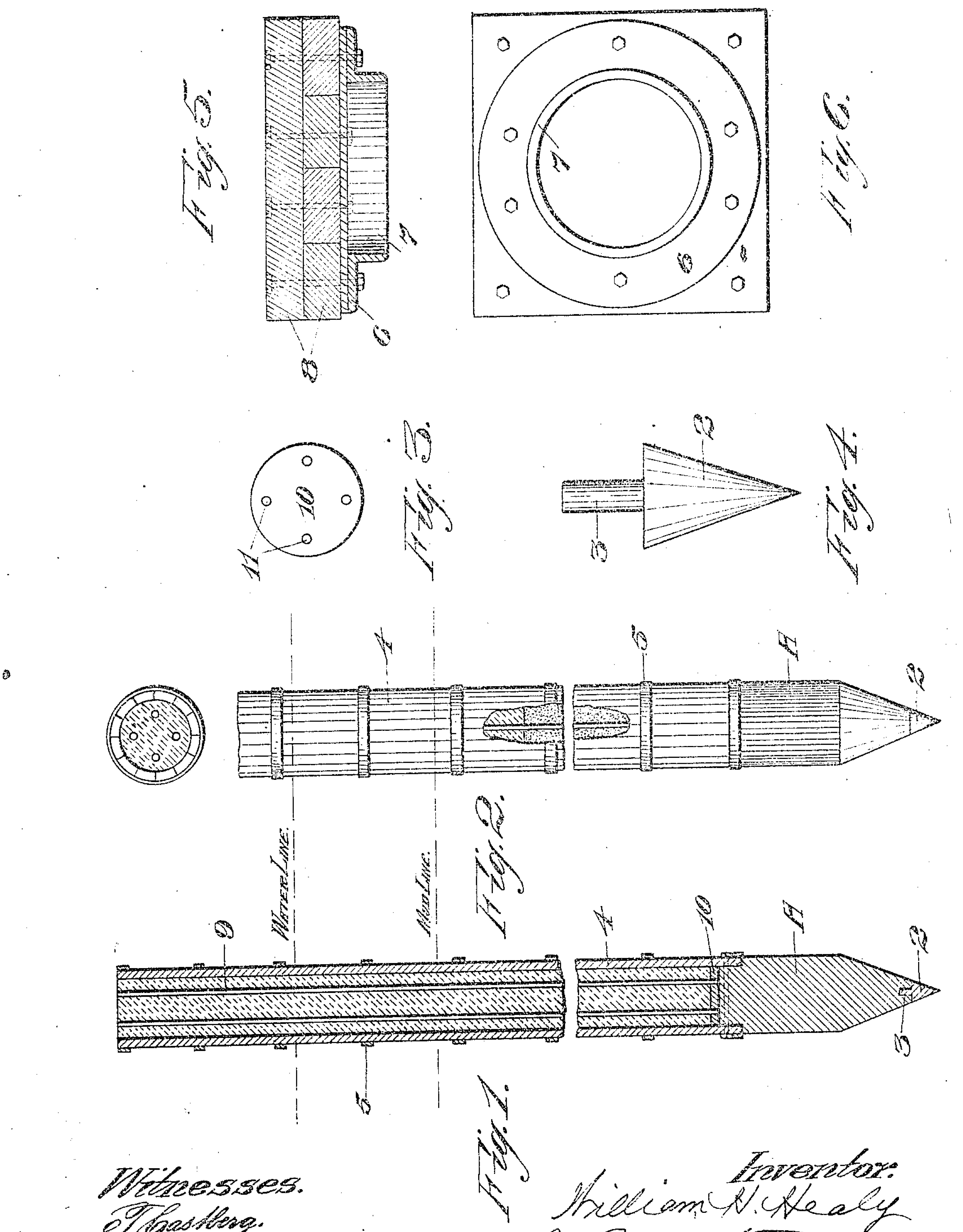
No. 825,599. PATENTED JULY 10, 1906.

W. H. HEALY.

REINFORCED CONCRETE PILE.

APPLICATION FILED SEPT. 27, 1905.



Witnesses.
T. Castberg.
J. H. Amee

Inventor:
William H. Healy
By Geo. H. Strong. atty.

UNITED STATES PATENT OFFICE.

WILLIAM H. HEALY, OF SAN FRANCISCO, CALIFORNIA.

REINFORCED CONCRETE PILE.

No. 825,599. Specification of Letters Patent. Patented July 10, 1906.

Application filed September 27, 1905. Serial No. 280,350.

To all whom it may concern:

Be it known that I, WILLIAM HENRY HEALY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Reinforced Concrete Piles, of which the following is a specification.

My invention relates to improvements in the construction of piles to be driven into the soil for the support of a superstructure or to form part of a wall. Its object is to provide a strong practical permanent pile for use in wharves, trestles, bulkheads, &c.

It consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a longitudinal section of my improved pile. Fig. 2 is an elevation of same, partly broken to show bond of sand and concrete below mud-line. Fig. 3 is a plan of the templet. Fig. 4 is a detail of the metal point. Fig. 5 is a section of the driving-cap. Fig. 6 is a bottom plan of same.

In practicing my invention I employ a wooden shoe A of suitable length and diameter, tapered, preferably, at the lower end and shod with a metal point 2. This point is here shown as made top shape, with a stem 3 to fit a hole in the drive end of the shoe A. The upper end of the shoe has a reduced annular part to telescope with a hollow stave-cylinder 4 and has an annular ledge for the end of the cylinder to abut against and form a seat for the cylinder when the pile is driven into the soil. The cylinder 4, while it may be of any suitable material, is preferably built up of wooden staves, which are held in place by means of metal hoops or bands 5. The shoe is fastened to the cylinder by bolts or other suitable securing means. The joints between the staves of the cylinder and between the cylinder and shoe are intended to be water-tight, so that when the pile is submerged no water may penetrate to the interior.

