R. J. BEALL, Jr.

REMOVABLE PILE FOR FORMING CONCRETE PILING.

APPLICATION FILED APR. 21, 1904.

999,430. Patented Aug. 1, 1911.

Fig. 1.

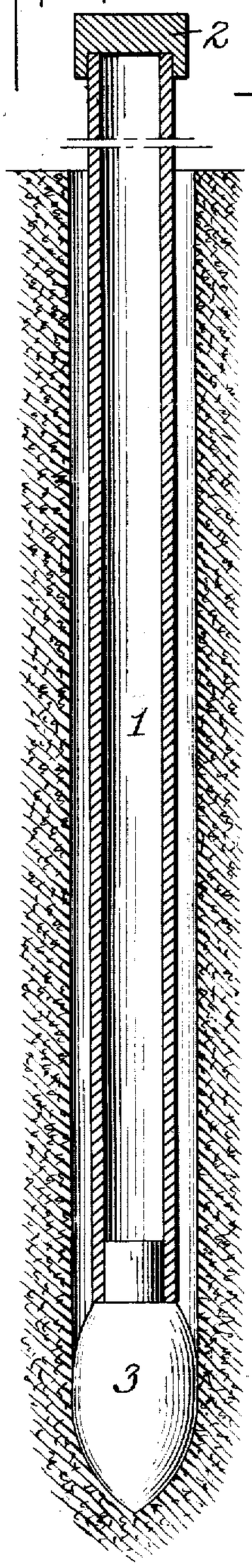


Fig. 2.

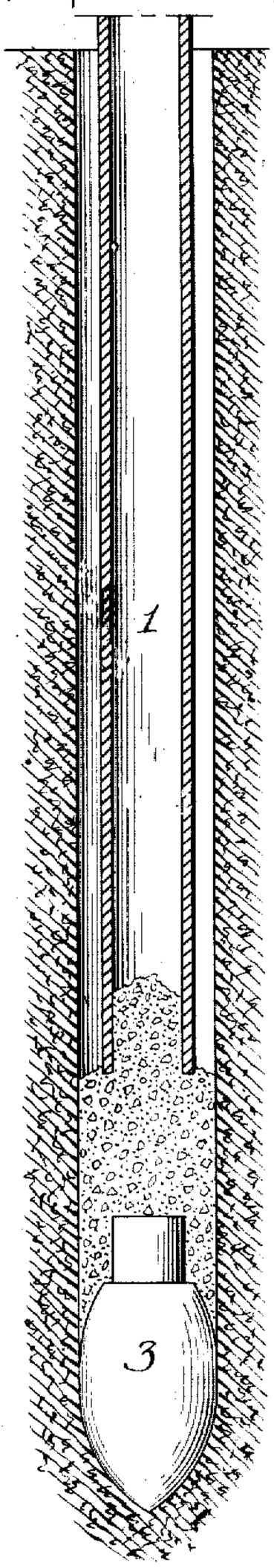


Fig. 3.

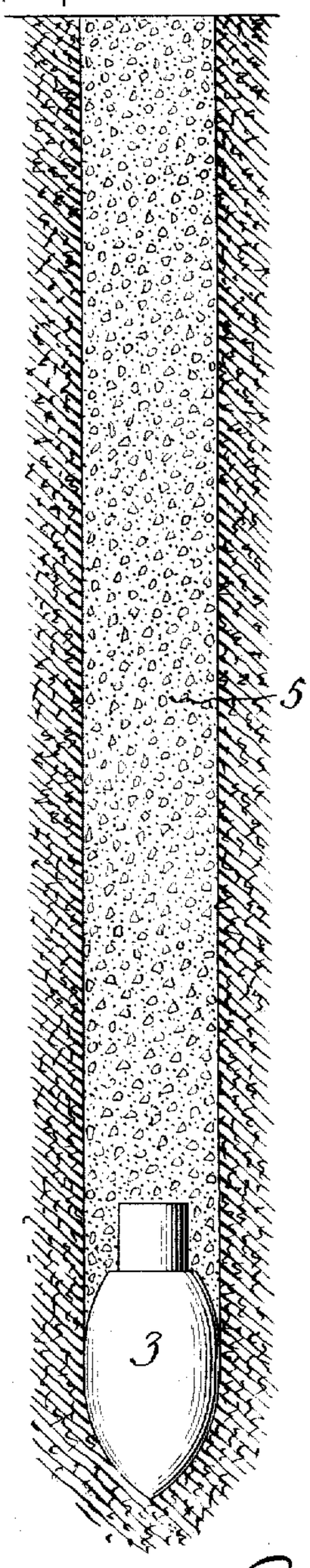
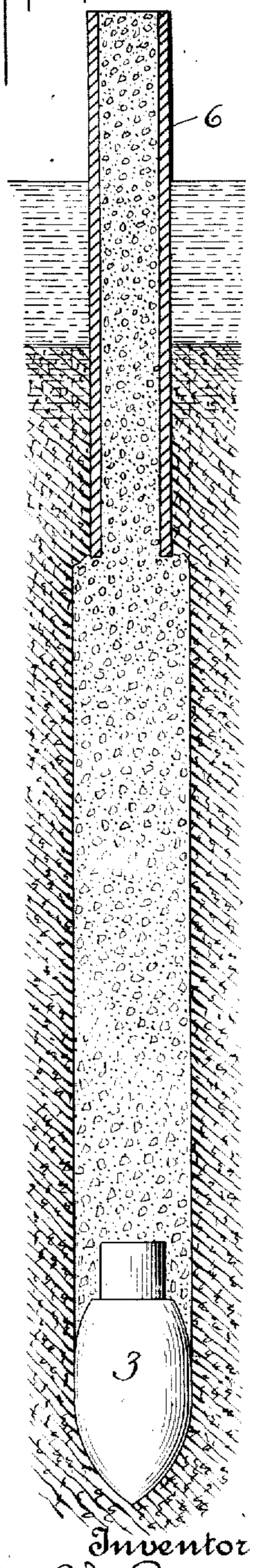


