R. A. CUMMINGS.

CORRUGATED CONCRETE PILE.

APPLICATION FILED DEC. 16, 1909.

1,041,035. Patented Oct. 15, 1912.

FIG. 2

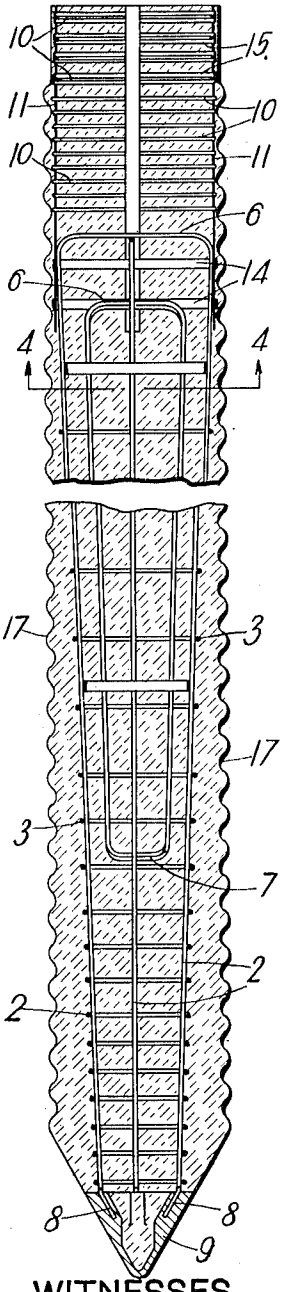


FIG. 5

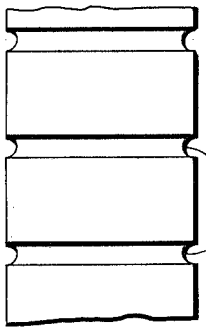


FIG. 6

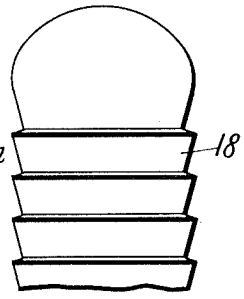


FIG. 1

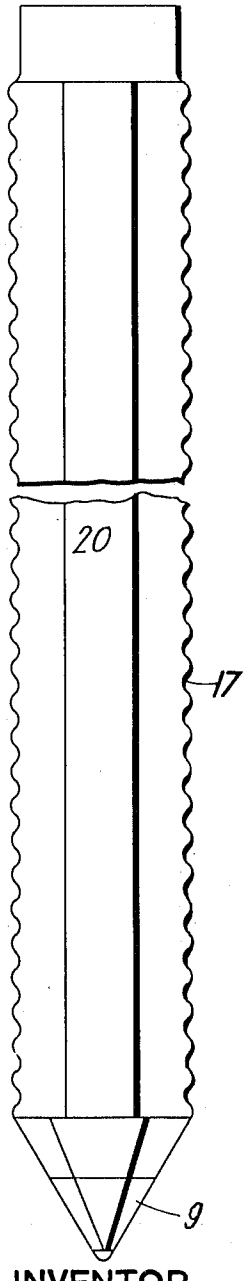
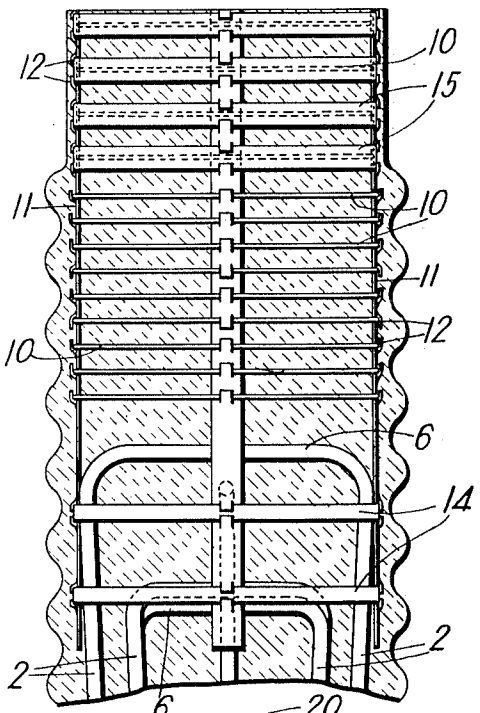


