

O. HOFF.
 APPARATUS FOR SUBAQUEOUS PILE DRIVING.
 APPLICATION FILED MAY 24, 1909.

972,192.

Patented Oct. 11, 1910.

2 SHEETS—SHEET 1.

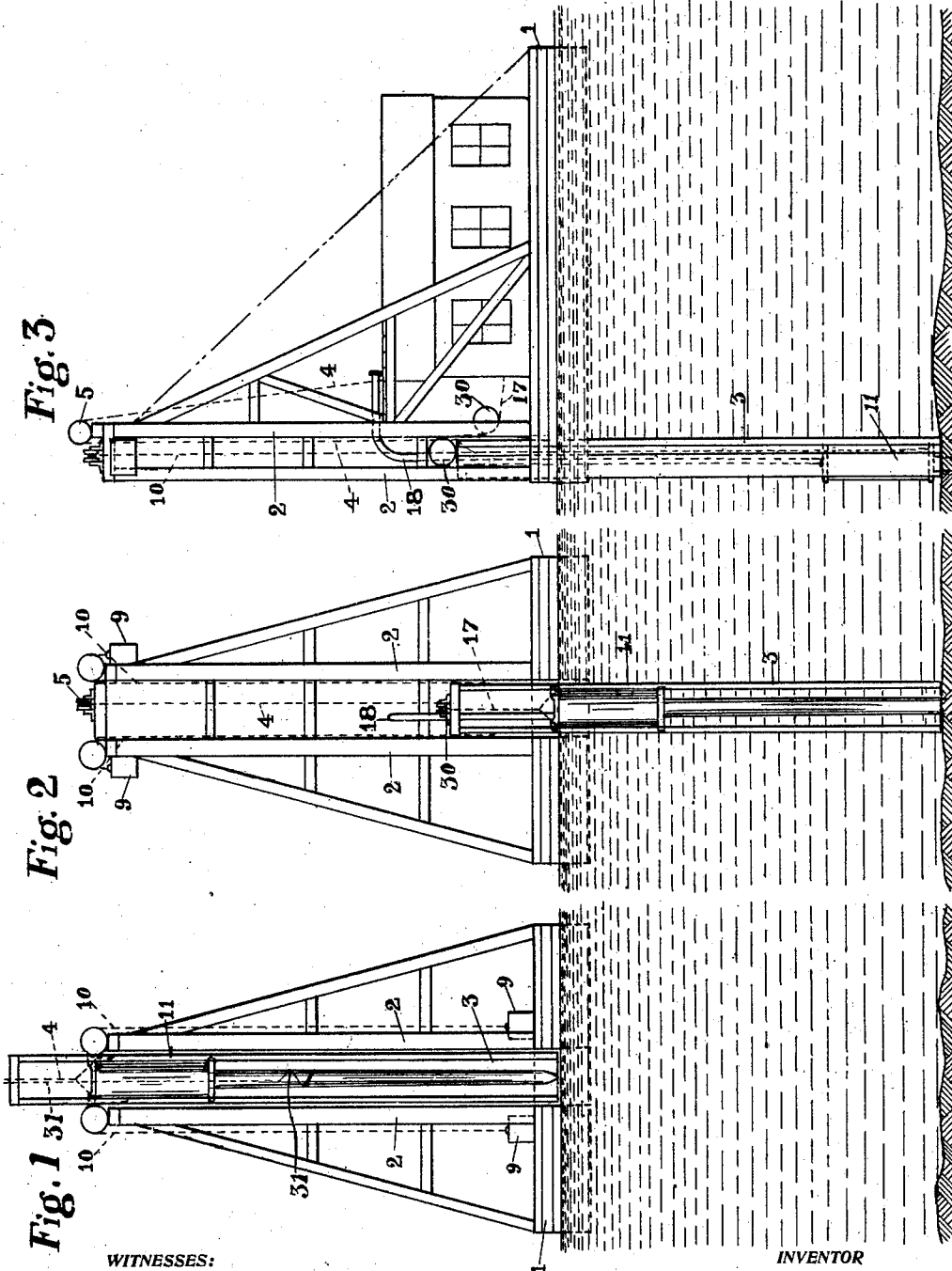


Fig. 1

Fig. 2

Fig. 3

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2 SHEETS—SHEET 2.

