

J. C. BLACK & J. F. EATON.

CONCRETE INCASED PILE.

APPLICATION FILED JUNE 3, 1907. RENEWED OCT 31, 1908.

910,453.

Patented Jan. 19, 1909.

Fig 1

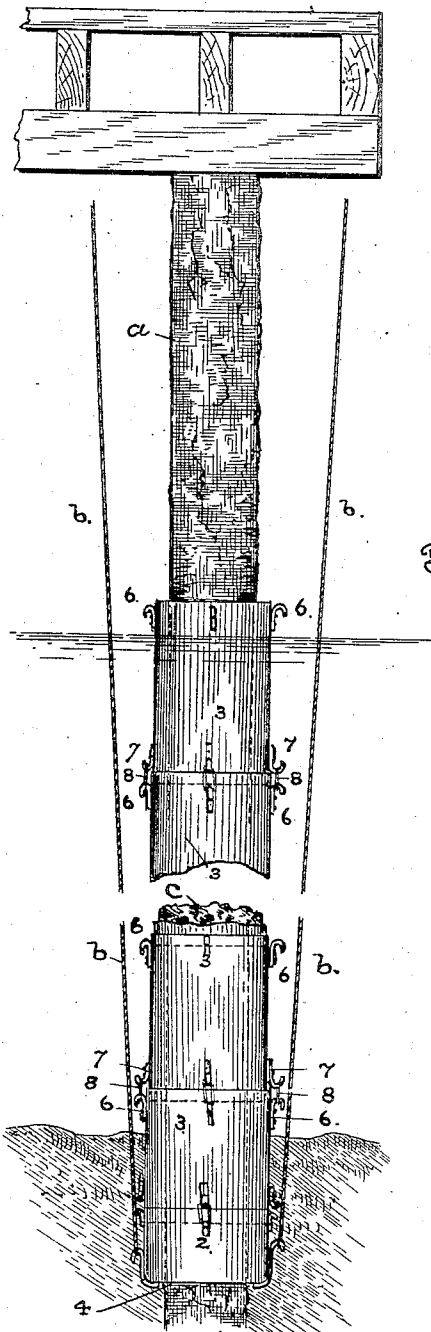


Fig 2

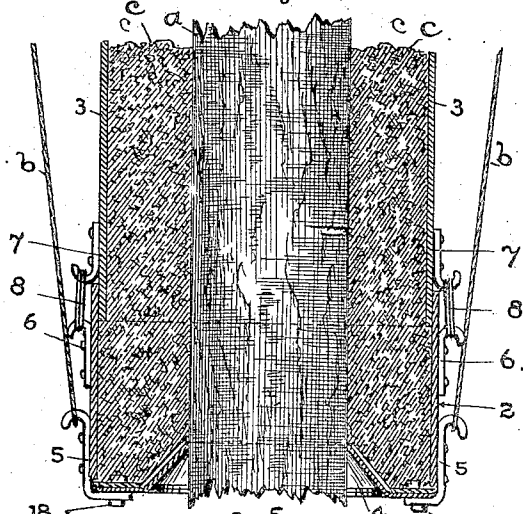


Fig 3

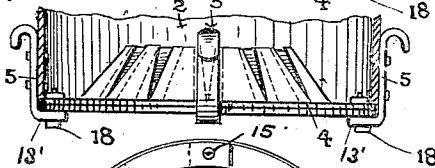


Fig 4

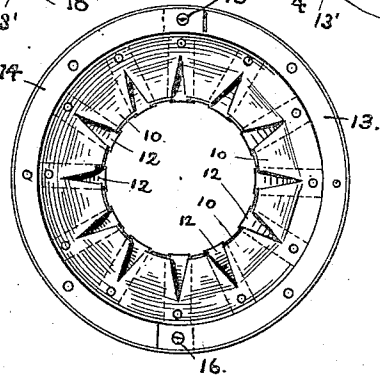
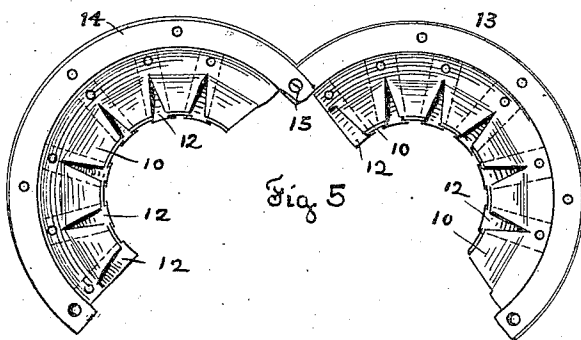


Fig 5



Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN C. BLACK AND JAMES F. EATON, OF POINT RICHMOND, CALIFORNIA.

CONCRETE-INCASED PILE.

No. 910,458.

