Nov. 3, 1931. E. FRANKIGNOUL 1,830,651

DEVICE FOR THE PRODUCTION OF PILES OF CONCRETE AND THE LIKE

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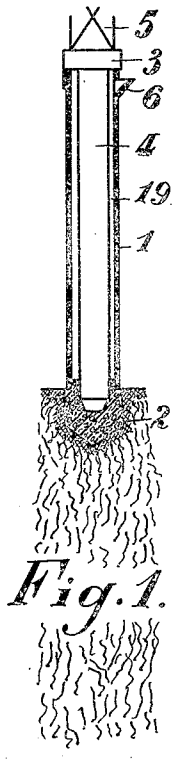


Fig. 1.

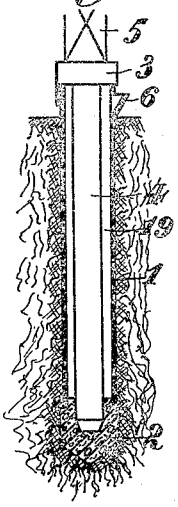


Fig. 2.

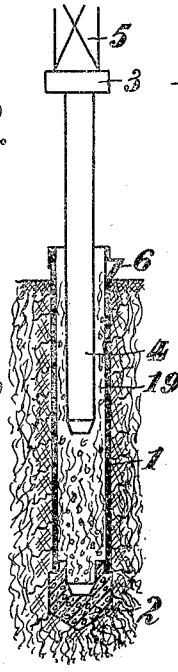


Fig. 3.

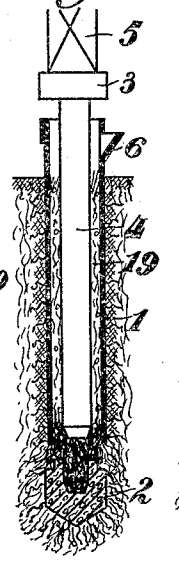


Fig. 4.

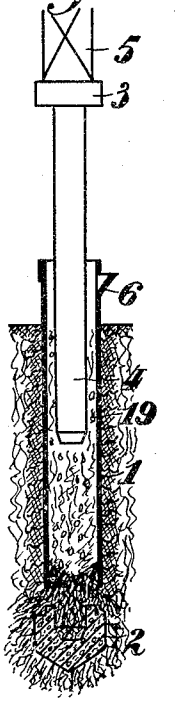


Fig. 5.

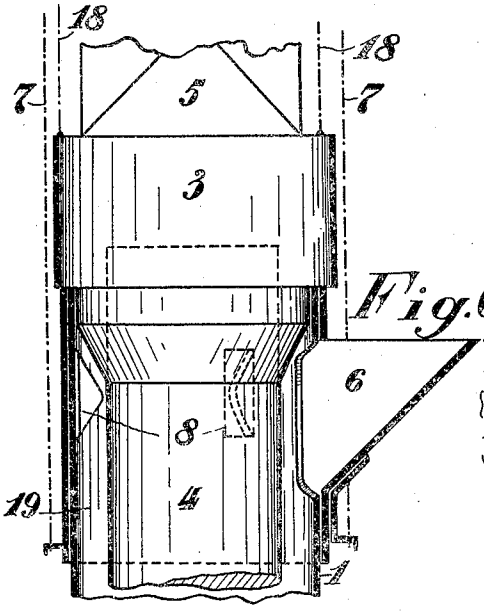


Fig. 6.

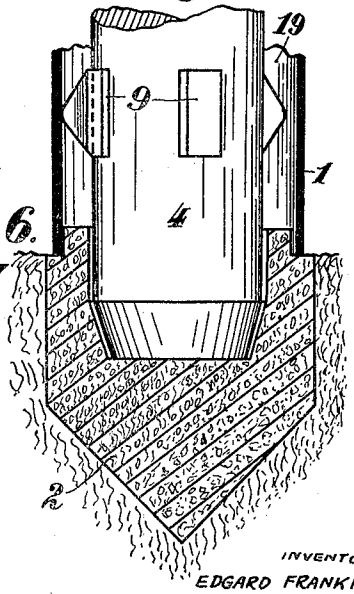


Fig. 7.

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Fig.8.

