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METHOD OF FORMING CONCRETE PILES

Filed Sept. 21, 1964

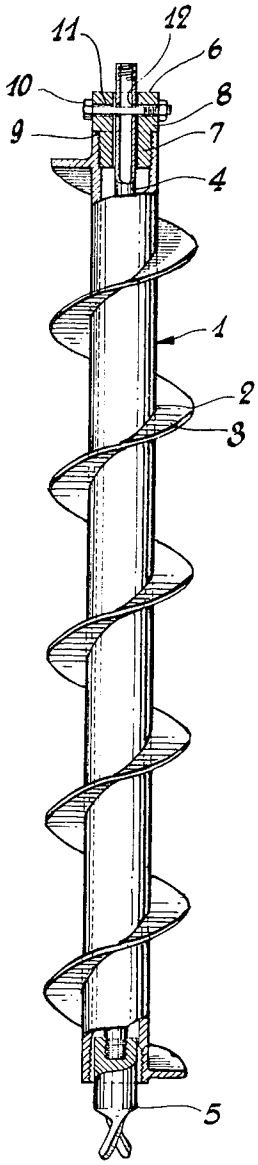


Fig. 1.

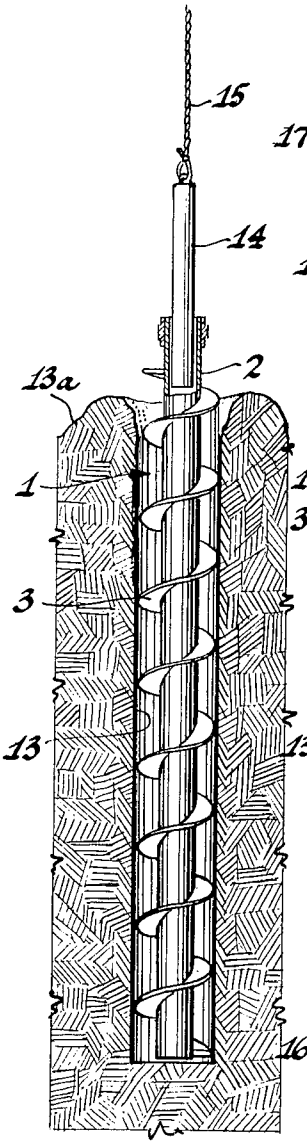


Fig. 2.

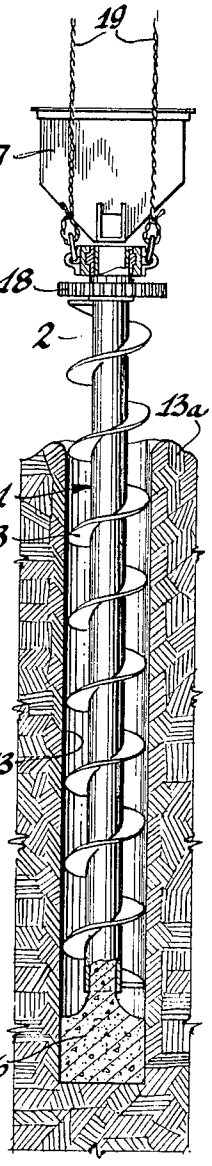


Fig. 3.

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METHOD OF FORMING CONCRETE PILES

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1 Claim. (Cl. 61—53.64)

This application is a continuation-in-part of application Serial Number 146,774, filed October 23, 1961, and now abandoned.

This invention relates to pile foundations and more particularly to a method of forming concrete piles.

Pile foundations of concrete are widely employed but are relatively costly to produce, partly due to the great pressures which it is necessary to apply to the body of concrete. Moreover, it is difficult to prevent contamination of the body of concrete with accidental falls of earth and the like from the wall of the hole that has been formed to receive the concrete.

It is an object of this invention to provide a method of forming concrete piles which may be conducted in a convenient, rapid, and inexpensive manner, and wherein the body of concrete is maintained substantially free from contaminating particles and lumps of earth and the like.

The method in accordance with the invention comprises the steps of drilling a hole of sufficient diameter and depth for formation of the concrete pile therein and feeding a downwardly moving stream of concrete in the hole directly to the bottom thereof. During the feeding step, the side wall of the hole is subjected to a scraping and cleaning step to prevent intermingling with the concrete stream of material detached from the side wall. The detached material is moved upwardly in and from the hole during the feeding step. The flow of concrete into the hole and the movement of detached material out of the hole are confined to separated paths of travel to prevent any such intermingling. The step of scraping and cleaning comprises a combined rotary and vertical scraping of the side wall along a vertical spiral path the produce an upward lifting movement of the detached material as it is detached from the side wall along a vertical inclined and spiral path thereby to prevent falling of the detached material into the concrete fed into the bottom of the hole.

