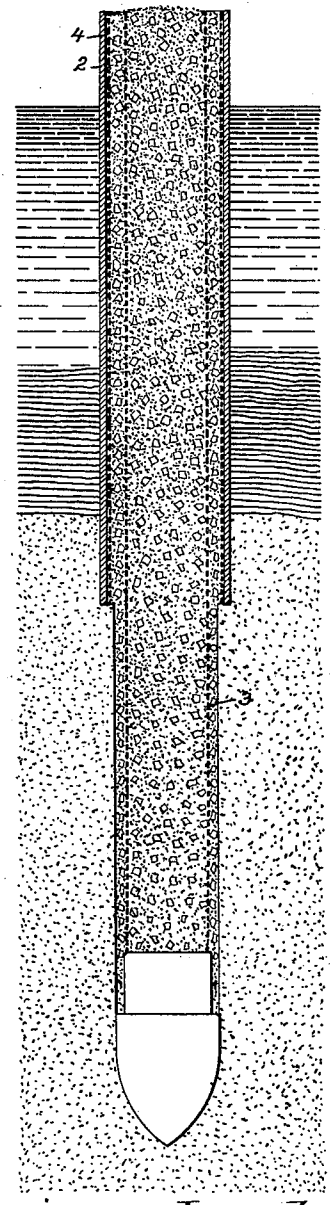


Fig. 3.



Witnesses:-
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Inventor
Frank Shuman,
by his Attorneys,
Howson & Howson

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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METHOD OF FORMING CONCRETE PILES.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

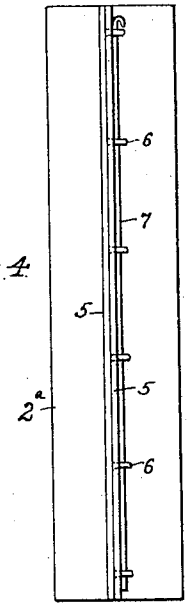
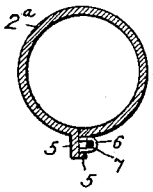


Fig. 5.



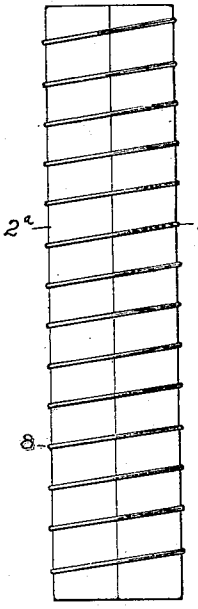


Fig. 6.

Fig. 9.

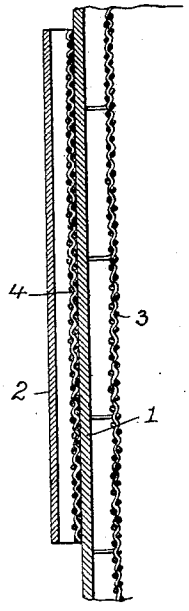


Fig. 7.

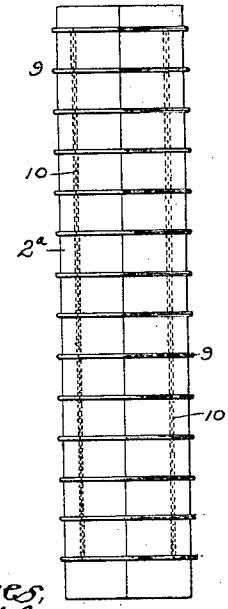
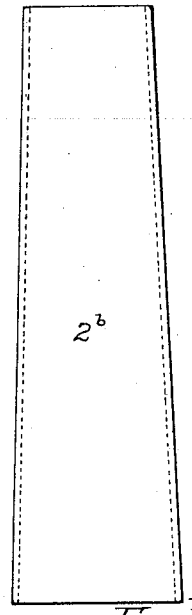


Fig. 8.



Witnesses,
Titus N. Sons.
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Inventor
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Howson & Howson

THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

No. 763,213. Patented June 21, 1904.