Fig. 4.



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REMOVABLE PILE FOR FORMING CONCRETE PILING.

999,430. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed April 21, 1904. Serial No. 204,231.

To all whom it may concern:

Be it known that I, RICHARD J. BEALL, JR., a citizen of the United States, residing at Washington, in the District of Columbia, have invented a Removable Pile for Forming Concrete Piling, of which the following is a specification.

My invention relates to that method of forming piles of concrete or cement which consists in first driving a pile into the ground, then withdrawing said pile, and then filling the opening formed thereby with concrete or cement in plastic or fluid form, which when it sets forms the permanent pile.

One object of my invention is to provide for driving or withdrawing the removable pile with the exercise of much less power than is required when piles of this class as heretofore constructed are used, a further object being to provide at the bottom of the opening formed by the removable pile a base for the permanent cement or concrete pile, and a still further object being to provide a construction for under-water work or for use in unstable ground.

In the accompanying drawing: Figure 1 is a vertical sectional view of a removable preparatory pile and its point constructed in accordance with my invention, showing the pile driven into the ground in order to form the opening for the subsequent reception of the permanent pile. Fig. 2 illustrates a special method of filling in the concrete, which is adopted in some cases. Fig. 3 is a view showing the permanent pile produced by filling the opening with cement or concrete after the withdrawal of the preparatory pile. Fig. 4 is a view showing a permanent pile which is provided for under-water work and for unstable ground.

For the purpose of forming in the ground openings for the reception of concrete or cement to constitute permanent piling the use of an ordinary wooden or metal preparatory pile of cylindrical form or tapering inwardly from top to bottom is objectionable, for the reason that the frictional hold of the earth upon the sides of the pile is such that the pile cannot be driven beyond a limited distance without the exercise of destructive force and cannot be withdrawn after being driven without the exercise of still greater force, the frictional hold of the earth upon the pile being now assisted by atmospheric pressure, owing to the fact that the withdrawal of the pile tends to create a partial vacuum in the opening left thereby. For this reason various forms of collapsible piles have been proposed; but such piles, owing to their sectional character, are necessarily limited in strength and, moreover, do not overcome the objection of resistance due to the frictional hold of the earth thereupon while they are being driven. When the pile tapers inwardly from top to bottom, there is the same resistance to the driving of the pile, and the resistance to the withdrawal of the pile is also excessive, because, owing to the atmospheric pressure, the earth is caused to firmly cling to the pile, so as to increase the difficulty of starting the same. Hence its movement is retarded for some time after it is started. In carrying out my invention, therefore, I provide the pile with an enlarged point, so as to displace the earth laterally at and near the point of the pile to a greater extent than the diameter of said pile, thereby freeing the pile, except as to a limited area at and near the point, from frictional contact with the walls of the opening formed thereby, thus facilitating the driving of the pile and practically removing any limit in the depth to which the pile can be driven. To facilitate the withdrawal of the pile, I make this enlarged point detachable therefrom. Hence the withdrawal of said pile can be effected without frictional contact of the walls of the opening to any material extent with the sides of the pile. The point, which remains at the bottom of the opening, forms an acceptable base or foundation for the permanent pile of cement or concrete.

