

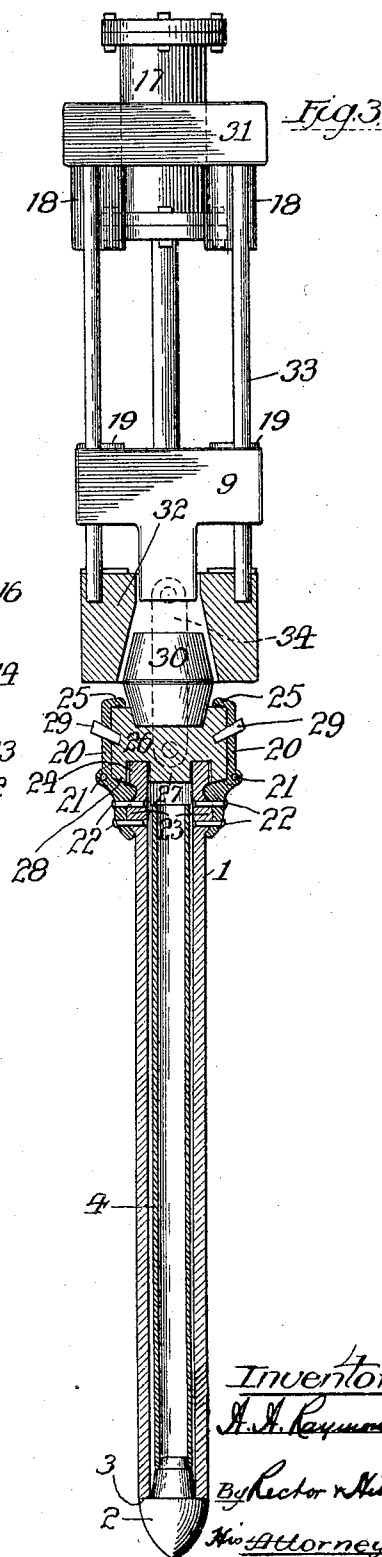
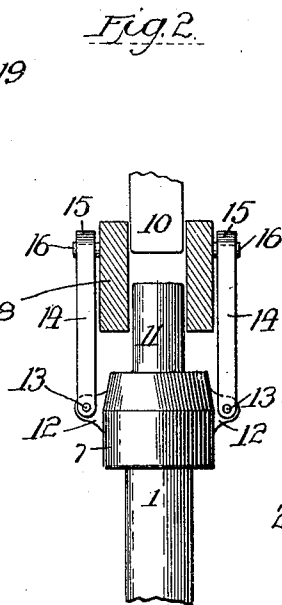
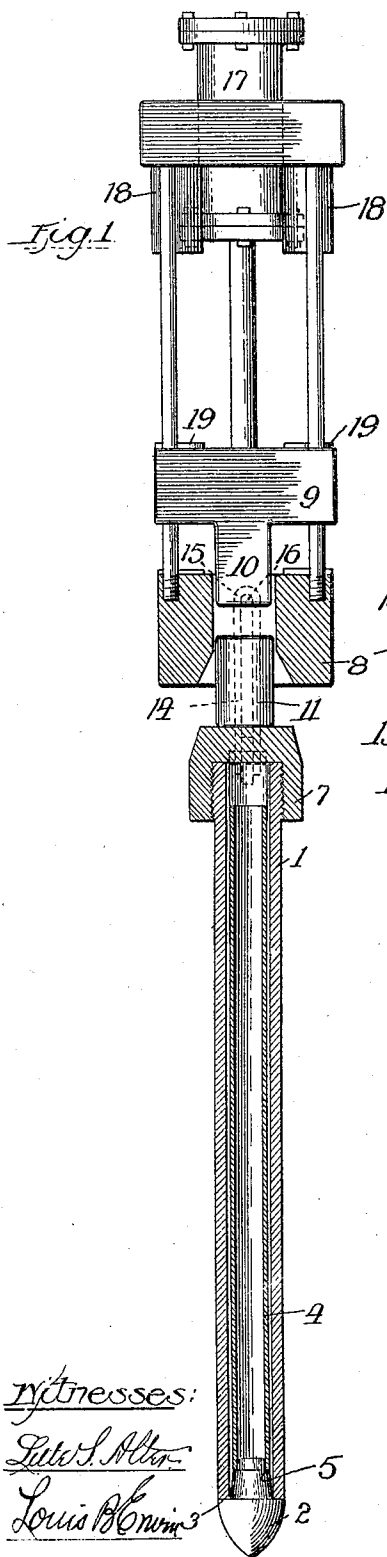
No. 806,838.

