

Dec. 9, 1952

B. C. GERWICK

2,620,633

PILE CONSTRUCTION

Filed July 26, 1948

FIG. 1 FIG. 2 FIG. 3

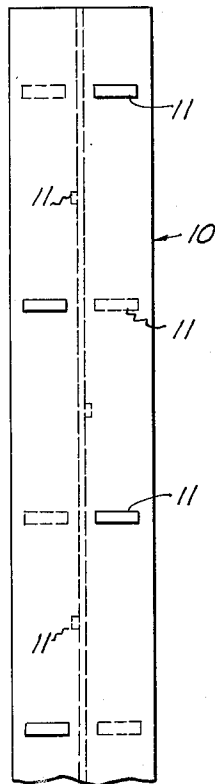
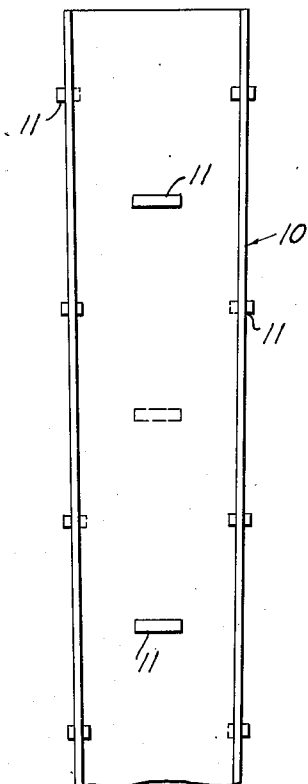
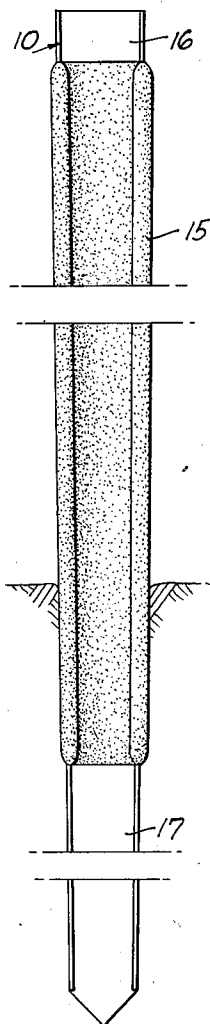


FIG. 5 FIG. 6

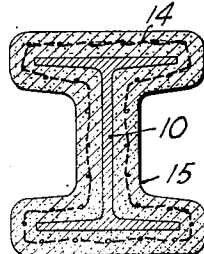
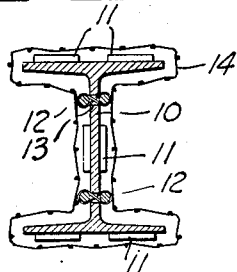
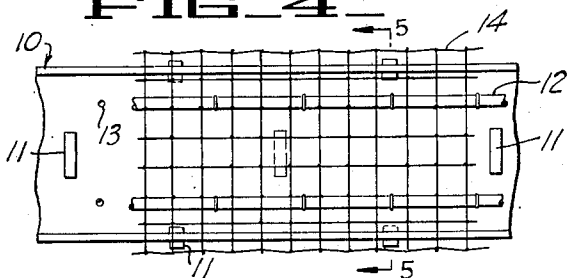


FIG. 4



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2,620,633

PILE CONSTRUCTION

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Application July 26, 1948, Serial No. 40,675

1 Claim. (Cl. 61—54)

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This invention relates generally to the construction of piles such as are used in the building of docks or wharfs, bulkheads, trestles, foundation structures and the like.

In the past wood-concrete piles have been successfully constructed consisting of a conventional wood pile jacketed with reinforced concrete. The concrete is generally applied by what is commonly known as the Guniting method, in which a relatively dry mix of Portland cement and coarse sand is conveyed pneumatically through a flexible conduit and discharged through a manually directed nozzle.

Cold rolled structural steel sections have been employed in place of wooden piles, but their use has been limited because of corrosion, erosion and electrolysis. Bitumastic coatings have been used to protect the steel, but have not been entirely satisfactory, because the bitumastic can be readily scraped, scoured, or knocked off during handling and driving.

It has been thought impossible to apply a practical concrete jacket about structural steel members, due to the difficulties involved in securing a proper bond between the steel and the concrete, and in preventing breakage or cracking of the jacket during driving.

It is a general object of the present invention to provide a concrete-steel pile construction which is capable of being driven in a wide variety of formations and conditions, without causing any cracking, breakage or spalling off of the concrete jacket.

Another object of the invention is to provide a concrete-steel pile which is relatively resistant to erosion and electrolytic or other forms of corrosion.

Additional objects of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a side elevational view illustrating a concrete pile construction incorporating the present invention.

Figure 2 is a detail in side elevation showing a structural steel member being prepared to receive a concrete jacket, and having shear lugs applied to the same.

Figure 3 is a view like Figure 2 looking towards the right-hand side of the latter.

Figure 4 is a fragmentary detail illustrating a structural steel member with reinforcing netting applied about the same and ready for the concrete jacketing operation.

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Figure 5 is a cross-sectional view taken along the line 5—5 of Figure 4.

