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F. T. LEEDER

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APPARATUS FOR AND METHOD OF MAKING PRECAST CONCRETE PILING

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2 Sheets-Sheet 2

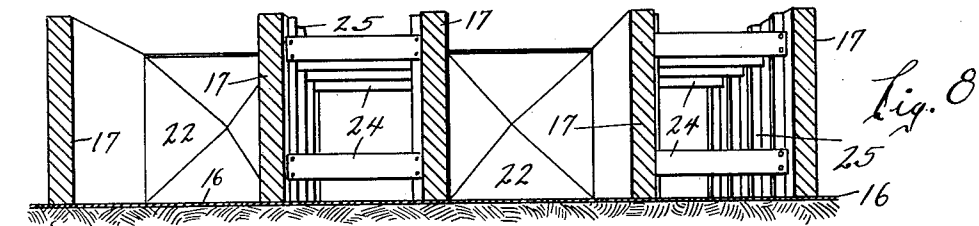


Fig. 8

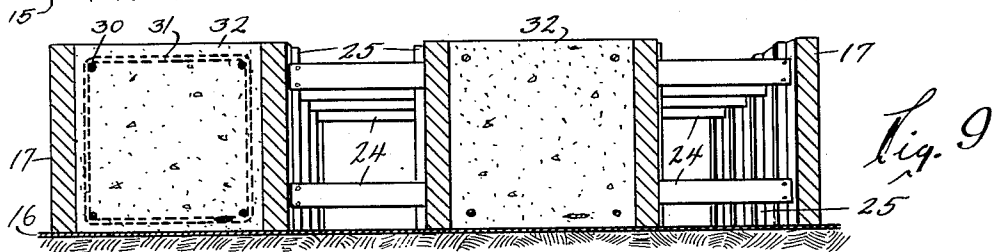


Fig. 9

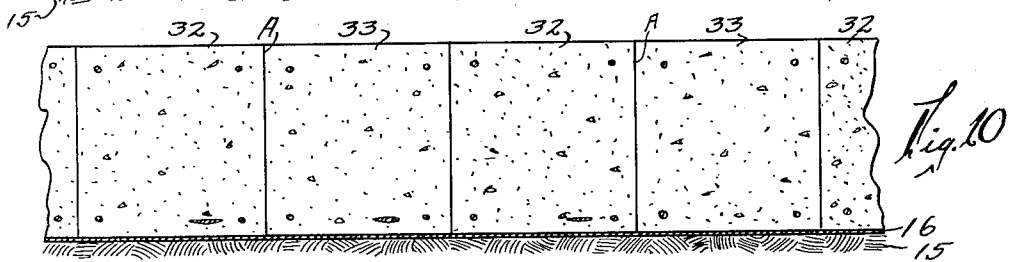


Fig. 10

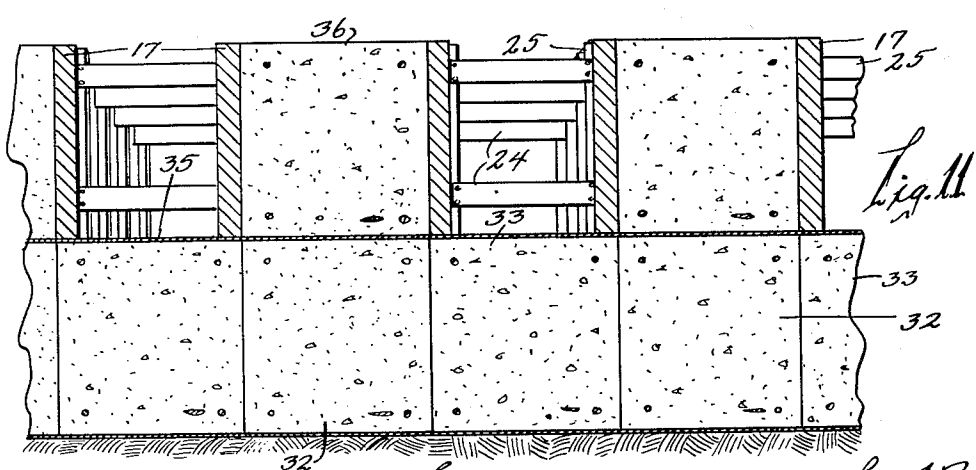


Fig. 11

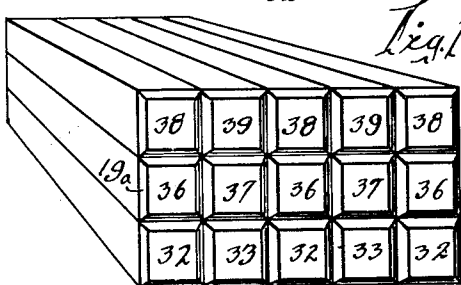


Fig. 12

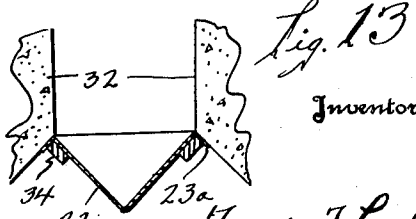


Fig. 13

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APPARATUS FOR AND METHOD OF MAKING PRECAST CONCRETE PILING

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My invention relates to the art of pre-casting concrete piling and has for its primary object to provide a method and apparatus, by means of which a large number of piling can be made in a small space.

The problem of casting concrete piling in places where space is restricted is a serious problem, for the reason that each pile must be allowed to cure for a period of time ranging from eight to fifteen days before it is in condition to be driven.

Consequently in a job where a large number of piling is required, it is necessary to cast anywhere from two to three times as many piling as can be driven in a single day before the driving operation commences so that there may be a full supply of cured piling ready for each day's driving and enough piling in various stages of curing to provide for the succeeding days of driving.

As it is possible ordinarily to drive at least twenty-five piles a day, it will be seen that the minimum number of piling which would be necessary in any job of any size to have in readiness at any one time would be two hundred.

My invention aims to provide a method of casting piling whereby the individual piles may be grouped side by side with face to face contact and in tiers one on top of the other during the curing process.

