May 17, 1927. 1,629,103

F. S. HONBERGER

PROTECTED CONCRETE PILE AND METHOD OF MAKING SAME

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Fig. 1.

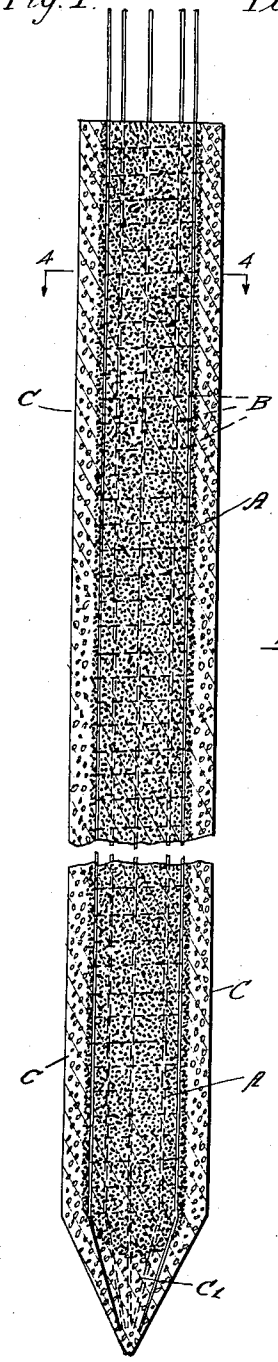


Fig. 2.

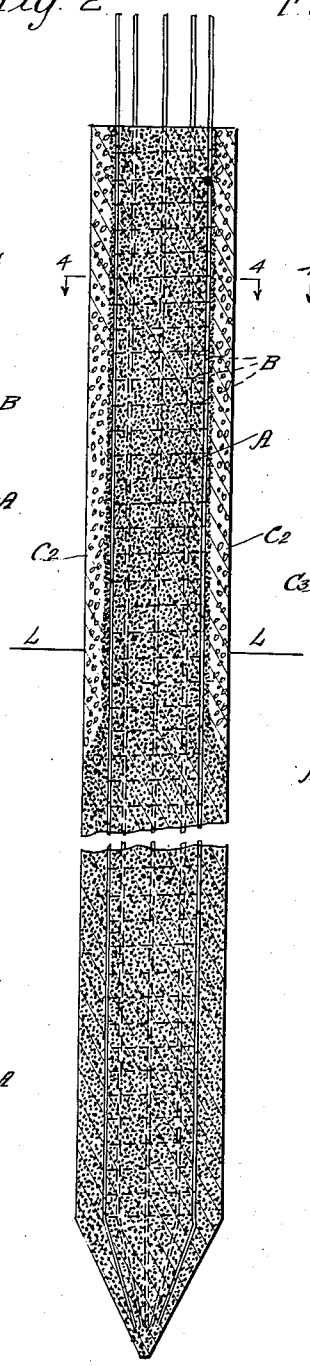


Fig. 3.

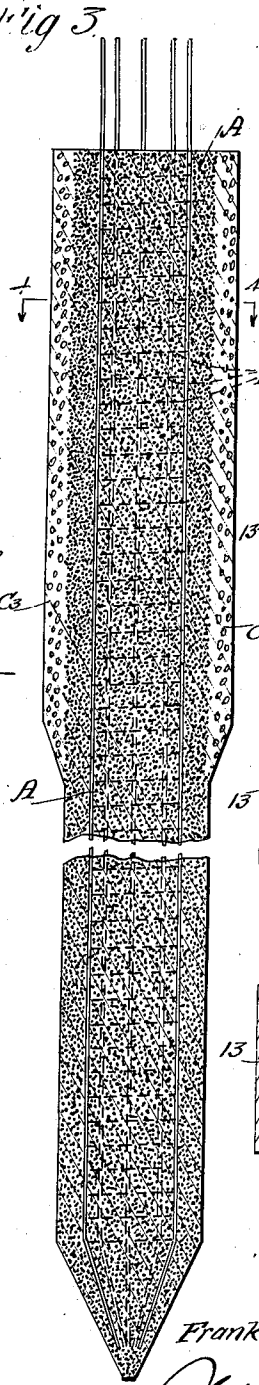


Fig. 4.

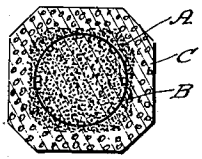


Fig. 5.