PATENTED DEC. 12, 1905.

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# METHOD OF AND MEANS FOR FORMING CONCRETE PILES.

APPLICATION FILED NOV. 30, 1903.



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## METHOD OF AND MEANS FOR FORMING CONCRETE PILES.

No. 806,838.

Specification of Letters Patent.

Patented Dec. 12, 1905.

Application filed November 30, 1903. Serial No. 183,195.

*To all whom it may concern:*

Be it known that I, ALFRED A. RAYMOND, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented a new and useful Method of and Means for Forming Concrete Piles, of which the following is a specification.

My invention relates to the formation of piles of the general character described in my prior patents, No. 589,026, dated August 31, 1897, and No. 700,707, dated May 20, 1902, and comprises a new method of and means for forming such piles.

In the practice of the methods disclosed in my patents aforesaid a core was employed for the purpose of driving or sinking a thin shell or pile-covering, which core was subsequently withdrawn, leaving in the ground the shell or pile-covering, which was filled with the proper filling material, such as concrete.

The present invention relates to a new method of sinking or driving the pile, which, as shown, consists in sinking a shell or covering which is to be filled with the concrete to form the pile, and, briefly stated, such method consists, as shown, in sinking or driving an outer shell or pipe within which is loosely arranged or inserted (either before or after such pipe is driven) the pile, formed by filling the shell or covering, such pile being somewhat less in diameter than the outer shell or pipe, with the result that the latter may after being sunk or driven to the required depth be withdrawn, leaving the pile-shell in the ground whether such shell be inserted in the pipe before or after the latter is driven. This pile-shell is filled with concrete or the like while the same is still aboveground and before being introduced into the ground, as described, or after the pile-shell, together with the pipe, has been introduced into the ground, as described, to the required depth and either before or after the pipe has been withdrawn, preferably before. When the pile-shell is filled while still aboveground, the weight of the concrete is taken advantage of to facilitate the driving or sinking of the pipe and shell.

In the accompanying drawings, Figure 1 is a section of my concrete pile-shell with the driving and clamping mechanism therefor shown in elevation; Fig. 2, a side elevation of the driving mechanism, on an enlarged scale as compared with Fig. 1, also showing a sec-

tion of the pipe and pile-shell; and Fig. 3, a view of a modified form of clamping mechanism.

As shown in the drawings, the outer pipe 1 is cylindrical and provided at its lower end with a detachable tip or shoe 2, which closes such lower end and constitutes a penetrating-point therefor. This pipe, which rests upon the outer shoulder 3 of such tip or shoe, is adapted to be driven or sunk in suitable manner, preferably by the mechanism resembling a pile-driver, as hereinafter described, to which such pipe is removably secured, as hereinafter made apparent.

The inner shell 4, which for convenience will be termed the "pile-shell" because the same subsequently envelops the pile, consists of a cylinder or pipe of suitable thin material, such as thin sheet metal, fiber, papier-mâché, or the like. This pile-shell is somewhat less in diameter than the outer pipe 1 and is adapted to be arranged or inserted therein as seen in the drawings, preferably fitting upon the second reduced shoulder 5 of the tip. However, as hereinbefore suggested, this pile-shell may be inserted after the pipe has been driven.

From the description thus far given it will be understood that after the tip 2 has been applied the pipe is driven or sunk in the ground in suitable manner and by proper appliances until the desired depth is reached, the pile-shell 4 being inserted in the pipe either before or after the latter is sunk. The pile-shell is thus introduced into the ground and is now ready to be filled with the concrete. The filling of this shell takes place at any one of the times already noted, and the pipe 1 is withdrawn by suitable means, (hereinafter described,) leaving the shell 4, which may at this time be filled with the concrete, to constitute the formed pile or not, according to the elected method practiced in this respect.

As a suitable and efficient means for driving the pipe into the ground and withdrawing the same, as above explained, I have illustrated a pile-driver mechanism and clamping mechanism coöperating therewith, which means will now be described.