My process, therefore, contemplates the employment of a preliminary set of piling as forms for a second seat.

A further object is to provide an apparatus which may be withdrawn readily from a preliminary set of spaced piles without disturbing the spaced relation of said piles.

A further object is to provide an apparatus including means for accurately spacing the forms, said means also serving to close the ends of the forms.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a plan view of a set of piling constructed according to my invention;

Fig. 2 is a sectional view showing the butt end.

Fig. 3 is a plan view of a portion of the forms partially set up.

Fig. 4 is an inner side elevation of the butt end cap of the apparatus.

Fig. 5 is a sectional view through the same attached to the forms.

Fig. 6 is an inner side elevation of the nose end cap of the apparatus.

Fig. 7 is a sectional view of the same attached to the forms.

Fig. 8 is a transverse, sectional view through the forms set up for the first pouring operation.

Fig. 9 is a similar view showing the first pouring operation completed.

Fig. 10 is a similar view after the forms have been removed and the second pouring operation has been completed.

Fig. 11 illustrates the operation similar to that shown in Fig. 9 on the second tier of piling.

Fig. 12 is a perspective view of a group of piling, cast according to my method.

Fig. 13 is a sectional view showing the nose end cap used for forming a pile of the second series.

The amount of space required for casting about forty-eight piles, according to my method, will be a space equal to the length of the piling multiplied by the width of sixteen piles. For an eighteen inch by thirty foot pile, this will be approximately twenty-four by thirty feet.

The surface upon which the piling is to be made is first prepared by smoothing the earth to a perfectly smooth finish and as nearly level as possible. It will be understood that ordinarily the piling will be cast out in the open in a vacant lot or some portion of the yard adjacent the building operations.