The pile shown consists of a metal tube 1, although it may be a solid pile of wood or metal, if desired, this pile being provided at the top with a suitable driving-head 2 and at the bottom with a point 3, which is of so much greater diameter than the pile 1 that there is no likelihood of the latter coming in contact to any material extent with the walls of the opening formed by driving the pile. The point 3 has a horizontal cross-section approximating that of the pile 1, but of greater area, so that the strains upon the pile during the driving of the same are distributed with substantial equality about its periphery. Hence there is no tendency of the pile to deflect from a direct line while it

is being driven. The point 3 has a tapering lower end, so as to gradually displace the earth laterally as it advances. After the preparatory pile has been withdrawn, leaving its point at the base of the opening, the concrete or cement is poured into the opening, as in Fig. 3, so as to form the permanent pile 5, resting upon said point 3 as a base or foundation.

The pile and its point can be made of any desired horizontal cross-sectional shape, and the point can be made of wood, cast or wrought iron, steel, glass, asphaltum, concrete, or combinations of the same, or, in fact of any material which will withstand the shock of driving, the preferable material for the point being concrete, as the material of which the permanent pile is composed will effect a firmer union with such concrete point than with a point of other material.

The method of forming openings under water consists in forming a temporary water-tight joint between the hollow pile 1 and the detachable point 3, and, after the latter has been driven to the proper depth, pouring the concrete into the hollow pile and withdrawing the latter, either slowly or a little at a time, the temporary water-tight joint being broken on the withdrawal of the pile, so that the concrete can escape into the opening above the point, as shown in Fig. 2, the concrete gradually displacing the water in the opening from the bottom of the same to the top. The concrete is introduced into the hollow pile at such a rate as always to maintain a head of concrete at the bottom of the same. This system of filling can also be adopted in cases where the nature of the ground is unstable, so as not to sustain the shape of the opening if the pile is wholly removed before introducing the concrete. In either instance, and particularly where the permanent pile is to extend upward through a body of water, the metal preparatory pile or tube is not entirely withdrawn, but is left to remain a desired distance into the solid earth, so that the preparatory pile or tube may be filled with the concrete or cement to the desired height above the body of water and then cut off at this point, to leave the upper part of the permanent concrete pile with a metal casing.

6. Such a pile may be formed with a metal preparatory pile having a detachable point of the same diameter as the preparatory pile, or the detachable point may be of greater diameter, in which latter instance the method of filling the opening shown in Fig. 2, is employed, and after the concrete has set the earth is tamped around the lower part of the metal casing.

Having thus described my invention, what I claim as new, and desire to secure by Letters-Patent, is:

1. An apparatus for forming concrete piles in the ground, comprising a removable driving-tube having an unobstructed longitudinal bore, and a shoe of greater external diameter than the tube located at the lower end of said tube and detachable therefrom.

2. An apparatus for forming concrete piles in the ground, comprising a removable driving-tube having an unobstructed longitudinal bore of substantially uniform diameter throughout its length, and a shoe of greater external diameter than the tube located at the lower end thereof and detachable therefrom.

3. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having an enlarged point which is detachable from the pile, whereby said pile can be removed from the opening formed thereby, leaving the point at the bottom of the opening to form the base or foundation for the permanent pile, substantially as specified.

4. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having an enlarged point which is detachable from the pile and in horizontal cross-section approximates in shape but is greater in area than a like section of the body of the pile, substantially as specified.

5. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having a detachable non-metallic point, substantially as specified.

6. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having an enlarged and detachable non-metallic point, substantially as specified.

7. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having a detachable point composed of concrete, substantially as specified.

8. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable preparatory pile having an enlarged and detachable point composed of concrete, substantially as specified.

9. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable metallic preparatory pile having a detachable non-metallic point, substantially as specified.

10. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material,

a removable metallic preparatory pile having an enlarged and detachable non-metallic point, substantially as specified.

11. As a device for forming in the ground an opening for the subsequent reception of concrete or other plastic or fluid material, a removable metallic preparatory pile having a detachable point composed of concrete, substantially as specified.

12. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a removable metallic preparatory pile having an enlarged and detachable point composed of concrete, substantially as specified.

13. As a device for forming in the ground an opening for the subsequent reception of concrete or other fluid or plastic material, a hollow preparatory pile or tube having a detachable point, and said preparatory pile or tube adapted to form a casing for the upper part of the permanent concrete pile, substantially as specified.

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

RICHARD J. BEALL, JR.

Witnesses:

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HORACE S. BEALL.