The cylinder may be of any desired or required length. The shoe need only be of such length as is necessary to furnish the proper amount of stock to resist splintering or injury under the blows intended to be given to the opposite end of the cylinder to drive the pile to place. The diameter of the cylinder and shoe correspond to the size of the pile desired. Externally the pile has the appearance of a metal-bound pile. This hollow pile is driven into the soil to a suitable depth by any appropriate means. Heretofore, as far as I am aware, it has not been possible to drive successfully hollow cylinders, which may be one hundred feet or more in length, because of the liability to movement of one stave on another and the accidents likely to occur in striking soil which resists one side of the cylinder more than the other and in running onto sunken and hidden broken piles. By using a hollow pile of ordinary diameter and providing this pile with a solid tapered metal-shod shoe I can drive right down through the soil without danger of injury of any kind to the lower end of the cylinder, since the point of the shoe presents a very limited area of resistance compared to the annular area offered by an opened-end hollow pile. In fact, an open-ended hollow stave-cylinder cannot be driven any considerable distance. My pile can be driven wherever and to any depth that an ordinary pile can be.

For the purpose of protecting the upper end of the cylinder from the hammer in driving I employ a cap consisting of a heavy metal plate 6 to fit over the cylinder and having a deep annular angle-iron flange 7 to fit snug within the cylinder. The depth of the flange is such that when the hammer delivers its blow on the cap the latter will be prevented from jumping out and off of the cylinder. To the top of the plate 6 are bolted the hardwood timbers 8, preferably arranged in two layers, one crosswise of the other. The shock of the hammer or monkey is received directly on these timbers. The solid-metal plate presses equally on the ends of all the staves, and as the other end of all the staves bears equally on the shoe the pile may be driven home with the same facility as a solid pile and without danger of injury to the cylinder.

In operation a hollow pile which comprises essentially the assembled shoe and stave-cylinder is set upright, the cap placed on the end of it and driven to place. The interior of the cylinder is then filled with concrete and allowed to set. To give rigidity and strength to this concrete column, I may employ one or more vertical reinforcing-rods 9, running lengthwise of the column. Before filling the cylinder with cement, in case I want a reinforced pile, I place in the bottom of the cylin-

der a templet 10, cut round to fit the cylinder. This plate has a series of holes 11 arranged in a circle or any other desired form, into which the ends of the rods 9 are inserted and seated. The cement is then rammed in around the rods. From time to time during the filling and ramming a templet is slipped down over the rods to suitably space the rods and insure their uniformity of position throughout the length of the column. When the cylinder is completely filled, the concrete is allowed to set and harden. The rods are usually arranged about three inches from the cylinder or shell 4. If desired, the ends of the rod may be secured to the templet 10 before the latter is placed in the cylinder, all being lowered into the cylinder at the same time and the cement packed in afterward. The column thus formed of iron and concrete is practically indestructible, except it should be subjected to some extraordinary lateral strain or shock. The outer wooden casing may be eaten away or destroyed and still the inherent strength of the pile will remain undiminished.

This pile is simple to make, and the cost is considerably less than that of the ordinary concrete pile and pier constructions. As a driven pile the concrete column has a substantial support far down in the sand or mud below the mud or air lines. The cylinder being closed at the lower end and water-tight before the cement or concrete is put in all water and mud are excluded from the cylinder, so that the cement and concrete will set properly and not crumble. It is impossible to have cement and mud bound together where hollow open-ended cylinders are sunk into the mud. The wooden casing, which remains above the mud, will eventually be destroyed either through natural decay or by the action of the teredo and other marine pests; but that part of the cylinder and the shoe remaining in the mud or otherwise thoroughly protected from the air and water is practically indestructible. In fact, where piles are driven a considerable distance—say sixty feet, more or less—into deep mud or other loose and uncertain strata for the purpose of securing a suitable anchorage I may tamp a considerable portion of my cylinder below the mud-line with sand and so save the expense of concrete, of course leaving off with the sand a sufficient distance, which may be five or ten feet, more or less, below the mud-line, so that there is no danger by the washing away of the mud around the pile of the wooden cylinder which surrounds the sand being exposed. The trouble with most concrete piles or piers heretofore has occurred at their mud-line, due to the unsubstantial support of the concrete column and the imperfect bond between the concrete and the mud. With a pile of my construction the outer wooden shell is water-tight.

It is possible that various modifications in my invention may be made without departing from the principle thereof, and I do not wish to be understood as limiting myself to the specific construction as herein shown and described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A pile consisting of a wooden stave-cylinder provided with a shoe having an iron tip, and a filling of concrete in the cylinder.

2. A pile consisting of a stave-cylinder provided with a shoe at one end, the interior of said cylinder rendered water-tight, a series of rods within the cylinder and extending lengthwise thereof, and a filling of concrete around said rods.

3. A reinforced concrete pile comprising a wooden shoe portion tapered at one end and provided with a metal point, the opposite end of said shoe reduced, a wooden stave-cylinder into which the reduced end of said shoe is fitted, metal reinforces extending lengthwise of the pile within the cylinder, and a filling of concrete surrounding said metal reinforces.

4. In a wharf or like construction, a pile consisting of a wooden stave-cylinder having a shoe at one end and driven into the mud, a packing of sand or the like in the bottom of the cylinder, and a filling of concrete within the cylinder superposed on said packing of sand and extending below the mud-line.

5. In a wharf or like construction, a stave-cylinder provided with a tapered wooden shoe at one end and driven into the mud, and a filling of concrete for said cylinder extending below the mud-line.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM H. HEALY.

Witnesses:
S. H. NOURSE,
F. C. FLIEDNER.