UNITED STATES PATENT OFFICE.

FRANK SHUMAN, OF PHILADELPHIA, PENNSYLVANIA.

METHOD OF FORMING CONCRETE PILES.

SPECIFICATION forming part of Letters Patent No. 763,213, dated June 21, 1904.

Application filed February 25, 1904. Serial No. 195,184. (No model.)

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 the Formation of Concrete Piles, of which the following is a specification.

My invention consists of a method of forming concrete piles under water or where the pile is to project above stable ground, whether in water, unstable ground, or air, the invention being an improvement upon that set forth in my Patent No. 739,268, dated September 15, 1903, and the objects of my present invention being to render the coffer-dam independent of the pile, so that it can be used in connection with preparatory piles of any desired character, also to facilitate the removal of the coffer-dam after the completion of the pile and to enable the coffer-dam to be used as a means of applying a stiffening or strengthening structure to the pile. These objects I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 represents the first step in the formation of a concrete pile in accordance with my present invention; Fig. 2, a further step in the operation; Fig. 3, a still further step; Figs. 4 to 8, inclusive, views of special forms of coffer-dam made in accordance with my invention; and Fig. 9 is an enlarged view of part of Fig. 2.

In my previous patent, before referred to, a coffer-dam consisting of a tube surrounding the preparatory pile was confined between an enlarged head on the pile and a ring mounted on the pile some distance back of the head, both pile and coffer-dam being first driven until the lower end of said coffer-dam had been forced below the water and unstable soil, whereupon its connection with the pile was released and the driving of the pile continued until an opening of the desired depth had been formed in the solid ground, the preparatory pile being then withdrawn and the opening and coffer-dam filled with concrete which was permitted to set, the coffer-dam being either permitted to remain as a sheathing for the upper portion of the pile or being removed when such sheathing was not required.

In carrying out my present invention I first drive or otherwise sink the preparatory pile 1 to the proper depth and then drive or otherwise sink the coffer-dam 2 around the upper end of the preparatory pile until the lower end of said coffer-dam is embedded to a sufficient depth in the firm ground beneath the water and mud or silt, or the coffer-dam may be first driven or sunk to the required depth and the preparatory pile then driven or sunk through the same. The preparatory pile is then withdrawn, and the opening formed thereby, as well as the opening within the coffer-dam, is filled with concrete, and after the latter becomes set the coffer-dam can be removed or not, as desired.

The preparatory pile may be of any desired character, having either a flush or an enlarged head, and said head may be attached to the pile, or it may be detachable therefrom, so as to remain in the opening when the pile is withdrawn, or it may be collapsed and withdrawn through the hollow pile.

The pile may be withdrawn before filling the opening with concrete; but in the case of a hollow pile it is preferable to fill the opening through the pile as the latter is being slowly or intermittently withdrawn.

When it is desired to stiffen or strengthen the concrete pile, a metal reinforce—such as shown, for instance, at 3 in Figs. 2 and 9—may be introduced into the hollow pile before the withdrawal of the same, so as to be embedded in the concrete which is filled into the opening by being fed through the pile as the latter is being slowly or intermittently withdrawn, the pile thus serving as a backing or support for the reinforce, so as to prevent destruction or distortion of the same by the pressure of the concrete thereupon as it is being rammed. A similar metallic reinforce—such, for instance, as shown at 4 in Fig. 2—may be inserted between the pile and the coffer-dam, so as to be embedded in the outer surface of the upper portion of the completed pile. This reinforce may be placed in position either before or after the placing of the coffer-dam.

In order to facilitate the removal of the coffer-dam from the completed pile, various means for relaxing or increasing the diameter of said coffer-dam may be adopted. For instance, that form of coffer-dam shown in Figs.

4 and 5 consists of a longitudinally-split tube 2^a, with flanges 5 upon its meeting edges, one of these flanges 5 having projecting staples 6, which pass through slots in the opposite flange and are engaged by a key 7 to hold the edges of the tube together, separation of the flanges and consequent expansion of the tube being permitted when this key is withdrawn.