The invention will be described with reference to the accompanying drawing, in which

FIGURE 1 is a side elevation, partly in section, of an earth boring tool which may be employed in carrying out the invention, and

FIGURES 2 and 3 are side elevations illustrating the use of equipment in the formation of concrete piles in accordance with the invention.

In the drawing, **1** is an earth boring tool comprising a tubular casing or shaft **2** having a spiral flight **3** thereon and constituting an earth auger.

A sectional drill rod **4** is arranged to extend axially through the tubular shaft **2** and, as shown, has a diameter which is substantially smaller than the interior diameter of the shaft **2**. The length of the rod **4** corresponds generally to that of the tubular shaft.

A drill bit **5** is preferably detachably secured to one end of the drill rod **4** and is arranged to project somewhat beyond the adjacent end of the tubular shaft **2**. The bit **5** may have an overall diameter approaching the interior diameter of the tubular shaft **2** but has clearance therefrom to permit ease of axial movement of the bit (and rod **4**) through the shaft. It will be observed that, at the bit end of the tool, the drill rod **4** and bit **5** are completely free of connection to the adjacent end of tubular shaft **2**. The other end of drill rod **4** is removably fixed to the adjacent end of tubular shaft **2** by connecting means such as a plug **6** having a threaded reduced diameter

portion **7** for threaded connection with the end of shaft **2**, and a larger diameter portion **8** providing an annular shoulder **9** for seating engagement with the end edge of the tubular shaft **2**. A bolt **10** is passed through diametrically extending holes **11** and **12** in the portion **8** of plug **6** and rod **4**.

With the parts assembled, as shown in FIGURE 1, the tool is employed with conventional drilling equipment to drill a hole **13** in the earth **13***a* (FIGURE 2) to receive a concrete pile in required location. If possible, the hole is dug to depth at which bed rock is reached. If this is not possible, the hole is dug to a suitable depth, say, 20 or more feet. In either case, when the selected depth is reached, the rod **4** with bit **5** and the connecting means including plug **6** are removed from the shaft **2**, which is left in the hole. If bed rock has not been reached, the earth at the base of the hole may be compacted by repeated blows of a weight **14** (of, say, 600 pounds) which is suspended in the shaft **2** as by means of a line **15**. Since the shaft **2** constitutes a casing for the side walls of the hole, reciprocal movement of the weight is rendered possible without damage to the hole.

Having attained a rigid base at the bottom of the hole either by means of bed rock or compacted earth, concrete **16** is poured into the open top of the shaft **2** as from a spout or hopper **17** while simultaneously and continuously subjecting the shaft **2** with its helical blade or flight **3** to axial rotating movement as by means of a gear **18**. Such rotating movement not only keeps the bottom of the hole free from earth or like particles or lumps which are picked up by the helical blade **3** and carried to the surface, but it prevents the falling to the bottom of the hole of particles or lumps which may be dislodged from the side walls of the hole. Moreover, since the concrete is fed through the casing or shaft, it does not act to entrain or dislodge contaminating particles or lumps from the walls of the hole.

As the concrete reaches the bottom of the hole, the shaft **2** is raised, as by means of hoisting cables **19**, to permit the concrete body to fill the hole, as shown in FIGURE 3. Thus, the shaft **2** is gradually withdrawn from the hole as the concrete fills the same. It will be understood, however, that during the hoisting movement and the concrete filling operation, the shaft **2** is subjected to continuous rotation. The lower end of the shaft **2** and blade **3** is maintained slightly above the level of the body of concrete **16** in the hole, a shown in FIGURE 3, whereby there is no possibility of the revolving blade **3** coming into contact with the body of concrete and lifting portions of it. It will be apparent that the rate of feed of concrete and the rate of upward lifting of the shaft and blade must be closely related. It will further be observed that the flow of concrete into the hole and movement of detached material out of the hole are confined to separated paths of travel and thus prevent intermingling of the concrete and material.

I claim:

A method of forming concrete piles in the ground in situ comprising,

(a) drilling in the ground a hole of sufficient size for forming therein a concrete pile with a tool of the type including a tubular shaft with a drill removably received in said shaft and projectable below the shaft lower end together with a helical auger blade fixed to the shaft exterior surface and extending radially from the shaft along the length thereof,

(b) removing the drill from the shaft while leaving the shaft and blade in the hole, and

(c) simultaneously performing the steps of

(i) feeding a stream of concrete through said shaft and into said hole,

(ii) gradually withdrawing the shaft and blade

from the hole to permit said stream of concrete to gradually fill said hole with a body of concrete below said shaft and blade,

(iii) maintaining said shaft and blade above the level of said body of concrete in said hole to prevent contact of said blade with said body of concrete, and

(iv) rotating unidirectionally said shaft and blade thereby to cause scraping of the side wall of said hole continuously during the filling thereof with said body of concrete, and removal by said blade of material detached from said side wall upwardly through the space between said shaft and side wall thereby preventing intermingling of said detached material with said body of concrete.

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