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PROCESS FOR PRODUCING COMPOSITE PILES.

APPLICATION FILED MAR. 17, 1921.

1,409,422. Patented Mar. 14, 1922.

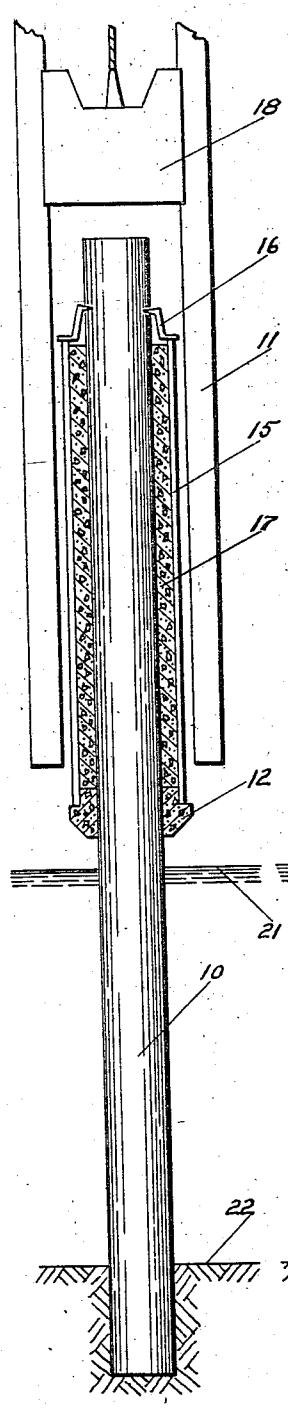


Fig. 1.

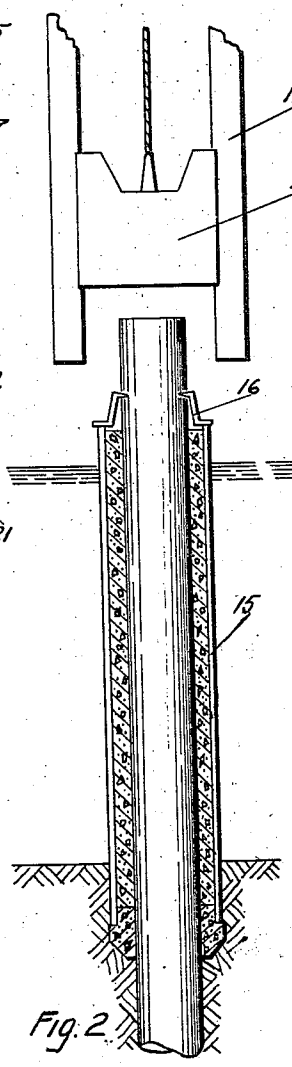
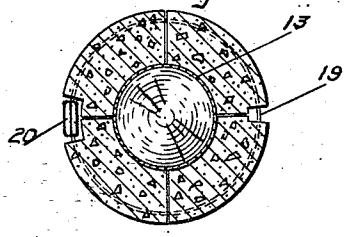


Fig. 2.

Fig. 5.



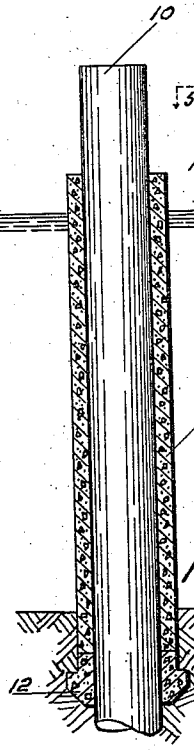


Fig. 3.

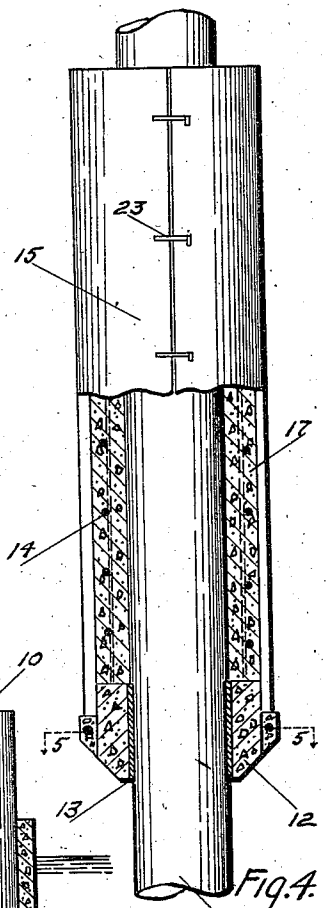


Fig. 4.

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PROCESS FOR PRODUCING COMPOSITE PILES.

1,409,422. Specification of Letters Patent. Patented Mar. 14, 1922.