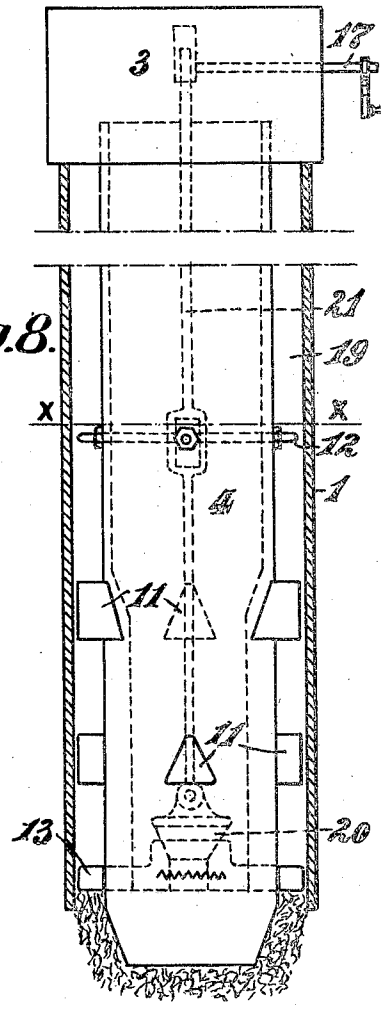


Fig.9.

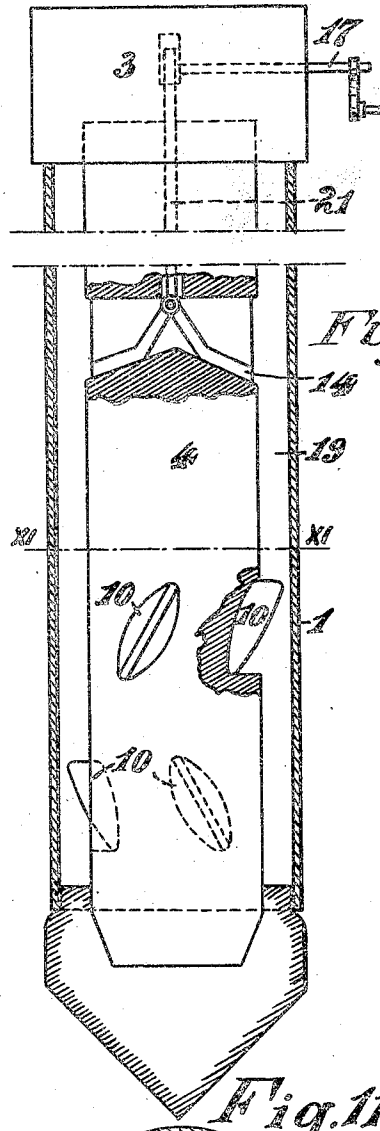


Fig.10.

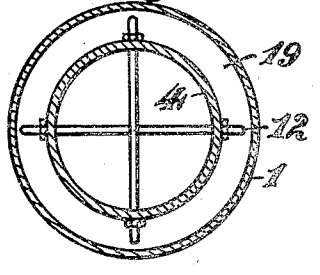
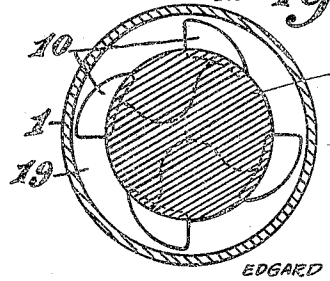


Fig.11.



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DEVICE FOR THE PRODUCTION OF PILES OF CONCRETE AND THE LIKE

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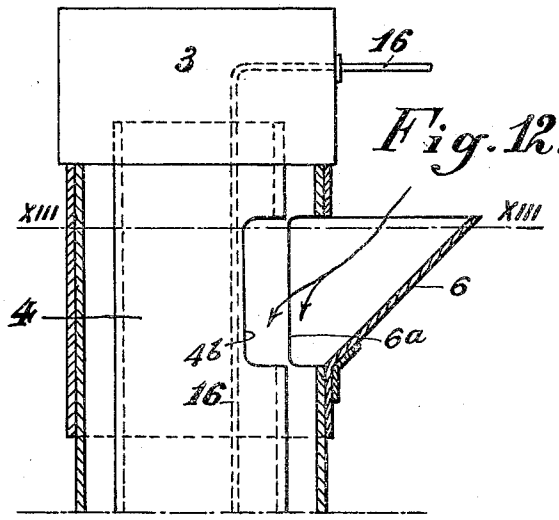
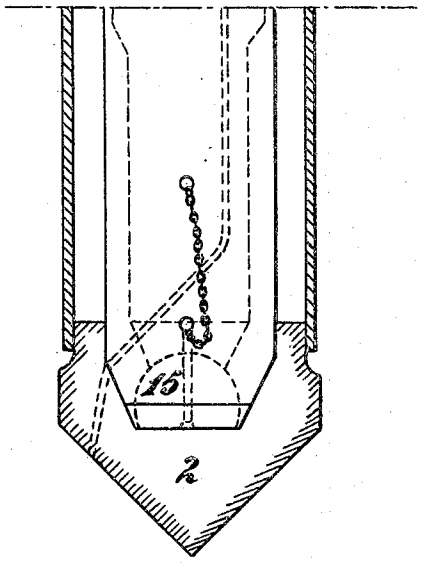


