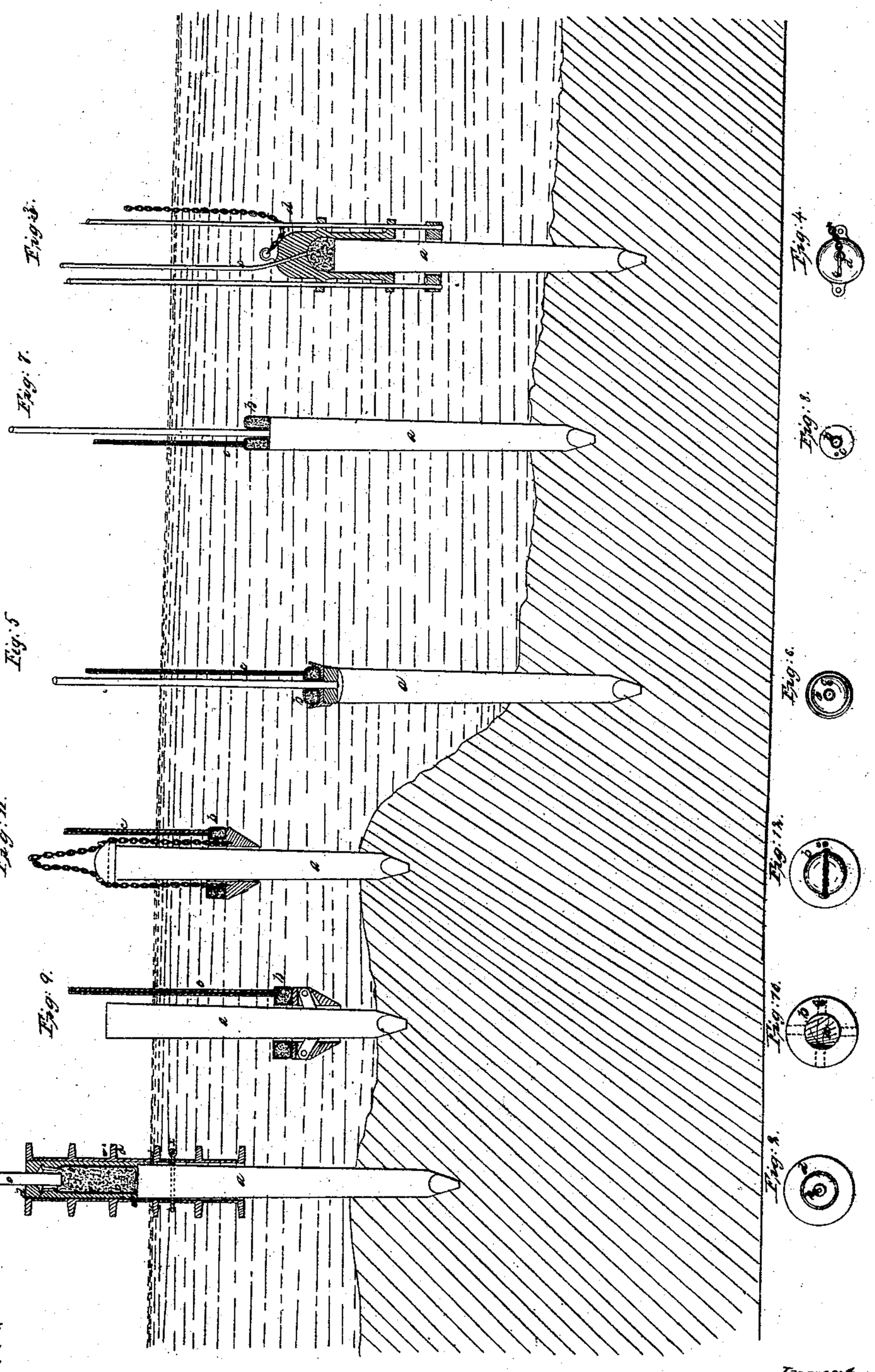
J. A. WHIPPLE.

PILE DRIVER.

No. 26,073. Patented Nov. 8, 1859.



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J. A. WHIPPLE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HIMSELF, AND G. A. STONE, OF ROXBURY, MASSACHUSETTS.

METHOD OF DRIVING PILES.