Application filed March 17, 1921. Serial No. 453,149.

To all whom it may concern:

Be it known that we, HARRY E. SQUIRE and HENRY NEWSON, citizens of the United States, and residents, respectively, of the city of Oakland, county of Alameda, State of California, and the city and county of San Francisco, State of California, have invented a new and useful Improvement in Processes for Producing Composite Piles, of which the following is a specification.

Our invention relates to processes for producing composite piles of the type comprising a wooden core and an outer casing of concrete designed to protect the core from the attacks of marine borers.

It has been the practice heretofore to produce such piles either by casting the concrete coating on the core while on land, or by pouring the concrete while in a plastic state into a form or mould placed about the core after it is driven in place.

Although it is possible by the use of the first mentioned process to produce the grade of concrete necessary to withstand the disintegrating effects of salt water, still the method is not practical because of the great cost occasioned by the labor and care required in handling and driving, due to weight and danger of breakage, and because of the delay and loss of time caused by the necessity of allowing the concrete coating to set and harden on land for thirty to forty-five days before handling is possible.

While some of the difficulties attendant upon the first process mentioned above are eliminated in the second one mentioned, still the second method is subject to an even more serious difficulty, namely that of the practical impossibility of so casting the concrete about the pile when driven in place in the water as to secure with certainty and uniformity a grade of concrete, particularly near the bottom end thereof and at the mud line, which will resist the disintegrating effects of salt water. This result is due to the fact that the property of concrete which makes it resistant to sea water is density and imperviousness to percolation of water. This property can rarely if ever be obtained with certainty and uniformity under the conditions above mentioned because to do so it is necessary to eliminate all excess water from the concrete while in its plastic state and subject it to thorough tamping or other treatment to secure compactness. Experience has shown that forms placed in the water about driven piles can rarely be made to prevent the admission of excess water to the plastic concrete within the form, particularly at the bottom end thereof, and moreover it has been found quite impracticable to properly tamp the plastic concrete while in such forms, especially when reinforcing members are used within the form. Thus by the second method the dense, impervious grade of concrete required to withstand salt water cannot be obtained.

The principal object of the present invention is to solve the above indicated difficulties by providing a process of applying the concrete coating to the core which will not only be economical and expeditious, but will also produce a coating composed of concrete which will have the peculiar qualities necessary to resist the disintegrating effect of salt water. Further objects of the invention will appear hereinafter.

The foregoing objects are accomplished by placing a suitable removable form about the core while still above water, closing said form at the bottom by a collar secured to the core and arranged to fit within and to support and seal the lower end of the form, pouring concrete in a plastic state into said form while still above water, and then striking the pile with a pile driver hammer thereby compacting the concrete and driving the pile. Thus excess water is excluded from the plastic concrete by means of the closed form and by the fact that said concrete is poured while above water. Moreover, by subjecting the plastic concrete to the thorough tamping caused by the impact of the piledriver hammer upon the upper end of the core, a great deal of the water originally contained in the concrete is worked out and a remarkable degree of compactness and density obtained.

A preferred method of carrying out the invention is exemplified in the following description and illustrated in the accompanying drawing in which—

Figure 1 is a front elevation of a pile about to be driven into place, the form and coating being shown in cross-section.

Figure 2 is a similar view of the pile when driven into place.

Figure 3 is a similar view, the removable

form having been taken off after the concrete coating has set.

Figure 4 is an elevation of the lower end of the form, the lower portion thereof being broken away to show a cross-section of the form and contents.

Figure 5 is a cross-sectional view on line 5—5 of Fig. 4.

In carrying out the invention, a core 10 is first set in the pile driver leads 11 and partially driven as shown in Figure 1. A supporting collar 12 having its upper outer edge recessed to receive a casing or form 15 is then secured to core 10 above the water line 21. Collar 12 is preferably made of concrete and formed in a plurality of segments as shown in Figure 5, which are held together by one or more iron bands or bolts 19 passing through the segments and having one or more nuts or turnbuckles 20, whereby said band or bolt may be tightened in a manner to cause the segments of the collar to firmly clamp the core 10. To increase the effectiveness of the connection of collar 12 to core 10 we employ a seal of plaster of Paris 13 applied between the inner side of collar 12 and the core 10.

The position of collar 12 on core 10 depends entirely upon the length of concrete coating which it is desired to apply to the core 10, its position preferably being such that when the pile is driven into place the collar and the end of the casing will be at the desired distance below the mud line 22.