Fig. 12.



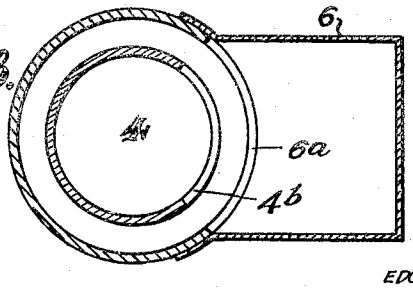


Fig. 13.

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Patented Nov. 3, 1931

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UNITED STATES PATENT OFFICE

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DEVICE FOR THE PRODUCTION OF PILES OF CONCRETE AND THE LIKE

Application filed November 15, 1927, Serial No. 233,445, and in Belgium November 30, 1926.

The present invention relates to a method and device for enabling rapid and economical production of piles of concrete or of similar materials which are completely compressed or rammed along the whole length of the pile.

According to the invention the lining or tubing is provided, when driving the system into the ground, with the necessary equipment for concreting, that is to say the rammer. After concreting the rammer and the lining are alternatively raised by fractions of the height of the pile which is being constructed. The lining is raised whilst the rammer, which was previously raised, carries out its ramming phase.

The rammer, after sinking the lining, may serve for forcing into the ground the closing device for the lining or the point of sinking, and for sinking the lining by pressing the upper portion of the rammer, which forms an anvil, upon the upper portion of the lining upon which its rests. The rammer is actuated by a steam or compressed air hammer or by simple fall.

After concreting, the space left free in the lining under the rammer after each raising of the latter is filled automatically with concrete obtained from a reserve formed in the lining itself.

This reserve may be formed in three different ways; either by using the space left free between the lining and the body of the rammer, or by utilizing the space left free between the lining and the body of the rammer concurrently with a space left free in the interior, of the body of the rammer; or using only the space which is left free in the interior of the body of the rammer.

The concrete is introduced into the reserve by a mouthpiece provided at the upper end of the tube or lining.

The invention provides for the raising of the rammer in such a manner that it is possible to allow the monkey to strike upon its upper end or anvil when it is raised so as to shake the mass of concrete clinging thereto, this mass in some cases being too compact to flow.

Means are also provided for effecting the disaggregation of the concrete enclosed and to accelerate its descent during the raising of the rammer, for example, by means of roughness on the rammer, or blades which are capable of collapsing. In the case where the reserve is formed by an internal capacity of the rammer it is possible to provide a member which is connected to the lining and pressing out the concrete when the rammer is raised.

The accompanying drawings illustrate by way of example, and not by way of limitation, various forms of construction of the invention. There are shown various modifications of carrying out the invention.

In these drawings:

Figures 1 to 5 illustrate diagrammatically various phases in the production of a pile.

Figures 6 and 7 illustrate to a larger scale the top and the bottom respectively of the device according to the invention before sinking into the ground.

Figures 8 and 9 show modifications of the device according to the invention.

Figures 10 and 11 are cross sections on the lines X—X and XI—XI of Figures 8 and 9 respectively.

Figure 12 shows a form of construction of the device according to the invention in which the rammer itself contains a reserve of concrete.

Figure 1 shows the position of the parts at the moment when the sinking into the ground is to commence.

The tube 1 bears on the point 2. On this rests the rammer 4 of which the upper part is connected to an anvil 3 adapted to receive the blows from a monkey arranged above this and illustrated diagrammatically at 5. This anvil rests on the upper end of the tube 1. The monkey is for example, a steam or compressed air actuated monkey or is simply a monkey having a free fall.