Figure 6 is a fragmentary cross-sectional detail showing a pile after the concrete jacketing has been applied.

My concrete pile is constructed from a standard structural steel shape, such as an H beam, to which elements are applied as by welding, to take shear stresses between the jacket and the steel member. Spacing members are also secured to the steel member, as by welding, and then suitable wire reinforcing mesh is applied. As finally applied in preparation for the concreting operation, the netting is spaced a substantial distance from the surfaces of the structural member, so that when the concrete is finally applied the reinforcing occupies a medial position in the concrete wall. A suitable concrete mixture is then applied as by the Guniting method previously described. After a proper thickness of the concrete has been applied over all surfaces of the steel member, it is properly cured and the completed pile is now ready for use.

Figures 2 and 3 of the drawing illustrate the H-shaped structural steel member 10, which is being prepared to receive the concrete jacket. Shear members 11 are shown applied to the web and flanges of the member 10 at regular intervals as illustrated. The dimensions of these shear lugs may vary in different instances, but in any event a substantial shoulder should be provided, extending laterally of the pile. For example in practice lugs 3 inches long, 1 inch wide, and 1/2 inch thick were applied to the web and flanges by welding. The concrete jacket applied over this type of lug was about 2 inches thick. Shear lugs so dimensioned provided abrupt shoulders extending at right angles to the length of the structural member, and projecting 1/2 inch from the adjacent surfaces of the flanges and web. A staggered pattern in applying the lugs can be followed as illustrated in Figures 2 and 3.

In addition to the shear lugs 11 it is desirable to apply suitable spacing members in preparation for applying the reinforcing mesh. For this purpose reinforcing bars 12 of a proper diameter can be secured to the web of the structural member, or simple metal lugs of a suitable height can be used. Such spacer members can be secured as by tack welding, or reinforcing bars as illustrated can be secured to the web by tie wires extending through the holes 13.

In order to insure a good bond between the concrete and the surfaces of the structural steel member 10, it is desirable at this point to clean

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and roughen the surfaces of the structural member. This can be carried out by conventional sand or shot blasting. While this can be done after the reinforcing netting is applied, it is preferably carried out before applying the netting, in order to avoid unnecessary cutting away of any galvanizing or other protective coating which may be applied to the netting.

Wire reinforcing netting 14 is now applied over the structural member, taking care to bend the same somewhat as illustrated in Figure 5 to maintain a substantial constant spacing between the netting and the adjacent surfaces of the structural member. This netting can be suitably attached to the spacing members 12 as by wiring or tack welding.

After preparing the structural member as described above, the concrete mix is applied by the Guniting method previously mentioned. Sufficient of the concrete mix is applied to provide a continuous jacket about the structural member of desired uniform thickness. The spacing of the netting 14, and the thickness of the concrete jacket, should be such that the netting occupies a position substantially midway of the thickness of the jacket, when the pile is complete (see Figure 6). Care should be taken to apply a dense impervious layer of the concrete, and after its application it should be suitably cured to insure proper hardness and strength without cracking. Thus the surface of the concrete can be kept continuously wet with water for a period of several days after its application, or one may apply a suitable type of membrane sealing compound.

The completed pile is illustrated in Figure 1. It will be noted that the concrete jacket 15 terminates to expose an upper end portion 16 of the structural member 10, and likewise a lower driving portion 17 of the structural member is exposed. After the pile is in place the concrete jacket should extend well below the water table level, or below the mud line where the pile is used for marine structures. After driving, the upper exposed end portion 16 of the structural member can be capped to facilitate the support of an overlying structure.

In some instances, however, it may be desirable to form a completed pile in which the concrete jacket covers the entire structural member 10.

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Concrete-steel piles constructed as described above have proven remarkably effective, both in resisting impacts and shocks during driving, and resisting various types of erosion and corrosion, including electrolysis. Thus in one instance a pile constructed as described above was driven to the point of refusal, and then struck an additional 1500 blows, without in any way injuring the bond between the concrete and the structural member, and without causing cracking. The jacket effectively protects the steel structural member from electrolysis, and from various types of corrosion such as is caused by salt water spray, and it effectively resists impacts and scouring such as is experienced in handling and driving operations and scouring from sand in rivers and on beaches.

I claim:

In a concrete-steel pile construction, a structural steel H beam member having web and flange portions, a plurality of shear lugs attached to the flanges and web of said beam, said lugs providing shoulder faces each extending for a substantial distance at right angles to the length of the member, spacer members attached to said member, reinforcing wire netting applied about the beam and bent to conform substantially to the cross-sectional contour of the beam, and a concrete jacket imbedding said shear lugs, said spacing beams, and said reinforcing, said jacket having a cross-sectional contour corresponding generally to the cross-sectional contour of said beam.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
847,516	Schroeder	Mar. 19, 1907
1,042,802	Koetitz	Oct. 29, 1912
1,119,066	Chamberlain	Dec. 1, 1914
2,082,960	Kinninger	June 8, 1937
2,187,316	Greulich	Jan. 16, 1940
2,340,176	Cueni et al.	Jan. 25, 1944

FOREIGN PATENTS

Number	Country	Date
504	Great Britain	1906