A removable form 15, which may be either cylindrical as shown, or of any other desired shape, is placed about core 10, its lower end being fitted into the recess in the upper edge of collar 12. Form 15 may be of any desired material. Suitable reinforcing members 14 having been placed about core 10 before the placing of form 15, concrete 17, in a plastic condition is then poured into form 15, while said form is still above water. Z-shaped dogs 16 are then driven into core 10, their lower arms bearing on the upper edge of form 15 in a manner to hold it in place. Blows from hammer 18 are now applied to the upper end of core 10, driving same into place at the same time compacting concrete 17 by the successive impacts thus given to it, and shaking out of it all excess water. It is to be noted that by means of the effective sealing of the bottom of form 15 provided by collar 12 and plaster of Paris 13, no sea water or mud of any kind is admitted to the form to impair the quality of concrete 17.

Once core 10 is thus driven into place and concrete 17 has set, form 15 may be left in place as part of the total structure, but said form is preferably made removable so as to be used over and over again. The form 15 may be made removable in any well known manner, as by constructing it in two longitudinal halves as shown in Fig. 4, said halves being held together by any suitable fastening means such as that shown in conventional form at 23. Form 15 should only be removed after concrete 17 has set, thus leaving the core 10 with a coating of thoroughly compacted concrete extending from below the mud line to above the water surface.

In situations where it would be desirable to place core 10 in position by jetting—that is by the common practice of using a stream of water at the end of core 10 to displace the bottom and admit the pile, the compacting of concrete 17 may be accomplished by impact directed against the sides of form 15 while above water, said impact being delivered by blows from a hammer, or any suitable means.

When it is desired to place extra long piles, it is found to be more convenient to cast the concrete coating in sections,—that is, after one section of coating has been applied as described above, the same process is repeated on the same core directly above the coating already cast, the upper end of the previously cast section fulfilling the function performed by collar 12 in the casting of the first section.

Having thus described our invention: what we claim as new and desire to secure by Letters Patent is:

1. The method of casting a protective coating on piles which consists in placing the coating material while in a plastic state, in a form about the pile above water, and driving the pile while said coating material is still plastic.

2. The method of casting a protective coating on piles which consists in placing the coating material while in a plastic state in a form about the pile, and compacting said coating by blows applied to the pile.

3. An apparatus for applying a coating of concrete to piles, during driving which comprises a removable form surrounding said pile, the lower end of said form being closed and supported upon a collar comprising a plurality of segments clamped to said pile, and means at the upper end of said form to secure said form to the pile, said means being arranged to permit the admission of plastic concrete between the form and the pile.

4. The method of casting a protective coating on piles which consists in placing the coating material while in a plastic state in a form about the pile above water before driving, sealing the lower end of the form, and compacting the coating material by the impact caused by the driving of the pile.

5. The method of producing a composite pile having a wooden core and a concrete casing which consists in placing the concrete in a plastic state in a form about the

pile above water and driving the pile into place, thereby compacting the plastic concrete.

6. The method of producing a composite pile which consists in placing concrete in a plastic state in a form about a wooden core, closing the space between the lower end of the form and the wooden core, and then driving the core with the form containing the plastic concrete into position.

7. The method of applying a protective coating of concrete to a pile, which consists in securing a collar to the pile, placing a form about said pile with its lower end closed by and supported upon said collar, filling said form with plastic concrete, and striking said pile in a manner to simultaneously drive same and compact the concrete in the form.

8. The method of applying a protective coating of concrete to a pile, which consists in securing a collar to the pile placing a form about said pile with its lower end closed by said collar, filling said form with plastic concrete, and striking said pile in a manner to simultaneously drive same and compact the concrete in the form.

9. The method of applying a protective coating of concrete to a pile during driving which consists in securing a collar to the pile, placing a form about said pile with its lower end closed by said collar, arranging reinforcing members between the pile and the sides of said form, filling said form with plastic concrete, then driving the pile.

10. The method of placing a composite pile which consists in partially driving a wooden core in place, securing a collar to said core above the water line, placing a form about said core with its lower end closed by said collar, filling said form with plastic concrete, then driving said core until the collar contacts with the material into which the pile is being driven.

11. An apparatus for applyng a coating of concrete to a pile which comprises a form surrounding the pile removable means to secure said form to said pile, and means to close the space between the lower end of said form and the pile, said means comprising a collar composed of a plurality of segments of concrete, a band cast in said segments, and a turnbuckle in said band at the opposite side of said collar.

12. In an apparatus of the character described, a concrete collar composed of segments, and means to clamp said segments together for the purpose described.

13. An apparatus for applying a coating of concrete to a pile during driving which comprises a form surrounding the pile, removable means to secure said form to said pile and prevent movement of said form relatively to said pile, and means to close the space between the lower end of said form and the pile, said means comprising a collar composed of a plurality of segments and means to clamp all of said segments against the pile in a manner to secure the collar to the pile.

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