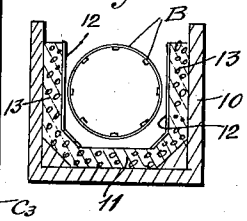


Fig. 6

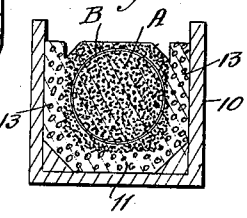
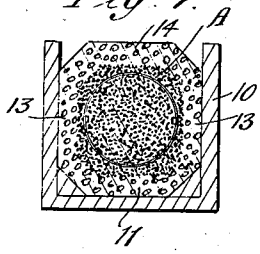


Fig. 7.



Inventor
Frank S. Honberger.

Attorney.

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F. S. HONBERGER

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Fig. 8.

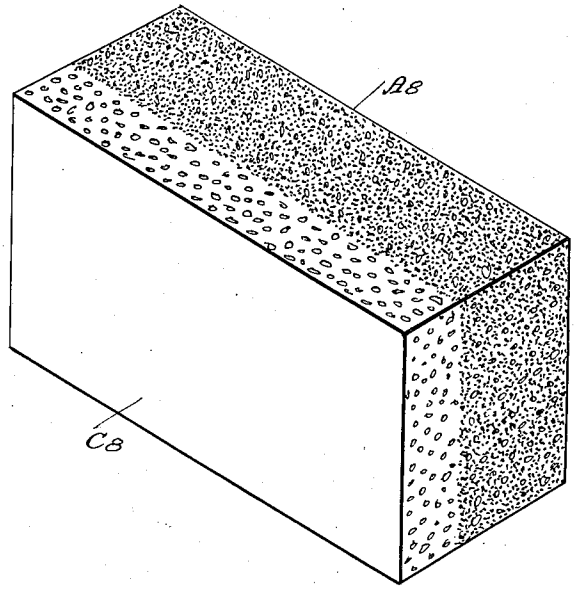


Fig. 9.

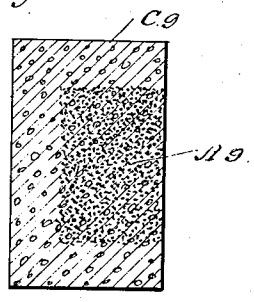
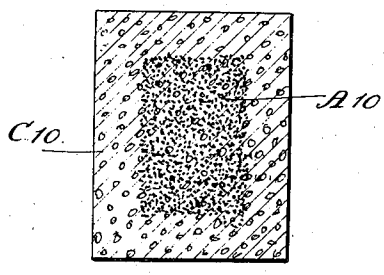


Fig. 10.



Inventor.
Frank S. Honberger.

Attorney.

Patented May 17, 1927. 1,629,103

UNITED STATES PATENT OFFICE.

FRANK S. HONBERGER, OF LOS ANGELES, CALIFORNIA.

PROTECTED CONCRETE PILE AND METHOD OF MAKING SAME.

Application filed August 28, 1926. Serial No. 132,073.

This invention has to do with the art of making an impregnated concrete article, impregnated for instance with a substance that renders the concrete water proof and immune to chemical or other deteriorative action of sea water. Although the invention in its more particular and specific aspects applies to piling, yet in its broadest aspects it may apply to other articles, such for instance as blocks for the formation of a sea wall, or blocks for the formation of other structures where it is desired to make a concrete block or other article of maximum strength and at the same time to protect it against entry of moisture. This application however is directed particularly to piling and the like in its specific aspects; a companion application filed on even date herewith, Serial No. 132,074, entitled Protected concrete block for paving and the like, is specific to blocks or slabs or similar articles; the broader claims generic to all forms being presented in this present application.

A description of the invention as applied to piling will make the invention itself most clearly understood, and therefore I elect to make a part of this specification a description of an improved concrete pile and the method of making such a pile.

I have had issued to me the following Letters Patent: Number 1,555,209 dated September 29, 1925, for method of treating concrete, Number 1,555,208 dated September 29, 1925 for method of and apparatus for treating concrete, which set out methods whereby concrete piling has successfully been made and impregnated to a sufficient depth to protect it and make it immune to the action of sea water. However, it has been found that in order successfully to impregnate such a pile to a desired depth from the surface, the pile must be made initially of concrete having an appreciable porosity, if the impregnation action is to be done within a reasonable length of time.