The point 2, the tube 1 and the column or rammer 4 are sunk simultaneously in such a manner as to occupy the position illustrated in Figure 2. Concrete is then introduced by the mouth 6 of the tube 1 into the space forming the reserve and formed by the annular space 19 contained between the tube 1 and the

column forming the rammer 4. For the purpose of ramming, the rammer is raised to a height which may vary for example from 50 cms. to 2 meters. The concrete is then supplied so as to occupy the complete section of the tube 1 and for the whole height under the rammer.

Figure 3 illustrates this phase of the operation. The parts being in this position the monkey 5 is operated in such a manner as to produce the downward movement of the column forming the rammer 4 by reason of the blows from the monkey which it receives. The ramming of the concrete situated below this column is thus effected.

At the same time as the operation of ramming proceeds the tube 1 is little by little extracted from the ground by means of a winch. The top of the tube gradually approaches the anvil 3 which is subjected to a downward movement under the action of the monkey. Figure 4 shows this phase of the operation.

Soon the column 4 and the tube 1 assume a position relatively near that which they occupy in the case of Figure 2 after sinking; the operation of the monkey is then stopped temporarily as also the movement of the tube 1. The column forming the rammer 4 as also the anvil 3 and the monkey 5 which are connected together are then again raised in such a manner as to enable a fresh quantity of concrete to pass downwardly underneath the column-rammer 4.

It is possible when the column-rammer 4 has been raised to give a few strokes of the monkey so as to shake the system which is for the purpose of disaggregating the concrete in the annular space which is left free between the tube 1 and the column 4 and thus to produce its flow to the bottom of the tube 1 under the rammer 4.

The operation then continues as above described whilst simultaneously producing a downward movement of the column 4 under the action of the monkey and an upward movement of the tube 1 which thus meets the anvil of the column 4.

In the method of construction illustrated in the drawings the point 2 which may be of concrete is left in the ground.

Figure 6 shows an arrangement which may be given to the upper part of the tube 1 and of the column 4. This figure particularly shows the manner in which a mouth 6 is constructed according to the invention at the top of the tube 1. Hoisting cables 7, adapted to effect the withdrawal of the tube, as also cables 18 adapted to effect the withdrawal of the column 4 and of the anvil 3 upon which the monkey 5 rests, are shown diagrammatically in Figure 6.

Figure 7 shows diagrammatically the lower part of the tube 1 and of the column 4 as also the fitting of these pieces into the point 2 when sinking the system.

For the purpose of guiding the column 4 in the interior of the tube 1 guide projections 8 and 9 are provided respectively at the upper and lower portions of these members. The projections 8 are secured to the tube 1 and are for example, three in number, whilst the projections 9 are secured to the column 4 and are four in number.

Certain compositions of materials entering into the production of concrete and contained in the annular reservoir 19 are heaped up under the action of the compression exerted on the concrete by the rammer 4, which causes the concrete to flow upwardly into the annular space 19 and to compress the concrete at the bottom of this container. When the column 4 is raised the concrete may remain in this position and may not flow into the space which is left free under the rammer 4. In order to cause the concrete to flow, the column 4 is provided either with teeth 11 (Figure 8) with a triangular base, or projections 10 (Figure 9), the point of starting of these projections being recessed in the body of the column 4 in such a manner as to produce spaces sufficient for the flow of the concrete. Pegs 12 (Figure 10) judiciously arranged on the column 4 effect, when concrete is supplied into the space 19, a mixing of the elements forming the concrete. Pegs 13 (Figure 8) and 14 (Figure 9) may, by means of a system operable from the outside at the top of the rammer, be approached or separated from the axis of the column 4 in such a manner that these projections or pegs, by reason of their engagement with the mass of concrete contained in the space 9 produce a sufficient disaggregation of the elements of the concrete so as to enable it to flow under the column or ram 4.

The pegs 13 and 14 are operated in such a manner that their ends are approached towards the centre of the column 4 when this is raised whilst they are spread apart from the axis of the column 4 and penetrate into the space 9 during the downward movement of the column thus producing the flow of concrete.

The pegs 13 are moved by a wedge 20 carried by the operating rod 21 engaging axially between inclined surfaces provided on the said pegs, which are constantly urged towards the axis by return springs. The pegs 14 are hinged at one end to the operating rod 21 and at the other end rest on a guide path 22.

