L. E. WELSH.

CONCRETE PILE AND METHOD OF MAKING THE SAME.

APPLICATION FILED MAR. 26, 1907.

950,360. Patented Feb. 22, 1910.

Fig. 1.

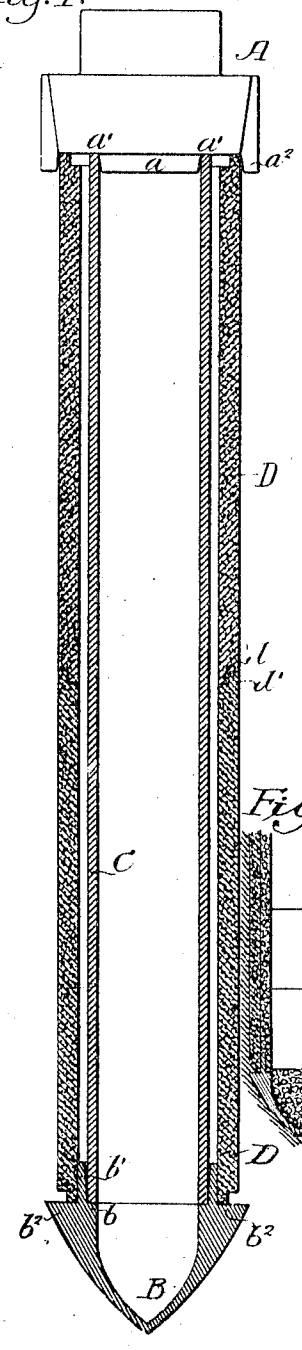

Fig. 2.

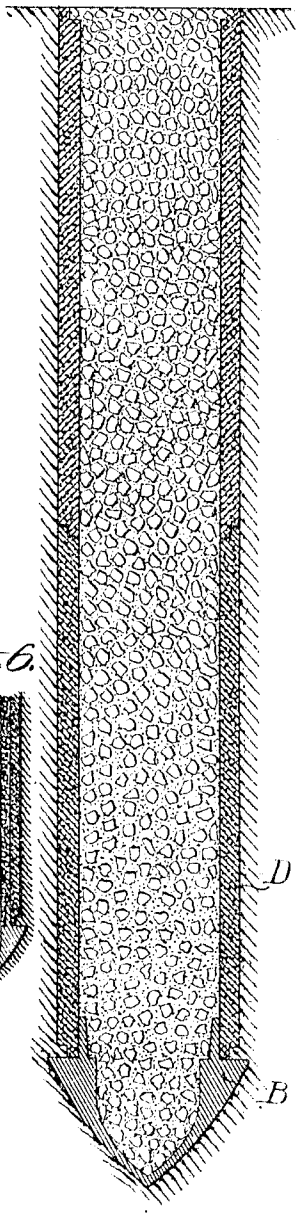

Fig. 3.

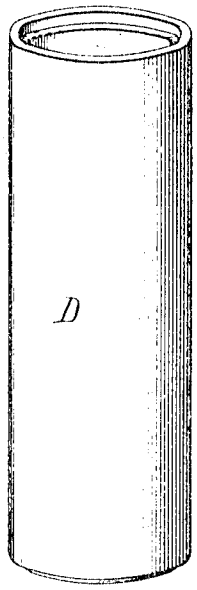

Fig. 4.

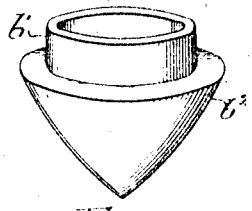

Fig. 5.

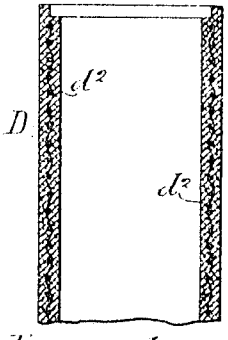

Fig. 6.

Witnesses:
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UNITED STATES PATENT OFFICE.

LOUIS E. WELSH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO AMERICAN CONCRETE PILING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

CONCRETE PILE AND METHOD OF MAKING THE SAME.

950,360. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed March 26, 1907. Serial No. 364,623.

