No. 822,588. PATENTED JUNE 5, 1906.

R. A. CUMMINGS.

METHOD OF SINKING AND BUILDING CONCRETE PILES.

APPLICATION FILED JULY 7, 1905.

FIG. 1

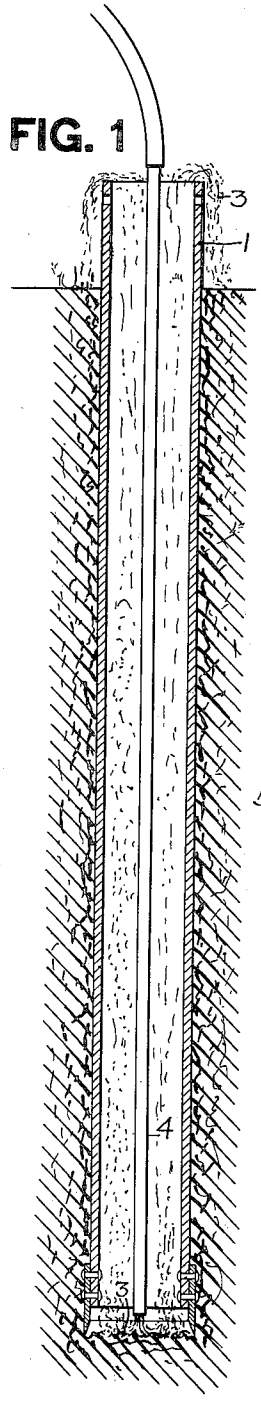


FIG. 2

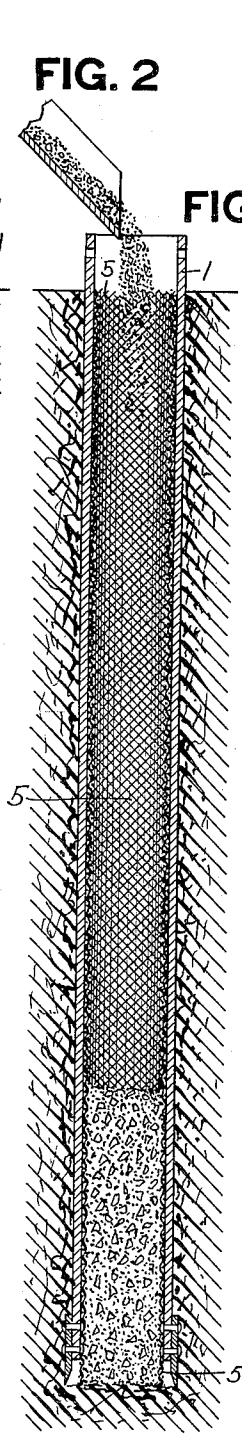


FIG. 3

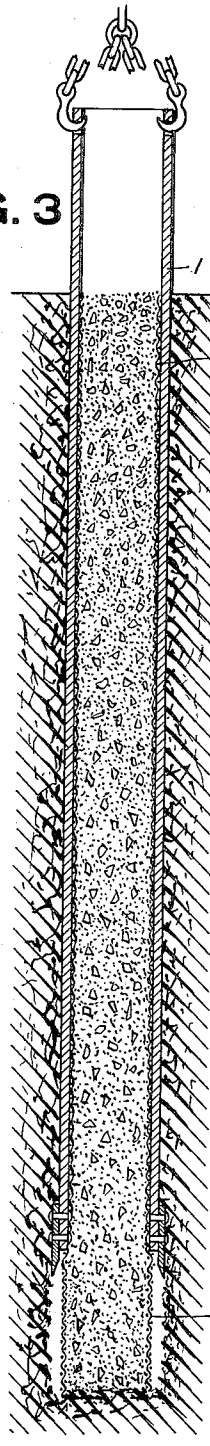
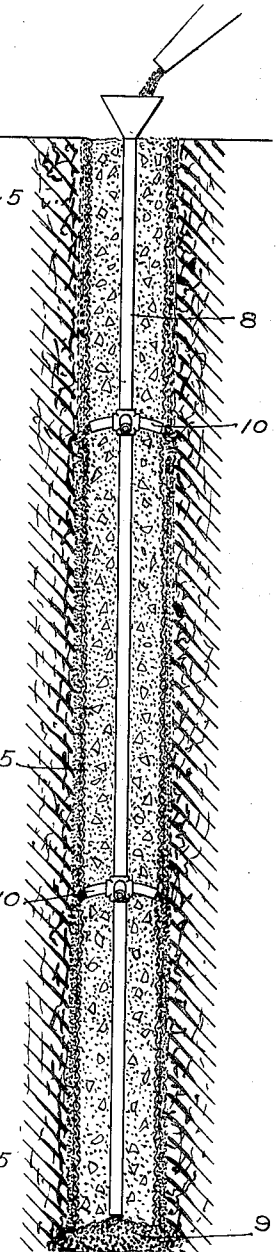


