

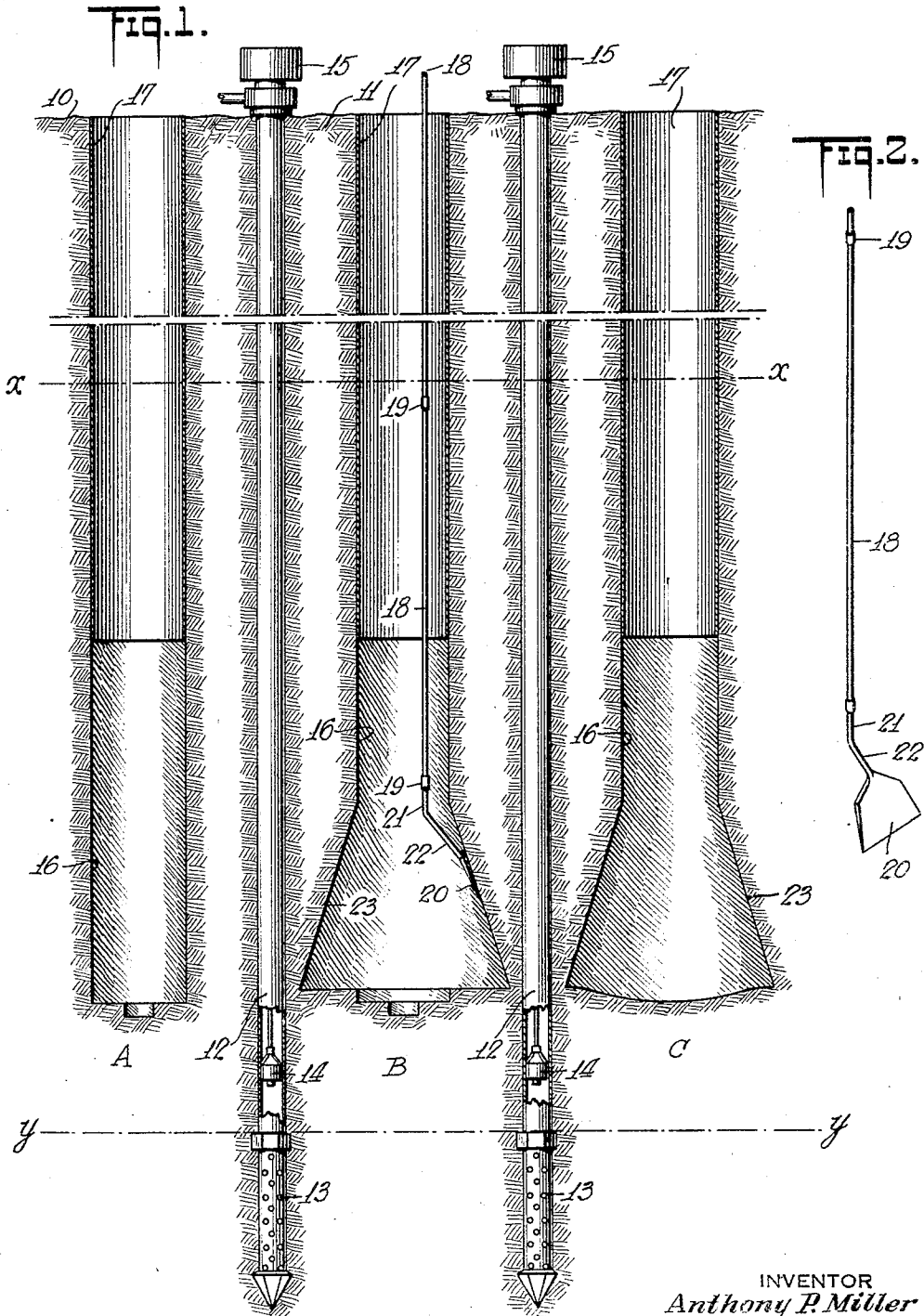
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A. P. MILLER

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METHOD OF INSTALLING PILING

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INVENTOR
Anthony P. Miller

BY
Franklin J. Foster
ATTORNEY

UNITED STATES PATENT OFFICE

ANTHONY PAUL MILLER, OF PLEASANTVILLE, NEW JERSEY

METHOD OF INSTALLING PILING

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The present invention is concerned with poured concrete foundations or footings of the character in which the foundation wall or pile is enlarged at its base to distribute the load over a large soil area.

It is more especially concerned with the formation of mushroom or pedestal piling, particularly with the problem of installing such piling in water bearing sand, such for instance, as beach sand.