The operating rod 21 may be actuated by any suitable mechanism. Its upper end, engaged in the anvil 3, may, for example, be provided with a rack moved by a toothed wheel carried by a shaft 17 mounted in the said anvil and operated for example by a crank or by a chain.

Moreover, the rod 21 may be arranged in such a manner as to receive a movement rela-

tively to the ram when this receives a blow from the monkey. For this purpose it would suffice for example if the rod is constantly exposed to an action tending to cause its head to extend beyond the upper surface of the anvil. The anvil 3 being raised it is possible to impart by means of the monkey some blows to the anvil which shake the system, and in this manner cause a flow and downward movement of the concrete in the space 19.

The anvil may be provided with pipes 16 (Figure 12) terminating at the bottom of the column 4 and enabling either water to be supplied to the concrete for concreting or for injecting water under the point 2 during the sinking in such a manner as to effect sinking by thrusts.

The column 4 may be hollow, that is to say, formed as a tube. In this case it may serve as a reservoir. A lateral opening 4*b* is provided near the top of column 4, see Figure 12, for the passage of concrete into the same. A lateral opening 6*a* corresponding to said opening 4*b* is provided in the tube 1 and a mouth 6 on said tube 1 directs the concrete into said openings 4*b* and 6*a*. The column 4 may be provided at its lower end with a valve 15 (Figure 12) which opens automatically when the column 4 is raised, thus allowing the concrete contained in the column 4 to pass out so as to enter the free space under the column 4.

The lower portion of the hollow column forming a reservoir may be provided simply with a free opening arranged in such a manner that during ramming of the concrete this will not flow back into the interior of the ram, the concrete in the orifices forming a sufficiently compact closure.

This may be broken when lifting the ram by a blow of the monkey on the latter in such a manner as to produce the disaggregation of the mass of concrete contained in the ram, thus exposing the lower opening in the ram so as to allow a fresh charge of concrete to pass out.

The opening provided at the lower portion of the hollow column 4 may be formed in a cap fitted on this column and provided with a hole the cross section of which is reduced relatively to the bore of the hollow column 4.

The invention provides that in the various forms of construction described the space or spaces forming the reservoir of concrete may have a section slightly enlarged towards the bottom in such a manner as to facilitate the downward movement of the concrete.

In the case where the reservoir is formed in the interior of the column-ram 4, the hollow portion of this may be slightly conical.

It will be understood that the relative length of the tube 1 and of the column 4 may be modified according to the circumstances in such a manner that when the anvil 3 secured to the column 4 bears upon the tube 1, the lower portion of the said column 4 may be either above the lower portion of the tube 1, or below or at the same level.

What I claim is:

1. A device for the driving and construction of concrete piles moulded in the soil comprising a tube provided at its lower end with a detachable driving point, a coaxial hollow rammer movable vertically and in spaced relation with respect to said tube, an anvil fixed on the top of said hollow rammer and abutting the top of said tube in driving position and feeding means simultaneously conducting concrete to the interior of said hollow rammer and the annular space between said tube and said hollow rammer.

2. A device for the driving and construction of concrete piles moulded in the soil comprising a tube, provided at its lower end with a detachable driving point, a coaxial hollow rammer movable vertically and in spaced relation with respect to said tube, an anvil fixed on the top of said hollow rammer and abutting the top of said tube in driving position, a lateral opening in said rammer and a lateral opening provided with a funnel, in said tube for simultaneously supplying concrete to the interior of said hollow rammer and the annular space between said tube and said hollow rammer and means carried by said anvil and projecting in said hollow rammer and said driving point for supplying water under said latter.

3. A device for the driving and construction of concrete piles moulded in the soil comprising a tube provided at its lower end with a detachable driving point, a coaxial hollow rammer movable vertically and in spaced relation with respect to said tube, an anvil fixed on the top of said hollow rammer and abutting the top of said tube in driving position, a funnel laterally fixed to said tube near the upper end thereof for supplying concrete simultaneously to the interior of said hollow rammer and the annular space between said tube and said hollow rammer, a valve normally closing the bottom of said hollow rammer and automatically opened by the lifting of said rammer and means carried by said anvil and projecting in said hollow rammer for supplying water at the bottom of said latter.

In witness whereof I affix my signature.

EDGARD FRANKIGNOUL.