Specification of Letters Patent.

Patented Jan. 19, 1909.

Application filed June 3, 1907, Serial No. 377,005. Renewed October 31, 1908. Serial No. 460,548.

To all whom it may concern:

Be it known that we, JOHN C. BLACK and JAMES F. EATON, citizens of the United States of America, residents of Point Richmond, county of Contra Costa, and State of California, have invented new and useful Improvements in Concrete-Incased Piles, of which the following is a specification.

This invention relates to improvements made in covering the submerged portion of a wooden pile with concrete, as a means of protecting the wood from the ravages of destructive marine animals, such as the ship-worm.

The improvements comprising the said invention embrace an extensible metallic shoe adapted by its form to surround the pile and inclose an annular space between the shoe and the pile when it is placed in position, and an adjustable diaphragm of novel construction on the bottom of the shoe, for closing the bottom of the space between the shoe and the pile. In connection with these parts a casing of variable length composed of a plurality of tubular casing-sections and fastening-devices for attaching and securing each section to the next as they are placed in position over the pile, constitutes a means for increasing the length of the shoe and thereby surrounding the pile for the desired length with a casing to confine and retain in position thereon a body of concrete-mixture as a protective covering. The diaphragm is of such construction that it adapts itself to variations in the diameter of the pile and in the contour of the surface, so as to close the opening at the bottom of the annular space in which the concrete-mixture or composition for the covering is placed. With the shoe and the extensible casing is combined means for maintaining it in position; with the top end above the surface of the water while the operation of forming the concrete covering is being carried on; and also for lowering the shoe and casing from time to time as the annular space is filled, in order to carry the covering down upon the pile.

The object of the invention is to facilitate the labor of forming a protective covering of concrete upon the submerged portion of a pile, or other similar support, after it has been driven in place; and particularly to enable the concrete covering to be carried down into the mud or bottom in which the

pile is driven, and from that point upward to any desired height above the water-line. 55

The nature of our said invention and the manner in which we proceed to apply and carry out the same is explained at length in the following description, in which reference is had to the accompanying drawing wherein 60 is illustrated a driven pile, or support under a wharf, incased by a concrete jacket or covering applied in accordance with the said invention, and with the extensible metallic casing shown in section.

Figure 1 illustrates a driven pile having its submerged portion protected by a concrete covering of our invention; the middle portion of the pile and the covering being broken away to reduce the size of the figure. Fig. 2 is a vertical section, on an enlarged scale, through the shoe and its diaphragm or expanding bottom; representing a portion of the pile and the jacket or covering between the pile and the shoe. Fig. 3 is a side-elevation of the diaphragm with the shoe in section. Fig. 4 is a plan or top-view of Fig. 3. Fig. 5 is a top-view of the diaphragm as it is opened for placing it in position on the pile. 75

In covering a driven pile according to this invention the portion of the pile to be covered, as indicated at *a*, is surrounded by a tubular, metallic casing in diameter somewhat larger than the pile to be covered, and placed over it so as to inclose an annular space around the pile. Into the upper end of the casing, which is supported or maintained above the water-level for that purpose, a concrete-mixture *c* is poured in to fill the inclosed space from the bottom to the top, and thereby surround the pile with a concrete jacket or covering. 85

A novel feature of the casing consists in a diaphragm or expanding bottom 4 on the shoe or lowest section 2, which is adapted by its construction to close the bottom of the annular space between the pile and the surrounding shoe to a sufficient extent to retain the concrete-mixture, and at the same time to slide on the pile and allow the shoe and the casing to move downward on the pile with the confined concrete, under the weight of the parts. 100

In connection with the movable shoe 2 and its diaphragm 4 is an extensible casing composed of separate tubular sections 3 con- 105

nected end to end, and provided with means for fastening the top-end of one section to the lower end of the next section as they are added one after another. The top end of the casing is thus maintained above the water-line during the work of filling in the space between the pile and the casing with the concrete, and of carrying the covering down over the entire submerged portion and into the mud.

Provision is made for keeping the casing from slipping down on the pile while it is being filled with the concrete; and for allowing it to descend on the pile from time to time as additional sections are to be added, by placing hooks 5 on the shoe or lowest section 2, and temporarily securing thereto wire-ropes *b*, which may be carried up to the top of the pile and fastened thereto; or to the structure supported by it.

By this means the casing and the concrete filling are lowered down to the bottom as the work proceeds, until the covering is formed around the pile from the mud or bottom in which the pile is driven, up to a point above high-water mark, or to such additional height as the conditions may call for. The pile is usually incased below the mud by allowing the casing and its contents to sink into the mud, as illustrated in Fig. 1.