The upper end of the pipe 1 is externally screw-threaded to engage the internal screw-threads of a cylinder or sleeve 7, closed at its top and screwing upon the pipe to form a driv-

ing-cap. The pile-driver frame 8, in which the hammer 9 reciprocates, is brought into close relation with the driving-cap during the driving operation, as shown in the drawings, in order that the striker 10 of such hammer may deliver its blows upon a wooden plug 11, resting upon the driving-cap, and thereby transmit such blow to the pipe. The driving-cap is provided in the present instance on opposite sides with lugs 12, forming bearings for pins 13. On these pins are hinged or pivoted clamping-arms 14, whose free ends 15 are adapted when swung vertically to engage or hook over pins 16 in the frame 8 of the pile-driver, with the result that the driving-cap, as well as the pipe 1, is clamped to the pile-driver mechanism. When it is desired to unclamp such parts, the clamp-arms 14 are unhooked, whereupon the latter may be used by the workmen as handles by which to unscrew the driving-cap from the pipe for any purpose—as, for instance, to enable the pile-shell to be inserted in case it is elected to insert the same after the pipe is driven into the ground or to add another section of pipe.

The driving mechanism proper may be substantially of the usual and well-known construction and of the steam pile-hammer type in which the hammer 9 is actuated by steam-pressure by means of a piston (not shown) connected thereto and traveling in a cylinder 17 in the driver-frame 8.

In the operation of withdrawing the pipe I prefer to utilize the striking power of the hammer in addition to the upward pull which can be exerted upon the entire hammer or driver frame in the well-known manner, and to this end I adapt the driver to deliver blows upwardly against downwardly-projecting portions 18 on the frame or head which carries the cylinder, the hammer being provided on its upper face with driving-blocks 19, arranged to strike such projections. By these means the pipe can be quickly and easily withdrawn from any character of soil.

For convenience in illustration and description I have shown a single section of pipe and pile-shell; but it will be understood that any practical length of pile can be attained by simply securing section upon section to the pipe until the desired depth in the ground is reached and by inserting therein a pile-shell made or built up to the desired length.

As a modified form of means for driving the pipe into the ground and withdrawing the same, as above explained, I have in Fig. 3 illustrated another pile-driver mechanism and clamping mechanism coöperating therewith, which means will now be described.

The modified form of clamping mechanism consists of two or more hinged catches 20, (two being used in the present instance,) which comprise two arms hinged together at 21. The lower arm of each catch, which is secured to the pipe in suitable manner, as by

rivets 22, is reversely curved on its inner face to snugly fit and embrace ribs or curved projections 23 of the pipe and also to fit underneath the marginal flange 24 thereof, all as clearly indicated in Fig. 3. The upper arm of each catch has a hook-shaped end 25 to engage the upper end of a driving-cap 26, which fits upon the upper end of the pipe and transmits thereto the blows of the pile-driver. As shown, the lower side or face of this driving-cap has an annular recess 26, thereby forming a central portion 27, fitting into the pipe, whereby the cap is centered and also forming a marginal flange 28, fitting down alongside the upper end of the pipe. In order to aid in securing the catch and driving-cap together and to transmit some of the pressure in the withdrawing operation, I provide pins or bolts 29, passing through the upper arms of the catch and entering the body of the cap. The upper face of the driving-cap is countersunk to partially receive the usual wooden plug 30, upon which the blows of the hammer are delivered. The driving mechanism may be of suitable construction to attain the desired results, and in the present instance the same consists of the usual steam-pile-hammer construction having the frame 31 and hood 32, connected thereto by parallel side bars 33, together with the usual cylinder and hammer. The hammer delivers its blows upon the wooden plug 30, as will be understood from an inspection of the drawings, and thereby causes a driving of the outer pipe 1 into the ground. The driving-cap is pivoted to the driver-hood 32 in suitable manner, as by the parallel links 34, with the result that such cap, in effect, constitutes a part of the driving mechanism and is withdrawn at the same time as such mechanism; but as the pipe 1 is clamped to the driving-cap, as hereinbefore explained, such pipe is also withdrawn with the cap, whereby the inner pile-shell and the tip or shoe 2 will be left in the ground. In the withdrawing operation I may utilize the upward striking power of the hammer in the manner already referred to.

From the foregoing description it will be understood that my method broadly considered is not to be limited to any particular sequence of steps so far as the time of inserting the pile-shell or pipe or the time of filling such shell to constitute the pipe proper are concerned, and the claims for such method are therefore to be interpreted accordingly, except those claims which expressly state the time or sequence of such steps in the method.

I claim—

1. The method of forming concrete piles consisting in sinking an outer shell or pipe, inserting an inner shell therein, filling such inner shell with a suitable filler, and withdrawing the outer shell or pipe.

2. The method of forming concrete piles consisting in sinking an outer pipe provided

with a tip or shoe at its lower end, inserting an inner shell in the pipe, filling such shell with a suitable filler, and withdrawing the pipe leaving the shell and tip in the ground.