For concrete structures where maximum strength is required, the specifications usually call for concrete of comparatively great denseness; and this is usually true of specifications for piling. This invention aims to provide a pile or other article composed mainly of dense concrete, or of concrete that meets the requirements of strength or other characteristics regardless of porosity or lack of porosity, and at the same time to provide a pile that can be easily and economically impregnated to proof it against water or other deteriorating action. Generally speaking I accomplish the objects of my invention by providing a pile or other article with an interior main body of concrete that conforms to the desired specifications (usually a concrete of comparatively dense mix) and an outer sheathing or envelope of comparatively porous concrete susceptible of easy and quick impregnation. The extent to which this outer sheathing of relatively porous concrete covers the inner main body of the pile or other article will depend upon the circumstances, as is more fully set forth in the following detailed specification. And to make my invention most plain, I illustrate several different forms of concrete articles in the accompanying drawings, to which reference is now had and in which:

Fig. 1 is a longitudinal central section of one form of concrete pile in accordance with my invention;

Figs. 2 and 3 are similar views of other specific forms of piling;

Fig. 4 is a cross section of any of the forms of the first three figures, said section being taken on line 4—4 of the first three figures;

Figs. 5, 6 and 7 are sectional views illustrating method of casting such a concrete pile;

Fig. 8 is a perspective illustrating a form of protected block in accordance with my invention; and

Figs. 9 and 10 are cross sections illustrating variant forms of concrete blocks.

In Fig. 1 a main interior body A of concrete is shown provided with the usual reinforcements B; and around the main body A there is shown an enveloping sheath or envelope C of concrete that is particularly amenable to impregnation. Usually the interior main body A will be of relatively dense concrete—of a concrete designed to be as strong as possible or practicable. The external envelope C on the other hand will usually be of a concrete having a substantial degree of porosity, just as the concrete mixture for the main interior body A will usually have been proportioned to give a dense concrete of greater physical strength. Although I say that these comparative characteristics will usually obtain, as between the main concrete body and the sheath, and although I will herein refer to the inner body being of comparatively dense concrete, that

is not necessarily specifically the situation in all cases. Generally speaking, the main interior body may be of concrete of any characteristics desired for any particular use; and the specifications for the main interior body may be laid down without any regard whatever to porosity or lack of porosity. On the other hand, the concrete of the exterior sheath must be so formed as to have a substantial degree of porosity in order to be quickly and economically impregnated.

In Fig. 1, I show the exterior sheath C enveloping the whole length of the pile and also forming the driving point of the pile, the sheath being thickened around the point as shown at C^1 so that if a small portion of the point be broken away in driving, the interior unimpregnated body A will not be exposed. On the other hand, in Figs. 2 and 3 I show an exterior sheath C^2 or C^3 that does not extend the whole length of the pile, but only envelops that portion of the pile that may be always above the water line. It has been found that the deterioration in concrete piling, or at least the maximum deterioration, takes place in those parts of the pile that are alternately subjected to water and air, in other words, in those parts of the pile that are above the lowest water level or the mud line. Thus in some instances the sheathing C^2 need only extend to a point below the lowest water level or mud line indicated at L in Fig. 2. In Fig. 2 the complete pile is shown of uniform diameter throughout, whereas in Fig. 3 the interior main body A is shown of uniform diameter throughout, the sheathing C^3 projecting out beyond the diameter of the body A. These three specific forms will give an idea of the physical arrangements whereby my invention may be incorporated in piles.

The piles are so formed that the interior dense body and the exterior porous sheathing are in fact one monolithic piece of concrete, although of different mixture. A practical way of forming such a pile is illustrated in Figs. 5 to 7. For instance, a casting box 10 is used of proper size and of proper interior configuration, and in it the reinforcing rods are put in position as illustrated in Fig. 5. Then in the bottom of the box a layer 11 of the sheathing concrete is first laid; and then by using removable forms 12, layers of the sheathing concrete are laid at 13 at the sides of the box. As soon as the concrete 13 has been placed, and usually tamped, then the removable forms 12 are taken away and the whole space between the two parts 13 is filled with the concrete of the main body A, in the proper specifications as required for that main body. Preferably when this concrete A is put in place it is tamped or otherwise forced into place so that in contact with the concrete of parts 11 and 13, it becomes completely bonded with those parts so that upon setting the whole mass of concrete forms a monolithic concrete body, although different parts of it are of different mixtures. Immediately after the concrete A has been placed, an upper layer 14 of sheathing concrete is poured and tamped, or otherwise forced, into the position shown in Fig. 7; and when the several parts of concrete have then all set together, a complete monolithic pile is formed. In this complete pile the reinforcements B may be either located in the interior dense main body or in the exterior sheathing, or in both. The particular placement of the reinforcements is of no concern so far as my present invention goes.