FIG. 4



WITNESSES.

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METHOD OF SINKING AND BUILDING CONCRETE PILES.

No. 822,588. Specification of Letters Patent. Patented June 5, 1906.

Application filed July 7, 1905. Serial No. 268,670.

To all whom it may concern:

Be it known that I, ROBERT A. CUMMINGS, a resident of Beaver, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Methods of Sinking and Building Concrete Piles; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to a method or mode of forming concrete or beton piles and the like.

The object of the invention is to simplify the manner of constructing piles *in situ*, so constructing the same that the casing or tube can be easily withdrawn, and providing a method whereby the piles can be placed close together and without danger of distorting or disturbing previously-constructed piles located in proximity to the one being constructed.

Various methods have been proposed for constructing concrete piles *in situ*. According to one method a tube with a closed end is first driven into the ground to form the opening and is then withdrawn, either bringing its closed end with it or leaving the latter in the bottom of the hole. This hole is then filled with concrete and the latter permitted to set. The difficulty with this method is that the driving of the closed-ended tube compacts the ground around the hole, not only making it difficult to drive the tube, but also forcing the ground sidewise against other previously-constructed piles in close proximity to the hole being driven, thus flattening and otherwise distorting the latter and endangering and disturbing the setting of the cement. It has also been proposed to sink into the ground an open-ended tube, remove the earth from the interior thereof, then fill the tube with concrete and afterward withdraw the tube, leaving the concrete in the hole formed. The difficulty with this method is that if the tube is entirely filled with concrete before it is withdrawn it is very difficult and practically impossible to withdraw it. On the other hand, if the tube is progressively withdrawn as the filling proceeds the concrete will have to be elevated to the upper end of the tube in order to be deposited into the same. With tubes for very long piles this involves much additional labor and hoisting apparatus.

My invention has for its object to overcome the foregoing defects.

It consists, briefly stated, in sinking an open-ended tube into the ground to the proper depth and removing the earth from the interior thereof, then placing in the tube a suitable inelastic envelop, preferably a porous flexible envelop, filling the concrete into but not around said envelop, and then withdrawing the tube and permitting the concrete to set. The envelop for the concrete prevents the latter from adhering to the interior of the tube so firmly as to make it difficult to withdraw the latter. At the same time the concrete may ooze out through the pores of the envelop and become thoroughly bonded to the surrounding earth.

The invention also comprises features of manipulation, which will be hereinafter more particularly described and claimed.

The drawings show in sectional elevation the mode of constructing the pile, Figure 1 showing the sinking of the tube; Fig. 2, the introducing of the concrete into the same; Fig. 3, the withdrawing of the tube, and Fig. 4 illustrates the formation of a bulb end or foot under the pile.