Specification of Letters Patent No. 26,073, dated November 8, 1859.

To all whom it may concern:

Be it known that I, JAMES A. WHIPPLE, of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Method of Driving Piles; and I do hereby declare that the following specification, taken in connection with the drawings, is a full, clear, and exact description thereof.

The drawings represent various modifications of the method invented by me and many others involving the principle of my invention might be exhibited, but it is believed that those accompanying this specification are sufficient to illustrate the principle of my invention and point out in what manner it may be applied to practice.

My invention was originally intended for use only for driving piles whose tops were immersed below the surface of water at some time during the operation of driving them and I believe that the superiority of my plan over all the old methods in point of both speed and economy will be more perceptible, when it is applied to piles driven as above stated, but in the course of my experiments I discovered that my system was equally applicable to the driving of piles either in land or under water when their tops were not driven below the surface.

In my plan of driving piles, I make use of gunpowder, or an equivalent therefor, capable of producing by explosion, a quantity of elastic gas, and I so arrannge the charge of powder that when exploded it shall act between the pile and some resistance or fulcrum, so that the force of explosion shall cause the pile to advance in the direction of its length or nearly so.

Figures 1 and 3 are elevations of piles with cartridges and apparatus in section and Figs. 2 and 4 are top plans of the same, in which my mode is exhibited under such an arrangement of parts that piles may be driven thereby either under water or on land, and in these figures the pile is shown at *a*, the cartridge at *b*, and the cartridge chamber at *d*, while the fuse is shown at *c*.

The chamber *d*, Figs. 1 and 2, is of metal and is prevented from slipping down over the pile head by a bolt or pin as at *e*, and the manner of driving the pile is as follows:—The cartridge and fuse are to be placed in position substantially as shown in the drawings, and as long as the chamber is above water, or in the air, sand, gravel, or other solid substances may be poured in above the cartridge, or if the pile head or cartridge fit the chamber sufficiently tight liquids may be used, or the bore of the chamber may be tamped solidly as in the old method of blasting (the object being to obtain a fulcrum or resistance to the action of the gases resulting from the explosion of the powder) and when the fuse is fired the pile will descend into the earth to a distance proportioned to the amount of the charge and the resistance the pile meets with. If the chamber should be lifted off the pile by the explosion (which sometimes happens) it must be replaced, and by a succession of explosions the pile may be driven to the required depth. A pin or bolt *x* may be passed through the pile *a*, and the chamber *d;* this is intended to be used in case it is desired to prevent the rise of the chamber from the pile, when the charge is exploded; or if desired the chamber may be solidly secured to the head of the pile, or, which amounts to the same thing, the chamber may have a head cast or bolted across its interior, for the head of the pile to rest against, the cartridge and tamping being above it. In either of these cases, when the cartridge is fired, the pile and chamber will advance together. In case the pin or bolt *x*, is used, the pin *e*, will not be required.

It is evident that in place of the pin *e*, a flange might be cast or secured to the inside of the chamber, and resting on the head of the pile to sustain the chamber in place; but this arrangement will be detrimental, as a surface of the pile head as large as possible is desirable for the charge to act against; it is also desirable that when the pins *e*, or *x*, are used the pile should fit the chamber tolerably close to prevent a portion of the force of the charge being dissipated between the sides of the pile and chamber.

It may sometimes happen, notwithstanding the above directions have been complied with that no effect will follow the explosion of the charge; but this is an exception to the general rule. In such case the same processes should be repeated.

If the pile is to be driven in water and its top to descend below the surface, the tamping may be omitted as soon as the top of the chamber gets below water, and in such case the cartridge and fuse should be waterproof.

In Figs. 3 and 4 the same letters refer to the same parts but in these figures the cartridge chamber is represented as closed at the top and provided with lugs properly bored out so as to slide on rods attached to the pile by a ring or in any other suitable manner; the cartridge chamber is pierced, so that the fire from the fuse may be communicated to its interior, and also has attached to it a rope or chain. In using such a chamber as this it is to be lifted from the pile and the cartridge inserted; the chamber is then to be lowered into place, as shown in the drawings and the charge fired, and these operations are to be repeated until the pile is driven to the required depth. When the top of the chamber gets below water, the weight of the column above it will resist the ascent of the chamber when the charge is fired; this plan is a very convenient one, as it admits of the charge being deposited in the chamber when it is above water even although the top of the pile should be far below it.