Fig. 4

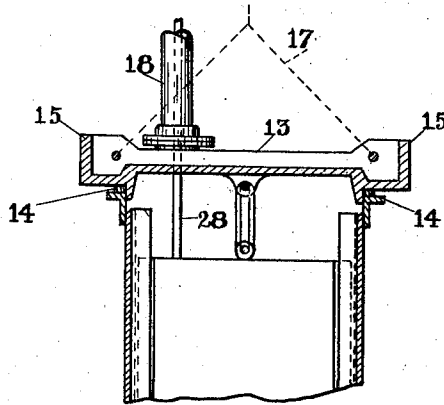
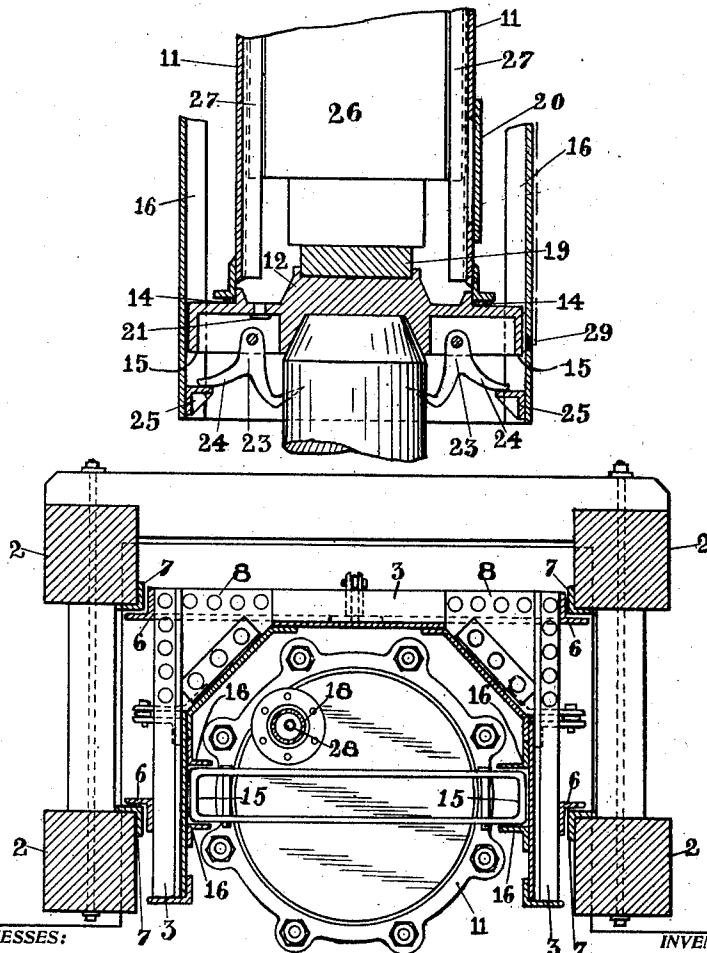


Fig. 5



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR SUBAQUEOUS PILE-DRIVING.

972,192.

Specification of Letters Patent.

Patented Oct. 11, 1910.

Application filed May 24, 1909. Serial No. 497,859.

To all whom it may concern:

Be it known that I, OLAF HOFF, a citizen of the United States of America, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus for Subaqueous Pile-Driving, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in subaqueous pile driving and has particular reference to means for driving piles in water to any depth below the surface without the use of a follower, or the aid of a caisson, cofferdam or the like.

A water-tight extension or chamber is placed on the head of a pile, in which a power hammer of any known construction works against the pile, the extension following the pile down through water to any depth, and the air therein being maintained at atmospheric pressure or at least at a pressure that does not impede the hammer regardless of the depth of submergence of the pile head and its extension.

The invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings which form a part of this specification, Figure 1 is a view in front elevation, largely diagrammatic, of apparatus embodying the invention. Fig. 2 is a similar view showing the pile partly down. Fig. 3 is a view in side elevation, showing the pile driven home. Fig. 4 is a vertical section of the extension or chamber and pile driver hammer, together with a portion of the leader at its lower end. Fig. 5 is a view in cross-section through the leader and adjacent guide timbers or uprights showing the extension in plan.

As a convenient arrangement, an ordinary pile driver equipment may be used, comprising the usual hoisting appliances mounted on a scow 1 or other movable support and having uprights 2. Between these uprights a leader 3 is mounted and may be raised and lowered thereon by a cable 4 running over sheaves 5 to the hoisting machinery. The leader may be of any suitable construction which has an open or unobstructed front into which a pile may be readily swung laterally. As herein illustrated, it is trough-shaped, with angle irons 6 sliding on liners 7 on the uprights 2, reinforcing corner

plates 8 and other necessary stiffening members being provided. To facilitate handling the leader, counterbalance weights 9 on cables 10 may be used.

An extension or hammer-chamber 11 is hung to slide up and down in the leader. In its preferred form, it consists of a cylindrical shell closed at its ends by a base 12 and a top 13, both seated on gaskets 14 to insure water-tight joints, and both provided with ears 15 which have sliding engagement with suitable ways 16 on the leader 3. A rope 17, chain or the like, running over pulleys 30 to the hoisting engine, is used for raising the extension or chamber and a pipe or hose 18 leading from the top 13, establishes at all times communication between the air in the chamber and the atmosphere. If preferred, however, to aid in keeping water from working through the joints at great depths, or to prevent collapse of the hose or of the shell, compressed air may be introduced at any pressure which does not affect the working of the power hammer.

The base 12 forms a driving head for a pile, and is consequently outwardly designed to rest snugly on the pile end, and a hammer block 19 is set or fitted into its upper or inner face. The latter is readily replaced through a hand hole in the shell covered by a removable plate 20 or by unbolting the head in which it is secured. An outwardly opening check-valve 21 is placed in the driving head 12, through which any water leaking into the extension may be driven out by forcing air through the hose 18. The driving head 12 should preferably be secured by some means to the pile during the driving, and as a convenient way, dogs 23 are pivoted in the ears 15 of the driving head and are driven into the pile and lugs 24 on the dogs engaging stops 25 on the leader automatically release the dogs as the pile reaches its final position.

A power hammer 26 of any convenient type is held in guides 27 in the extension and works against the hammer block 19; steam or compressed air for operating it may be introduced through tubing 28 passing through the pipe 18 or other suitable means. The hammer is either suspended from the head of the chamber or mounted therein in any suitable way dependent upon the make of hammer used.

An electric tell-tale, indicated at 29, may be used to give warning by the closing of

an electric circuit when the chamber approaches its lowest position in the leader.

In operation, the pile is swung into position in the leader and may be held by a rope
 5 31 while the extension is placed on the top thereof and becomes an integral part thereof. The leader is then lowered to place, and the hammer set in motion; the extension following the pile down as it is driven home
 10 maintains the hammer in an air space at atmospheric pressure or at a predetermined pressure, in which the hammer works as readily as above the surface. This obviates the necessity of caissons, coffer-dams or like
 15 unwieldy and costly apparatus. When the pile is fully down the extension is released and readily recovered for application for another pile.

Obviously changes in the details of construction may be made without departing from the spirit of the invention and I do not limit myself to any particular form or arrangement of parts.

What I claim as my invention is:—

25 1. An apparatus for subaqueous pile driving, comprising a hollow water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving mechanism adapted to force the supporting pile
 30 down, and means for maintaining communication between the interior of the extension and the outer air.

2. An apparatus for subaqueous pile driving, comprising a hollow, water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile, driving mechanism within the extension adapted to force down the supporting pile, and means for constantly maintaining
 40 communication between the interior of the extension and the outer air.