FIG. 3



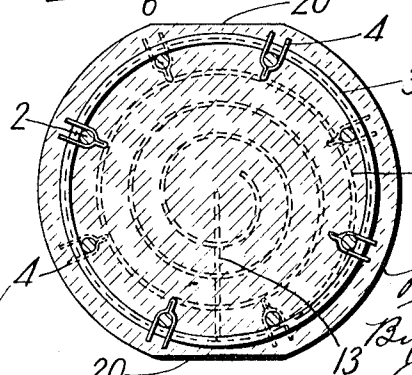


FIG. 4

WITNESSES

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CORRUGATED CONCRETE PILE.

1,041,035. Specification of Letters Patent. Patented Oct. 15, 1912.

Application filed December 16, 1909. Serial No. 533,452.

To all whom it may concern:

Be it known that I, ROBERT A. CUMMINGS, a resident of Beaver, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Corrugated Concrete Piles, of which the following is a specification.

This invention relates to piles and similar structures which are generally driven in the ground by concussive blows and support a load mainly by the frictional action of the earth thereagainst, and more particularly to reinforced concrete piles.

The principal object of the invention is to provide an improved pile which has firm bearing in the soil and is therefore capable of carrying a heavy load, and is provided with metallic reinforcement to strengthen the same.

The invention comprises the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings Figure 1 is a side view of a pile constructed according to this invention, the intermediate portion being broken out; Fig. 2 is a vertical section of the same; Fig. 3 is a vertical section showing the metal reinforcement in the upper end of the pile on an enlarged scale; Fig. 4 is a horizontal section on the line 4—4, Fig. 2; and Figs. 5 and 6 are side elevations showing modified forms.

The pile has its main body formed of cement, concrete, or similar cementitious material in which are embedded metallic members which are entirely covered by the cementitious material. The metallic reinforcement in the main is similar to that shown in my application filed September 27, 1909, Serial No. 519,859. As shown it comprises vertical reinforcing bars 2 which in number and size are chosen to suit the particular pile. The drawings show eight round rods arranged in four pairs, the two members of each pair being diametrically opposite each other. These longitudinal bars are connected at intervals by means of endless bands or hoops 3, also shown as formed of round rods and preferably have their ends welded together to form jointless endless hoops or bands which encircle the longitudinal bars and are secured thereto in any suitable way, preferably by means of a metallic clip or connecting member 4 such as shown in my Patent No. 879,148. A spiral wrapping may be used in place of the hoops. The longitudinal reinforcing members are securely anchored at both ends to the body of cementitious material. As shown, this is accomplished at the upper ends by joining together the ends of two oppositely arranged bars by means of transverse or diametric portions 6. At their lower ends some of these bars are also joined together by transverse or diametrical portions 7, so that each pair of vertical bars with their transverse connecting portions form endless loops. The other vertical bars at their lower ends may be suitably joined as by welding to short pieces of bars 8 anchored in casting 9 forming a shoe or protector for the lower end of the pile. The reinforcement so far described is similar to that shown and described in my application aforesaid, and except for the shoe 9, is also claimed in my application aforesaid. The pile at its upper end is also provided with special transverse reinforcements to take care of the horizontal tension strains induced in the cementitious body by hammer blows and to absorb the shock of the blows without serious injury to the pile, several forms of such reinforcements being shown in my application aforesaid.

The special transverse reinforcement forming the subject-matter of the present application is shown in the form of spiral bands 10 placed at suitable intervals apart in the cementitious material and held properly spaced apart by longitudinal spacing bars 11 which have tongues 12 punched out of the same for engaging the spiral bands 10. The outer ends of these spiral bands may be turned inwardly as at 13, to assist in holding the inner spirals in place or this may be twisted over and connected to the outside ring. The spacing bars 11 are suitably secured to the upper ends of the vertical reinforcing members 2 and are held in place by bands or hoops 14 surrounding said spacing bars. Preferably a number of the upper transverse spirals are surrounded by bands or hoops 15 which are also held in position by the spacing bars 11.