3. The method of forming concrete piles consisting in sinking an outer pipe, inserting an inner shell therein, filling such shell with concrete, and withdrawing the pipe after the shell has been filled.

4. The method of forming concrete piles consisting in simultaneously sinking a pipe and a pile-shell contained therein, filling such inner shell with a suitable filler, and withdrawing the pipe.

5. The method of forming concrete piles consisting in sinking a pipe provided with a detachable tip to form a cavity in the ground inserting a pile-shell in the pipe, withdrawing the pipe without the tip and shell, and filling the shell with concrete or the like.

6. The method of forming concrete piles consisting in sinking a pipe provided with a detachable tip, to form a cavity in the ground inserting in the pipe a separate pile-shell of less diameter than the pipe, withdrawing the pipe without the shell, and filling the latter with concrete or the like.

7. The method of forming concrete piles consisting in simultaneously sinking a pipe and a pile-shell contained therein, withdrawing such pipe without the inner shell, and filling the latter with concrete or the like.

8. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, and a driving-cap removably secured to such pipe and adapted to transmit the force of the hammer-blows to the pipe.

9. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, and a driving-cap mounted on such mechanism and arranged to screw upon said pipe, said cap being arranged to transmit the force of the hammer-blows to the pipe.

10. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, a driving-cap arranged upon the upper end of the pipe and adapted to transmit the hammer-blows thereto, and catches for removably securing the cap to the driver mechanism.

11. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, a driving-cap arranged upon the upper end of the pipe and adapted to transmit the hammer-blows thereto, and pivoted catches secured to the pipe and adapted to engage the driver mechanism for holding the cap thereto.

12. The means for forming concrete piles

comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, a driving-cap arranged upon the upper end of the pipe and adapted to transmit the hammer-blows thereto, and catches hinged to said cap and adapted to engage the driver mechanism.

13. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, a driving-cap removably secured to the upper end of the pipe and adapted to transmit the hammer-blows thereto, and catches hinged to said cap and adapted to engage the driver mechanism.

14. The means for forming concrete piles comprising an outer shell or pipe by which an inner shell is to be sunk or carried into the ground, pile-driver mechanism, a driving-cap arranged upon the upper end of the pipe and adapted to transmit the hammer-blows thereto, pins on the driver mechanism and catches hinged to the cap and arranged to engage said pins.

15. The means for forming concrete piles comprising an outer pipe 1, an inner shell arranged therein, a tip or shoe 2 having an annular shoulder on which the shell rests and having a larger annular shoulder on which the pipe rests, and means for driving and withdrawing the pipe.

16. The means for forming piles comprising an outer pipe adapted to be driven or sunk into the ground, a tip or shoe fitting upon the lower end of the pipe, and an inner shell arranged within the pipe and adapted to be filled with concrete or the like and to form an outer covering therefor.

17. The means for forming piles comprising an outer pipe adapted to be driven or sunk into the ground, a tip or shoe fitting upon but loosely carried by the lower end of the pipe whereby such pipe may be withdrawn therefrom, and an inner shell within the pipe and adapted to be filled with concrete or the like and to form an outer covering therefor.

18. The means for forming piles comprising an outer pipe adapted to be driven or sunk into the ground, a tip or shoe fitting upon but loosely carried by the lower end of the pipe whereby such pipe may be withdrawn therefrom, and an inner shell within the pipe and adapted to be filled with concrete or the like and to form an outer covering therefor, said shell resting upon the tip or shoe, whereby the latter forms the lower end of the completed pile when the shell is filled.

19. The method of driving piles, consisting in sinking an outer shell or pipe, inserting a pile within said outer shell, and withdrawing said outer shell or pipe.

20. The method of driving concrete piles, consisting in sinking an outer shell or pipe, inserting a formed concrete pile therein, and withdrawing said outer shell or pipe.

21. The method of driving concrete piles, consisting in simultaneously sinking an outer pipe or shell and a formed concrete pipe contained therein, and then withdrawing said  
5 outer pipe or shell.

22. The means for sinking piles, comprising a pipe adapted to receive within itself a formed pipe having a maximum external diameter less than the minimum internal diameter of said shell, mechanism for driving  
10 ameter of said shell, mechanism for driving

said outer shell into the ground, and a tip or shoe fitting upon but loosely carried by the lower end of the outer shell, said tip or shoe having a portion adapted to support the formed pile within said outer shell.

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