Certain inherent characteristics of sand, particularly water bearing sand, make it difficult and impracticable, to use more or less standardized methods commonly employed for the formation of pedestal pilings in clay or similar types of soil. Sand is substantially incompressible and ramming or driving methods cannot be used. If sand is undercut too deeply, it will cave and consequently known methods of undercutting by expanding rotary reamers are not suitable for work in sand. If the sand is saturated with water, it will run freely and the bottom of a mold formed in such sand, is unsuitable for the reception of poured concrete. This quality of sand also makes conventional hydraulic reaming methods impracticable.

In addition to the methods discussed above, there have been certain special methods developed for beach sand work. In all work of this character, the water level in the sand must be lowered by well points or the like, to permit the sand to be worked at all, the prior piling installation methods have presupposed the ability to control and maintain extreme accuracy of an artificially created water level. Such control is difficult and in practice, cannot be maintained except with great care, considerable expense and much loss of time. As a result, in the practice of these methods, the water level has not been accurately controlled and the methods have been haphazard and resulted in non-uniform, asymmetrical pilings of varying sizes and strengths, and the loading and safety factors could not be accurately calculated in advance.

An object of the present invention is to obviate the above noted difficulties and provide a method of forming piling in beach

sand, which will permit the concrete to be poured directly into and under-cut sand mold formed by proper excavation of the sand.

Another object is to permit the size and strength of the piling to be accurately computed in advance, whereby symmetry of individual pilings as well as uniformity of strength and contour of a plurality of pilings of a set are assured. The method, furthermore, precludes the possibility of the presence of disturbed sand at the base of the piling.

Another object is to permit the entire method to be carried out at any desired distance above an artificially created water level in the sand, so that the mold may be expeditiously formed and the concrete poured without the danger of accidental running and caving, such as might occur were quick sand in the mold bottom.

These results are to some extent, made possible by the use of a special mechanical enlarging tool, which is used to under-cut or enlarge the bottom of a vertical shaft or bore drilled in the sand. The tool is inherently incapable of undercutting at an angle which might cause caving and is effective to shave the sand and form the desired bore enlargement without danger of disturbing the sand at the base of the piling mold and without the need for motors or other special equipment for actuating or controlling the undercutting tool.

In practice, well points are sunk in well known manners in the region of the proposed piling excavation and water pumped from the sand so that the water level is reduced below the proposed bottom of the excavation. A straight shaft is then sunk with an ordinary auger or posthole digger and the top of the shaft lined with a metal shell to prevent inadvertent chipping or scaling off of sand by the handle of the mushroom forming tool. This tool is in the nature of a shaver offset from and disposed at an angle to its elongated and preferably sectional handle. The relation of tool to handle is such that as the handle is worked up and down in the bore, it cannot be canted to a position where the tool would undercut at a dangerous angle. In consequence, as the tool is worked up and

down and moved about the mold, the mold will be annularly enlarged into substantially inverted cone-shape at its bottom. The sand which has been dislodged by the shaving tool may be removed by the auger and the bottom of the mold smoothed off by tamping or by pouring in a very small quantity of water, which quickly drains down to the artificial water level, either smoothing method leaving the sand mold bottom dry and hard for the reception of poured concrete.

The invention may be more fully understood from the following description in connection with the accompanying drawing, wherein:

Fig. 1 is a diagrammatic view illustrative at A, B and C, three successive stages in the formation of the pile and

Fig. 2 is a fragmentary perspective view of the scraping or shaving tool which is used to enlarge the piling bore and form the mushroom portion of the mold.

In the drawing, 10 represents the surface of a body of sand 11, in which a series of mushroom pilings are to be installed. The normal water level in the sand may be approximately at the line $x-x$ and the first step in the method is to lower this level to below the bottoms of the proposed piling excavations. One well known and convenient method of artificially lowering the water level is to sink a series of well point casings 12 in the region of the excavation and through them to pump water from the sand until the water level drops, say to the line $y-y$. The water enters the well points through perforations 13 in their lower ends and may be withdrawn by a vacuum pump or by self-priming rotary force pumps 14 of the character here illustrated, these pumps being operated by electric motors 15 mounted directly upon the tops of the well casings.

Having lowered the water level, the next step is to sink a straight vertical shaft or bore 16 in the sand, this shaft being drilled with a conventional auger or post hole digger. After the shaft is sunk, the upper end thereof is lined with a thin gauge metal shell 17, which serves to prevent chipping and scaling of the walls of the mold during subsequent enlarging operations at the base of the mold. The condition of the mold after the shaft has been sunk and the shell inserted, is designated at A in Figure 1.