The pile or column on its exterior is provided with substantially horizontal corrugations or grooves. Figs. 1 and 2 illustrate the column provided for its entire length with external horizontal wavy corrugations 17. These corrugations may ex-

tend either straight around the column or slightly spiral thereto, or if desired the spirals may run in opposite directions. In any event, the corrugations should be substantially horizontal, that is to say, their angle to the axis of the column should always be more than 45 degrees. Instead of wavy corrugations I may use some angular corrugations or ribs, as shown at 18, Fig. 6, and instead of having the corrugations close together they may be spaced considerable distances apart as at 17ª, Fig. 5. These corrugations preferably are formed the entire length of the pile, but in any event will be for a substantial length of the pile and at the upper end thereof, or that portion of the pile which may be located in the strata of the earth whose resistance is greatest.

In driving the pile the earth is crowded to the side and compacted, and tends to press or settle inwardly against the pile. It therefore enters the grooves around the pile and exerts a very strong resistance against further sinking of the pile. The inward pressure of the earth is, of course, resolved into components, one of which is normal to the curved or inclined surfaces of the corrugations and assists very strongly in preventing downward movement of the pile. Consequently, the pile has greater stability and will carry a heavier load than the usual smooth piles. In order that the pile sink farther it is necessary to shear off the portions of the earth or soil projecting into the grooves in the surface of the pile. Such shearing off is effectively resisted and particularly if considerable spaces are provided between the corrugations, as illustrated in Fig. 5.

The pile may have the corrugations extend entirely around the same, or only partly around the same. In molding the pile it is desirable to have the same rest upon a sill and this leaves a flat side 20 on the pile, and a flat face is formed on the opposite side to make a symmetrical cross-section. The particular pile illustrated has the two flat sides.

The top of the upper end of the pile is specially reinforced to withstand the battering of a hammer in driving, and if desired the pile may be provided with a specially rounded head shown in Fig. 6, so as to give a greater area to distribute the force in driving. This head as well as the specially reinforced part may be either a part of the pile, or separate from and molded to the pile, and preferably will be fitted into a cap which receives the driving blow. The pile is shown as of uniform diameter from end to end. If desired, the lower end may be slightly enlarged to form a penetrating head to form a hole slightly larger to make the driving of the pile easier.

What I claim is:

1. An artificial pile or similar structure adapted to be driven by concussive blows, comprising a body of cementitious material, transverse reinforcing members embedded in the upper end thereof and placed sufficiently close together to reduce surface fracture, longitudinal reinforcing bars also embedded therein and having their upper ends securely anchored in the cementitious material, a protecting cap or shoe at the lower end of the pile, some of the longitudinal bars having their ends rigidly secured to said cap or shoe, and bars for spacing said transverse members apart, said bars being secured to said longitudinal bars.

2. An artificial pile or similar structure adapted to be driven by concussive blows, comprising an integral solid body of cementitious material, transverse reinforcing members embedded in the upper end thereof and placed sufficiently close together to reduce surface fracture, longitudinal reinforcing bars also embedded therein united rigidly at their upper ends across the body of the cementitious material, and a protecting cap or shoe at the lower end of the pile, some of said longitudinal bars being rigidly secured to said cap or shoe, and bars for spacing said transverse members apart, said bars being secured to said longitudinal bars.

3. An artificial pile or similar structure adapted to be driven by concussive blows, comprising a body of cementitious material, a series of transversely arranged metal reinforcements embedded in the upper portion thereof and spaced sufficiently closely together to reduce surface fracture, longitudinal spacing bars connected to said transverse reinforcements, and hoops surrounding the said spacing bars and secured thereto adjacent to the transversely arranged reinforcements.

4. An artificial pile or similar structure comprising a body of cementitious material, and a series of transverse reinforcing members embedded therein and spaced sufficiently closely together to reduce surface fracture, said transverse reinforcing members each comprising a spiral band or rod of metal having the turns lying in substantially the same plane.

In testimony whereof, I have hereunto set my hand.

ROBERT A. CUMMINGS.

Witnesses:
F. W. WINTER,
JAS. L. WELDON.