To all whom it may concern:

Be it known that I, LOUIS E. WELSH, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Concrete Piles and Methods of Making the Same, of which the following is a specification.

My invention relates to certain improvements in what are known as concrete piles and the object of my invention is to provide means whereby a shell of concrete or other fragile material can be carried into the opening in the ground and filled with concrete thus producing an absolutely perfect pile.

In the accompanying drawing:—Figure 1, is a sectional elevation of my improved pile ready to be driven into the ground; Fig. 2, is a sectional view of the finished pile with the driving form removed; Fig. 3, is a perspective view of one of the concrete piles; Fig. 4, is a perspective view of the driving point; Fig. 5, is a sectional view of one of the shells, showing one method of reinforcing the shell, and Fig. 6, is a view showing one method of filling the shell with concrete.

A is the driving head which may be of any suitable form and made in any suitable manner.

B is the driving point; being preferably made of cast iron and tapered in form and as shown in the present instance this driving point is hollow, there being sufficient metal in the point to resist the blows of the driver.

C is a tubular driving form extending from the head A to the point B. This driving form is of such thickness as to resist the pressure exerted on the driving head to force the point into the ground.

In the present instance the driving head A has a central projection a and a flange a^2. The body portion of the driving head rests at a' upon the driving form C and there is space between the driving form and the flange a^2 for the reception of the concrete shell D. The lower end of the driving form rests upon an inner shoulder b formed on the driving point B and surrounding this shoulder in the present instance is a flange b' which retains the driving form C in position in respect to the driving point. The driving point has an outer shoulder b^2 upon which the concrete shell rests and the driving point is of a greater diameter than the shell, although in some instances it may be of the same diameter where the ground is of such a character that the skin friction will not fracture or disintegrate the shell.

The driving form is less than the inner diameter of the shell so that after the pile is driven into the ground the driving form C can be readily removed. The flange b' of the driving point in the present instance acts to separate the driving form from the shell and also acts to keep both parts centered in respect to the driving point.

The shell or hollow section D may be made in one or more parts, depending considerably upon the depth to which the pile is to be driven. The shell rests upon the shoulder b^2 on the driving point B and the upper portion of the shell is held in place by the annular flange a^2 which projects from the driving head A.

The driving form C is of such a length in respect to the shell D that the blow will be transmitted from the head A to the point B through the driving form C; the shell D being mounted between the head A and the shell B so that it will be carried into the ground with the driving elements without the liability of fracture. If the shell is made up of a series of sections, then one shell preferably interlocks with another, as illustrated in Fig. 1. On one end of each section is an internal flange d which interlocks with the external flange d' on one end of another section, thus preventing displacement and the sections will be always in line.

I preferably make the point section B considerably greater in diameter than the concrete shell D so that the hole produced by the driving point is of greater diameter than the shell, thus reducing the skin friction to such an extent that the shell can be driven to a much greater depth than if the hole was practically the same diameter as the shell.

The shell D may be made entirely of concrete, as illustrated in Fig. 1, without being reinforced, or it may be made with concrete reinforced in the usual manner; one method of reinforcing being shown in Fig. 5, in which the cylinder of intermeshing wire d^2 is embedded in the concrete.

In carrying out my improved process, I preferably mount one or more tubular sections D with the driving form C upon the

driving point B, then I place the head A in position; the head in the present instance acting as the upper guide for the shell D. The pile can be driven into the ground by the ordinary method; the head A receiving a blow which is transmitted to the driving point through the driving section C without affecting or injuring the concrete shell D. The head being of greater diameter than the shell it produces a hole larger than the shell so that the skin friction upon the shell is reduced to a minimum and the point protects the shell from any pressure of the earth under it. After the pile is driven into the ground to the desired depth then the head is removed and the driving form withdrawn. This can be readily accomplished as the driving form is less in diameter than the inner diameter of the shell and practically does not come in contact with the shell, leaving the driving point, or that portion of the driving point under the shell, in the ground as a base for the shell. After the driving form is removed then the tubular pile can be inspected from top to bottom before the concrete forming the body of the pile is discharged into the shell. The inspection can be made either by the use of a lamp, or in the case of larger piles a man may be lowered into the shell, if found desirable.