In the operation of forming and placing the concrete by filling the casing from above and allowing it to move down on the pile, the concrete-mixture is employed in a dry state; and the water necessary to effect the chemical action and combination between the ingredients of the mixture is obtained from the surrounding body of water, which is admitted through the joints and crevices of the shoe and the casing in sufficient quantity to produce the required effect upon the material. This feature of using and applying the materials of the concrete-mixture in a dry state is of important advantage in allowing the casing and its contents to readily move downward by gravity. It also tends to produce a close fit and adhesion of the concrete covering to the irregularities in the surface of the pile and its variations in diameter.

The bottom of the shoe is of such character that it will fit closely around the pile and close the annular space at the bottom; at the same time it will yield and move down on the pile under the weight of the load, when the ropes *b* are slackened. The construction of this yielding bottom, or diaphragm, which we have illustrated in the drawing is found well-adapted for the purpose. It has, besides, the desired qualities of simplicity and low cost of manufacture in its favor. After being set and fixed in this manner, the metallic casing is allowed to remain in position on the pile indefinitely after the concrete has become hard; and being thus used, it will be obvious that the construction of the shoe and

the additional casing-sections should be as inexpensive as practicable, in order to reduce as far as possible the expense of protecting a pile.

The shoe 2 consists of two semicircular sections 13 and 14 pivotally united together at one end by a pin 15 and arranged to engage with the lower edge of one of the metallic casing sections 3, as indicated in Fig. 1. Each section is provided at its lower edge with an inturned flange 13' on which rests the diaphragm. This diaphragm, which closes the opening between the lower end of the shoe and the pile, consists of two semicircular sections 4—4 secured to the upper surface of the flanges 13', 13' by screw bolts 18, as indicated in Fig. 3. When it is desired to place a shoe in position it is spread open, as indicated in Fig. 5, and placed around the pile and the free ends thereof are then brought together and secured by a pin or screw 16. The inner edge of the diaphragm is slit in radial directions to form a series of tongues 10 which are bent upwardly at an angle. These fingers are adapted to yield so that the diaphragm will conform to the shape and size of the pile, and thereby form a bottom to the shoe and retain the cement within the casing.

Each half or part of the shoe is correspondingly formed of a semi-circular disk of sheet-metal with a semi-circular opening in the center of smaller radius than the pile, and with slits at intervals apart on lines of equal length running radially from the open center outward to within a short distance of the circumferential edge.

The triangular spaces between the tongues 10 are closed by strips 12 placed against the under side of the tongues, so as to overlap the adjacent edge thereof; and the strips 12 are fastened in place by rivets. The outer edges of the slitted metal are inserted between the semicircular plates 13—14 and fastened by screws or rivets. The two parts composing the diaphragm are attached together by the hinge-joint 15 at one side, and by the bolt 16 passed through the overlapped ends of the semicircular plates at the opposite side, after the diaphragm is placed around the pile.

The lowermost section or shoe 2, and each section 3, is provided with means for fastening the upper end of one to the lower end of the next section; such as the hooks 6 having downwardly turned ends on each section near its top end, and the hooks 7 with upwardly turned ends similarly fixed on the section near its lower end. By tying and winding short lengths of wire 8 around the hooks on the adjoining ends of two sections after being placed together, they are readily drawn together and fastened.

The hooks 5 on the shoe to which are attached the supporting-ropes are turned in-

wards at the bottom, as shown in Figs. 2 and 3, to take under the circular rim of the diaphragm 4, and are secured to the shoe or lowest section by fastenings, such as bolts and nuts 18.

Having described our invention, what we claim and desire to secure by Letters Patent, is:—

1. In a protective covering for a pile, or similar structure wholly or partially submerged, the combination of an extensible casing composed of separate tubular sections, a shoe, and a diaphragm at the bottom of the shoe adapted to close the opening between the pile and the bottom of the shoe, and having the quality of accommodating itself to the irregularities and the variations in the pile.

2. In a protective covering for a driven pile, or similar structure, a metallic casing composed of separate tubular sections which are adapted to carry up the height of the casing to maintain the same above the water-line, an expansible diaphragm at the bottom of the lowest casing-section adapted to close the annular space between the pile and the surrounding casing at the bottom; and means

for sustaining the weight of the casing from above and for lowering the same on the pile as the length of the casing is increased by the added casing-sections.

3. In a protective covering for a pile, the combination of a shoe comprising two sections, each of said sections having a wall extending perpendicularly, a diaphragm formed of two sections to close the lower end of the shoe secured to the sections thereof, and a casing arranged to engage with the upper end of the shoe.

4. In a protective covering for a driven pile, the combination of a casing arranged to surround the pile, a shoe at the lower end of said casing comprising two semicircular sections hinged together at one side, means for connecting the shoe and casing together, and a diaphragm at the lower end of the shoe comprising a series of yielding fingers arranged to close the space between the shoe and the pile.

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Witnesses:—

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