In carrying out my invention I employ a suitable tube or casing 1 of the necessary cross-sectional shape and area to form the desired pile. This tube is open at its lower end, as shown, and is sunk into the ground in any suitable manner, either by driving the same by suitable mechanism and then removing the earth from the interior thereof, or by removing the earth simultaneously with the sinking, so that little driving will be necessary. The particular mode to follow will depend upon the size of the tube and character of earth in which the same is to be sunk. In Fig. 1 I have illustrated the tube 1 being sunk into the ground and the earth 3 in the interior thereof being removed simultaneously with the sinking thereof by means of a water-jet from a pipe 4, pressure also being exerted on the tube to force it downwardly. Any other method of sinking the tube and removing the earth therefrom will answer my purpose. After this tube has been sunk to the required depth and the earth therein removed the concrete is introduced into the same. The manner of introducing the concrete forms the essentially novel step of my invention. This step is carried out in such a manner as to provide a suitable envelop inclosing the concrete and lying between the same and the inner face of the tube 1. The envelop may first be introductd into the tube and the

concrete then filled into the same, or the concrete may be filled into a suitable envelop at the surface and the mass thus formed introduced bodily into the tube. The former arrangement will be employed in building large piles and is shown in the drawings. The envelop or inner casing 5 is formed of any suitable material and is introduced into the outer tube 1. The concrete is then filled into the same in any suitable manner. With short small piles the concrete may be inclosed in an envelop either for the entire length of the pile or a section thereof and the inclosed mass then introduced into the outer tube 1.

The envelop may be of any suitable material which will serve to separate the concrete from the tube, so as to prevent it adhering to the latter. I have found metal mesh or coarse bagging or similar fabric, or even thin sheet metal or vertical metal strips or horizontal bands connected together to form a casing, entirely suitable for the purpose. Such envelop will lie between the tube 1 and concrete, and as it is practically inelastic it will prevent the concrete from adhering to the tube. As a consequence the tube may remain in the ground until filled entirely or nearly to its top, when it can be withdrawn with comparative ease. I do not wish to exclude, however, the progressive or intermittent withdrawal of the tube as the filling in of the concrete proceeds.

The envelop when formed of metal mesh or sheet metal and filled with concrete will be stiff, thus reinforcing the concrete against vertical loads and flexing and will also form a casing around the concrete and hold it from fracturing laterally, so that the pile is strengthened thereby. It may be in the form of a shell, so as to extend through water, such as when sinking the pile into the bottom of a body of water. It may be left in place, if desired.

If desired, a central or otherwise located tube 8 may be introduced during the building up of the column, so that afterward concrete or cement in a practically liquid state may be introduced through the same, so as to form a bulb end or foot 9 underneath the pile, as is now the custom. This pipe may have branches 10 extending out to the sides of the pile, so that the space between the pile and the walls of the hole can be filled with cement.

Various modes of procedure in carrying out this invention may be employed and various forms of material used for the envelop. I wish it understood, therefore, that the annexed claims are not to be limited beyond their terms by either the illustration or foregoing description. This method may also be applied in the construction of small piers and sections of wall and the like.

What I claim is—

1. The method of forming concrete and similar piles and the like which consists in sinking an open-ended tube into the ground, removing the earth from the interior of said tube, placing an inelastic envelop or casing in and close to the walls of said tube, then filling concrete into said envelop but not between the same and the tube, and finally withdrawing the tube.

2. The method of forming concrete and similar piles and the like which consists in sinking an open-ended tube into the ground, removing the earth from the interior of said tube, placing an inelastic flexible envelop or casing in and close to the walls of the tube, filling concrete into said envelop but not between the same and the tube, and withdrawing the tube.

3. The method of forming concrete and similar piles and the like, consisting in sinking an open-ended tube into the ground, removing the earth from the interior of said tube, placing an inelastic porous envelop or casing in and close to the walls of the tube, filling concrete into said envelop but not between the same and the tube, and then withdrawing the tube.

4. The method of forming concrete and similar piles and the like, consisting in sinking an open-ended tube into the ground, removing the earth from the interior of said tube, placing a flexible porous envelop in and close to the walls of said tube, filling concrete into said envelop but not between the same and the tube, and then withdrawing the tube.

In testimony whereof I, the said ROBERT A. CUMMINGS, have hereunto set my hand.

ROBERT A. CUMMINGS.

Witnesses:

F. W. WINTER,

ROBERT C. TOTTEN.