In Figs. 5, 6, 7, and 8 are shown modes of using the explosive force of the powder without the aid of a chamber, and in these figures the same letters refer to the same parts as in all the other figures; but the plan illustrated by these figures is useful only when the top of the pile is always below the surface of water, the water itself furnishing the fulcrum or resistance between which, and the pile, the charge is exploded. In all these figures I have shown a small rod as extending from the top of the pile above the water and the cartridge as made up with a hole in the center and by this contrivance the cartridge may always be located with ease and exactness, even when the top of the pile is far below the surface of the water.

In Figs. 7 and 8 the cartridge is represented as resting directly upon the pile, while in Figs. 5 and 6 there is interposed between it and the pile a sort of shoe, one flange or short cylinder of which surrounds the pile, while the other receives the cartridge; the explosion of a succession of cartridges will drive the pile to the required depth.

Figs. 9, 10, 11, and 12 illustrate form of apparatus useful when a pile is to be driven through water with or without its top descending below the surface. In all these figures the pile is exhibited as surrounded by a ring bracket upon the top of which the cartridge is to be supported. This bracket is to be sustained either by a chain extending to the top of the pile as shown in Figs. 11, and 12, or by toggles as shown in Fig. 9, the chains being so secured that the distance of the bracket from the top of the pile may be regulated at pleasure, and the toggles being constructed substantially as shown, so that they will prevent the bracket from descending unless they are tripped and will loosen themselves when the bracket is lifted and admit of its being lifted, while at the same time they will grasp the pile firmly at the instant of explosion. This bracket may be placed in position by a driver or by appropriate machinery attached to it and leading above water. An annular cartridge is to be employed and the bracket is always to be lowered, so far as to insure a sufficient column of water above the cartridge; as the pile is driven by successive charges the bracket will descend with it. In case the pile with its bracket have been driven so far that another charge would force the bracket to rest on the bottom it should be raised sufficiently before such charge is fired. The arrangement for supporting the bracket by toggles is a good one, but I consider the plan of supporting it by chains to be inferior, as the chain will of necessity be heavy and will soon wear by reason of the repeated concussions. The bracket itself is a very useful plan, as a heavy column of water to resist the upward force of the charge may be insured owing to the fact that the bracket may be depressed below water, while the pile head is still above the surface.

If the piles are required to be driven level with the bottom, the driving may be finished by the plans shown in Figs. 5 and 7. The guides for locating the chamber or the cartridge may be employed or dispensed with in all the modifications illustrated in the drawings, and when guides for the cartridge are not used and the pile itself will not serve as a guide the cartridges may be located below water by a diver.

Any sort of waterproof cartridge and fuse may be used, and the latter may be fired in any proper way or be dispensed with and the charge fired by a galvanic battery and wires.

By my plan piles may be driven at various angles with the horizon, as well as vertically, and in all cases the pile must be located and secured by guys or props before the first charge is fired, or as an equivalent for this the pile may be started ino the soil a few inches (enough to steady it) by sledges, or a hole may be bored and the pile inserted into it.

My plan will be most useful when applied to driving piles whose tops are to be driven below the water's surface and especially in situations where the water is rough.

I have not, as before stated, deemed it necessary to point out all the modifications which I have devised, but in all of them, as in those specially described, the principle is the same, namely, to drive the pile by an explosion of gunpowder acting between the pile and a fulcrum or resistance and this principle exists in Figs. 9 and 11, for the

bracket is, as far as the action of the explosion is concerned, the same as the pile itself, being attached to the pile and making a part of it. I have also thought it unnecessary to point out specially the advantages of my process as they will be easily discovered and appreciated by those engineers who have directed the driving of piles and more especially by those who have driven piles under water.

I claim as of my own invention—

The method or process, substantially as herein described of driving piles by exploding charges of gunpowder or its equivalent between the pile and a fulcrum or resistance, so that the force of the explosion shall wholly or partially act to drive the pile in the direction of its length or nearly so.

In testimony whereof I have hereunto subscribed my name in the city of Boston.

JAMES A. WHIPPLE. [L. S.]

In presence of—

JOHN DYE,

BENJ. F. COOKE.