Where the pile is driven into moist ground the solid point B and the tubular sections D form a lining which will prevent the admission of water or soil into the opening formed in driving the pile so that when the concrete forming the body portion is inserted a true pile is assured.

Several methods may be used for filling a tubular pile with concrete after it is driven; one method being to entirely remove the driving form C and then fill the entire cavity at once with concrete, or the driving head can be removed and the driving form C raised a certain distance; concrete being poured through the driving form into the hollow pile until it rises to the bottom of the driving form when the driving form can be raised to a certain point and more material poured in until the tubular pile is entirely filled, or sections of molded concrete piles can be placed in the hollow pile and grout can be poured into the space between the solid sections and the tubular sections, as shown in Fig. 6. Reinforcing members can be inserted in the pile if found necessary. Thus a pile is produced having a tubular shell which can be inspected from top to bottom, after which the shell can be filled with concrete forming a solid, homogeneous pile.

In the formation of piles according to my improved method, a hole is made by entering a suitable metal point into the ground under the force of impact driving means, and simultaneously with the formation of such hole a shell of concrete or similar fragile material is introduced, which follows the point into the ground and is not subjected to tensile stress or disintegrating blows. This shell is preferaby made in sections in order that it may be introduced as the hole progressively increases in depth; such shell providing a protective lining that prevents the surrounding earth entering the cavity and permits examination of the latter prior to deposit of the filling of concrete which forms with such shell the actual pile. The shell is not intended as a vertical load supporting medium, but owing to its cylindrical shape it possesses a high degree of resistance to lateral crushing pressure and in connection with the concrete filling forms a solid homogeneous pile. Moreover the exterior of the shell is comparatively rough and maintains substantially the same frictional contact with the surrounding earth as the ordinary concrete piles.

I claim:

1. The method herein described of forming homogeneous concrete piles in the ground, said method consisting in forming a tubular shell or casing of concrete or other fragile material, providing a driving form with an enlarged separate and unattached point, mounting the tubular shell on the outside of the driving form in contact with said point, the latter being enlarged at its junction with the shell, simultaneously forming the hole and introducing the tubular concrete shell therein, removing that portion of the driving form within the tubular shell, and finally filling said shell with concrete.

2. The method herein described of forming homogeneous concrete piles in the ground, said method consisting in making one or more tubular shells of concrete to form the outer wall of a finished pile, mounting said shell on the outside of a driving form having a separate and unattached point, said point forming a rest for the lower end of the concrete shell, said shell being held to its seat by means carried by the upper end of the driving form, forming a hole and simultaneously introducing therein the shell by impact upon the driving form, said concrete shell following the driving point, then removing that portion of the driving form within the tubular shell, and finally filling the shell with concrete, which will make, with the shell, a homogeneous pile.

3. The method herein described of forming homogeneous concrete piles in the ground, said method consisting in forming a tubular shell of concrete or other fragile material to serve as a part of the finished pile, said shell having a total area less than the filling for the same, mounting said tubu-

lar shell on the outside of a driving form having a separate and unattached point of greater diameter than the tubular shell, simultaneously forming a hole and introducing therein the tubular shell, said driving point making a hole larger than the shell whereby the entrance of the latter is unobstructed, removing that portion of the driving form within the tubular shell, and finally filling the shell with concrete which with said shell forms a solid homogeneous pile.

4. A driving point for concrete piles having inner and outer shoulders in substantially the same horizontal plane; and a flange separating said shoulders, one of said shoulders being adapted to take the thrust of a driving form and the other forming a rest for a tubular section.

5. A hollow driving point for concrete piles having inner and outer shoulders with a vertical flange separating said shoulders, both shoulders being below the top of said flange, said point adapted to receive a portion of the concrete of the finished pile.

6. The combination of a hollow point section having a vertical flange and inner and outer shoulders separated by said flange, a driving head having a central projection, a tubular driving form surrounding the central projection of the head and mounted within the flange of the point section to be supported by the inner shoulder of the same, one or more tubular shells of concrete surrounding the driving form and mounted between the driving head and the point, said shells being supported by the outer shoulder of the point.

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

LOUIS E. WELSH.

Witnesses:
VICTOR SHUMAN,
ALAN CRAIG CUNNINGHAM.