After the pile, physically formed as above described, is finished, it is then impregnated in the manner described in the above identified patents. The impregnating process involves fundamentally the drawing in or forcing under pressure, of heated liquid asphalt or other impregnating and protecting substances into the interstitial spaces of the concrete to fill those interstitial spaces and thus make the concrete entirely fluid proof. In the present form of pile it is only the exterior sheathing that is to any great extent impregnated with asphalt. The comparatively dense main body A may be to a certain extent impregnated; but in the average case, where a very dense and strong concrete is used, the impregnation of the main body A in the short time needed for complete impregnation of sheathing C will be more or less negligible. On the other hand, in some cases the specification for main concrete body A may be such that incidentally that body may be substantially porous, and in that case the main body may be impregnated to some substantial depth, both in its surface that may not be covered by sheathing C and in its surface under the sheathing C. Thus the finished pile is characterized by having the interior concrete body that may or may not be impregnated, but characteristically not impregnated to any substantial degree; and the facing or sheathing of comparatively porous concrete that is impregnated with an impregnating and protecting substance such as asphalt. The finished pile thus has all of the characteristics required in engineering practice—characteristics such as great crushing and bending strength—and also is thoroughly and completely protected against the action of sea water or other fluid.

Fig. 8, I illustrate the application of my invention to a concrete block or slab such as may be used for a sea wall or pavement, or any other structure. Here there is a main body A^8 which may be of dense concrete or of concrete having the desired physical characteristics regardless of porosity; and

a facing or sheathing C^8 of comparatively porous concrete impregnated with asphalt or other suitable impregnating and protection substances. Using a block of the form shown in Fig. 8, the impregnated face may be the outer facing of a sea wall or other structure, or the face of a paving block that is exposed to traffic abrasion, and can carry the traffic loads. On the other hand, the block may be formed as shown in Fig. 9 with a body A^9 surrounded by a porous impregnated sheathing C^9 that extends around all faces of the block except the back face; or as is shown in Fig. 10, the impregnated sheathing C^{10} may extend completely around and completely enclose the interior body A^{10}. Various other physical forms will occur to those skilled in the art, for use for such structures as I have herein indicated, or for use for other structures, and such blocks and slabs and their uses are more particularly set out in my said companion application, they only being mentioned here to indicate that in its broader aspects my invention is not limited to piling.

I claim:

1. A protected concrete body, comprising a main body of relatively dense concrete, and a concrete facing formed integrally with said body, said concrete facing being relatively porous and having its interstitial spaces filled with a protective substance.

2. A protected concrete body, comprising a main body of relatively dense concrete, and a concrete facing formed integrally with said body, said concrete facing being relatively porous and having its interstitial spaces filled with asphalt.

3. A protected concrete body, comprising a main inner body of comparatively dense concrete, and a surrounding sheating formed integrally with said main body and of comparatively porous concrete said concrete sheathing having its interstitial spaces filled with an impregnating substance.

4. A protected concrete body, comprising a main inner body of comparatively dense concrete, and a surrounding concrete sheathing formed integrally with said main body and of comparatively porous concrete and having its interstitial spaces filled with asphalt.

5. The herein described method of forming a protected concrete body, that includes forming an inner body of comparatively dense concrete and forming an outer sheathing integrally with said body and of comparatively porous concrete; and then impregnating the porous concrete of the sheathing with an impregnating substance to fill its interstitial spaces.

6. The herein described method of forming a protected concrete body, that includes an inner body of comparatively dense concrete and forming an outer sheathing integrally with said body and of comparatively porous concrete; and then impregnating the porous concrete of the sheathing with asphalt to fill its interstitial spaces.

7. The herein described method of forming a protected concrete body, that includes forming an inner body of comparatively dense concrete and forming an outer sheathing integrally with said body and of comparatively porous concrete; and then subjecting the whole body to a liquid impregnating substance such as heated liquid asphalt and causing the asphalt to be forced under pressure into and fill the interstitial spaces of the porous concrete of the sheathing.

In witness that I claim the foregoing I have hereunto subscribed my name this 23d day of August, 1926.

FRANK S. HONBERGER.