The split tube shown in Fig. 6 is normally retained in closed position by means of a rope, cord, or wire 8, wound spirally around the same, expansion of the tube being permitted when this restraining influence is withdrawn, and the split tube shown in Fig. 7 is normally retained in the closed position by means of a series of rings 9, slipped over the same and connected by chains 10 or other suitable means, so that they can be easily withdrawn to permit of the expansion of the tube.

Instead of a split tube of the character described the coffer-dam may consist of a tube composed of any desired number of segments held together in either of the ways described or in any other desired manner, so as to be readily freed from the restraining influence when it is desired to remove the coffer-dam from the pile.

Another method of constructing the coffer-dam so as to facilitate its withdrawal from the pile is shown in Fig. 8, in which the tube 2^b instead of being split is tapered slightly, being larger in diameter at the lower end than at the upper end. It is preferable, also, to lubricate the inner surface of the coffer-dam in order to prevent it from sticking to the concrete.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The method of forming concrete piles, which consists in independently driving or sinking a preparatory pile and a coffer-dam surrounding the upper portion of the same, and then withdrawing the preparatory pile and filling the hole with concrete and permitting the latter to set, substantially as specified.

2. The method of forming concrete piles which consists in independently driving or sinking a preparatory pile and a coffer-dam surrounding the upper end of the same, and then withdrawing said pile and filling the opening and also the coffer-dam with concrete and permitting the latter to set, substantially as specified.

3. The method of forming concrete piles which consists in independently sinking a preparatory pile and a coffer-dam surrounding the upper portion of the same, then withdrawing the preparatory pile and filling the opening and the coffer-dam with concrete, permitting the latter to set and then removing the coffer-dam, substantially as specified.

4. The method of forming concrete piles which consists in driving or sinking a hollow preparatory pile, introducing a metallic reinforce into the same, slowly or intermittently withdrawing the hollow pile, and filling the concrete into the opening as the pile is thus withdrawn, substantially as specified.

5. The method of forming concrete piles which consists in first sinking a preparatory pile and a coffer-dam surrounding the upper portion of said preparatory pile, introducing a metallic reinforce between the two, and withdrawing the preparatory pile and filling the opening thereby formed with concrete, which also fills the coffer-dam and engages the metallic reinforce therein, substantially as specified.

6. The method of forming concrete piles which consists in first driving or sinking a preparatory pile and a coffer-dam surrounding the upper portion of the same, then withdrawing the preparatory pile and filling the opening formed thereby and also the coffer-dam with concrete, permitting the concrete to set, relaxing or increasing the diameter of the coffer-dam and then removing the same, substantially as specified.

7. The method of forming concrete piles which consists in first driving or sinking a hollow preparatory pile with detachable point, then independently driving or sinking a coffer-dam surrounding the upper portion of the pile, then slowly or intermittently withdrawing the preparatory pile, without the point, and, during such withdrawal, filling in the concrete until the coffer-dam and the opening below the same have been filled, and then permitting the concrete to set, substantially as specified.

8. The method of forming concrete piles which consists in first driving or sinking a hollow preparatory pile with detachable point, then independently driving or sinking a coffer-dam surrounding the upper portion of the pile, then slowly or intermittently withdrawing the preparatory pile, without the point, and, during such withdrawal, filling in the concrete until the coffer-dam and the opening below the same have been filled, then permitting the concrete to set and finally removing the coffer-dam, substantially as specified.

9. The method of forming concrete piles which consists in first driving or sinking a hollow preparatory pile with detachable point, then independently driving or sinking a coffer-dam surrounding the upper portion of the pile, then slowly or intermittently withdrawing the preparatory pile, without the point, and, during such withdrawal, filling in the concrete until the coffer-dam and the opening below the same have been filled, then permitting the concrete to set, relaxing or increasing the diameter of the coffer-dam and then removing the same, substantially as specified.

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

FRANK SHUMAN.

Witnesses:
JAMES MCMORRIS,
JOS. H. KLEIN.