The next step is to mechanically enlarge the lower end of the bore with a special form of sand shaving or reaming tool illustrated in Figure 2 and in operation, at B, in Figure 1. This tool is equipped with a long straight handle 18, which may be formed of a plurality of lengths of pipe connected by couplings 19. The tool head 20 is preferably in the nature of a flat scraper having a sharp straight lower edge. The head is connected to the bottom of a handle by a shank 21 angularly

offset at 22 relative to the handle and to the head. Angularities of shank and head to the tool handle are such that the head itself is offset from the handle and disposed at about a 30° angle relative thereto, whereby as the handle is worked up and down to cause the scraper to dig into the sand walls at the bottom of the bore, the bore will be undercut at an angle of approximately 60° . This angle is important because unduly sharp undercutting is apt to cause caving of the sand. As the sand is shaved from the lower end of the bore by gradually working the tool around the bore periphery, the bottom of the bore is gradually enlarged to provide a substantially inverted cone shaped enlargement 23. Sand which is scraped from the bore walls may be removed by the auger and at this time, the bottom of the mushroom will show a shouldered or stepped appearance in cross section as indicated at B, the shoulders representing the impressions left by the auger and the auger tip.

Entirely aside from the possibility of caving of the sand when undercutting, an angle of about 60° to the horizontal is preferable due to the fact that it closely corresponds to the angle through which the load of piling is transmitted through the soil beneath it. In other words, a mushroom which is truly bulbous is not designed scientifically, since part of the bulb does not actually take any of the load or transmit any of the load to the soil below the piling.

In certain types of work, it may be desirable to use other undercutting angles and if this is the case, it will be apparent that the tool head in its integral shank, may be readily removed from the handle and replaced by tool heads having different angularities or different shapes for special types of work.

The next step is to round off the bottom of the mushroom and provide a smooth surface upon which the concrete may be poured, so that the loose sand will not become mixed with the concrete. This smoothing operation may be performed in many ways as by tamping tools or by simply pouring a bucket of water into the mold, this water smoothing out the mold bottom and quickly draining through the sand down to the artificially maintained water level, so that the mold bottom will be left hard, smooth and dry. The condition of the mold, at this time, is indicated at C.

The concluding step of the method is to pour concrete directly into the mold, the hard mold bottom preventing splashing of the concrete or intimate mixture thereof with the sand, which might cause a non-homogeneous and fracturable footing.

From the foregoing description, it will be seen that mushroom pilings or equivalent undercut footings, may by the present method, be expeditiously emplaced in beach sand

without the need for maintaining extremely accurate control of an artificially created water level, it being merely necessary to pull the level down below the bottom of the excavation and keep the pumps working while the pilings are being formed. It will also be evident that the method obviates the need for highly skilled workmen or complex machinery of any type.

I claim:

1. A method of installing pedestal piling in water bearing sand which includes the steps of (1) lowering the water level to a depth below the proposed bottom of the piling, (2) sinking a straight shaft in the sand to a depth corresponding to the proposed bottom of the piling, (3) lining the upper end of the shaft with a shell to prevent shaling of the walls thereof during subsequent excavating and concrete placing operations, (4) chopping out the dewatered but still moist sand below the shell to form an inverted conical enlargement of the lower end of the shaft, the taper of said enlargement being at a lesser angle than the caving angle of moist sand, (5) removing the sand thus chopped out, (6) pouring water into the mold to recreate an undisturbed footing, and (7) when such water has drained out of the mold through the sand filling the mold with concrete.

2. A method of preparing a mold for concrete pedestal piling to be cast in situ in water bearing sand and where the pedestal molding portion is below the normal water level in the sand, which includes the steps of (1) lowering the normal water to a depth below the proposed bottom of the mold; (2) sinking a straight shaft in the sand to a depth corresponding approximately to the proposed bottom of the piling; (3) lining the upper end of the shaft with a thin metal shell to prevent shaling of the shaft walls during the subsequent enlargement of the lower end of the mold and (4) chopping out and removing the dewatered but still moist sand constituting the wall of the shaft bottom to form an inverted conical chamber concentric with the shaft and with its walls tapered at an angle lesser than the normal caving angle of the sand in such moist and dewatered condition.

Signed at Pleasantville in the county of Atlantic and State of New Jersey this 16th day of November A. D. 1929.

ANTHONY PAUL MILLER.