3. An apparatus for subaqueous pile-driving, comprising a hollow, water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving mechanism adapted to force the supporting pile
 45 down, and an air-tube connecting the interior of the extension with the outer air.

4. An apparatus for subaqueous pile driving, comprising a hollow, water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension
 55 of the pile and containing driving mechanism adapted to force the supporting pile down, means for maintaining communication between the interior of the extension and the outer air, and means for recovering the extension from a driven pile.
 60

5. An apparatus for subaqueous pile driving comprising a hollow, water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension
 65 of the pile and containing driving mechanism

adapted to force the supporting pile down, means for maintaining communication between the interior of the extension and the outer air, and immersible, extensible guiding means for the extension.

6. An apparatus for subaqueous pile driving comprising a hollow, water-tight, submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving mechanism adapted to force down the supporting pile, a movable support, extensible, immersible guiding means for the extension carried by the support, and an air pipe from the extensions whose upper end is held by the support above water at all depths of submergence of the extension.

7. An apparatus for subaqueous pile driving comprising a hollow, water-tight submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving mechanism adapted to force down the supporting pile, a movable support, extensible, immersible guiding means for the extension carried by the support, and means on the support for operating the driving mechanism in the extension.

8. An apparatus for subaqueous pile driving comprising a hollow, water-tight submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving mechanism adapted to force down the supporting pile, a movable support, extensible, immersible guiding means for the extension carried by the support, and means on the support having flexible connection with the driving means for operating the latter.

9. An apparatus for subaqueous pile driving comprising a hollow, water-tight submergible chamber adapted to be placed on a pile, forming when so placed an extension of the pile and containing driving means adapted to force down a pile on which the extension is placed, means for rigidly securing the extension on a pile, and guiding means for the extension and a pile on which it is secured and means on said guiding means for releasing the said securing means when the extension reaches a predetermined point.

10. An apparatus for subaqueous pile driving comprising a support, upright members thereon, a leader longitudinally reciprocable in the uprights, a hollow, water-tight submergible extension longitudinally reciprocable in the leader adapted to be seated on the head of a pile, driving mechanism within the extension adapted to force down a pile on which the extension is supported, and means on the support for raising the leader and extension.

11. An apparatus for subaqueous pile driving, comprising a support, uprights

thereon, a leader having sliding engagement with the uprights, a hollow, water tight submergible extension longitudinally reciprocable in the leader, provided at its lower end with a driving head adapted to rest on a pile, driving mechanism within the extension adapted to operate against the head to force a pile down on which the head is placed, and means for raising the leader and the extension.

12. An apparatus for subaqueous pile driving, comprising a support, uprights thereon, a leader having sliding engagement with the uprights, a hollow, water-tight submergible extension longitudinally reciprocable in the leader, provided at its lower end with a driving head adapted to rest on a pile, means for securing the extension on the pile, driving mechanism within the extension adapted to operate against the head to force a pile down on which the head is placed, and means for raising the leader and the extension.

13. An apparatus for subaqueous pile driving, comprising a support, uprights thereon, a leader having sliding engagement with the uprights, a hollow, water-tight, submergible extension longitudinally reciprocable in the leader, provided at its lower

end with a driving head adapted to rest on a pile, driving mechanism within the extension adapted to operate against the head to force a pile down on which the head is placed, means for securing the extension on a pile, means on the leader to release the securing means from the pile when it has reached a predetermined position, and means for raising the released extension.

14. An apparatus for subaqueous pile driving, comprising a support, a leader vertically movable thereon having an open front into which a pile may be moved laterally, a hollow, watertight submergible chamber having longitudinal sliding engagement with the leader adapted when placed on a pile to form an extension thereof, means within the extension for forcing down a pile on which the extension rests, and means on the support for operating the driving mechanism, and raising the leader and also the extension.

In testimony whereof I affix my signature in presence of two witnesses.

OLAF HOFF.

Witnesses:

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ANNA M. DORR.