After levelling the earth, which is indicated in Figs. 8—11, inclusive, by the reference character 15, a sheet 16 is spread over the entire surface so as to cover all of the earth. This sheet may be made of several strips of red resin paper or the like and is for the

purpose of giving a smooth surface to the lower sides of the piling and to prevent earth from adhering thereto.

The forms are shown in Fig. 3 and comprise primarily the planks 17, which are adapted to be positioned vertically, resting on their edges. As will be noted in Fig. 8, the forms 17 are positioned in pairs, adapted to be secured together so that the outer faces of each pair of forms are spaced from the outer faces of the adjacent pair of forms on either side thereof a distance equal exactly to the width of a pile.

Furthermore, the distance between the outer face of any one particular pair of forms is also exactly equal to the width of a pile whereby after the forms have been removed to leave a first series of piling, the distance between the side faces of said first series will be just the right amount to provide forms for a second series of piling. In order to space the pairs of forms from each other, I provide the end caps, shown in Figs. 4-7 inclusive. The butt end cap, shown in Fig. 4, comprises an inner plate 18, provided with a bevelled rim 19, terminating in the flange 20, which is perpendicular to the plate 18. The flange 20 is continued to form a flange 21, parallel to the plate 18. The flanges 21 are located on two sides only of the plate and are adapted to abut against the ends of the forms 17, the flanges 20 being received between the inner faces of the forms and serving to space the forms the exactly correct distance apart. The purpose of the bevelled rim 19 is to form bevelled corners 19^a at the butt ends of a pile, and in driving the pile, a driving cap 19^b is employed, which fits the contour of the butt end of the pile. Driving pressure against the driving cap is transmitted to the pile as indicated by the arrows in Fig. 14, preventing spalling or chipping of the corners of the pile during the driving process.

The nose end cap shown in Fig. 6 comprises a pyramidal cup 22, two sides of which terminate in flanges 23, positioned in a common plane so as to abut against the ends of the forms 17.

In order to space the forms of an individual pair from each other, I provide spacing blocks 24, adapted to be nailed to vertical cleats 25, permanently secured to the forms 17. The blocks 24 are exactly the proper length to space the forms apart. Where the forms are set up to produce tapered piling, as shown in the drawings, the blocks 24 are successively reduced in length and properly identified so that each block may be placed in its correct position.

In setting up the forms, each pair of forms may be arranged in properly spaced relation and the various pairs spaced by means of the end caps. The end caps are preferably secured in a temporary fashion by nailing through the flanges 23 and 21, respec-

tively, into the ends of the forms and after the forms have been adjusted so that the ends of all of the forms are aligned in the proper arcs of circles, stakes 26 are driven into the earth in line with the forms 17 and against the flanges 23, while the butt caps are held in place by a plank 27, curved to engage the series of caps and held securely in place by stakes 28, driven in the ground.

The forms now being securely positioned, they are ready for the pouring operation. Prior to the securing of the end caps in place, however, the reinforcing element shown at 29 in Fig. 3 is placed in position. The reinforcing element employed in producing piling, according to my invention, comprises four corner longitudinal rods 30 (Fig. 9) and a square coil 31, secured to the rods 30 by means of wire loops 30^a. The coil is pyramidal in shape, and the rods are thus positioned in converging relation to each other in the finished reinforcing element. Thus a reinforcing element is produced which conforms to the shape of the pile, and is imbedded at all points to the same depth in the sides of the pile. Such an element is much easier to make than one, for instance, which is formed of longitudinal rods and individual connecting loops.

Concrete is now poured between each pair of forms as illustrated in Fig. 9, thus forming a first series of piling, each pile being spaced from its neighbor by a space equivalent to the dimensions required of another pile.

During the puddling of the concrete, the reinforcing element is lifted by means of a crow bar with a hooked end, or the like, and thus brought to its position properly centered in the form. As the concrete flows under the element, it serves to support it in that position.

The next step in the process is to remove the forms. In order to remove the forms without disturbing the relation of the piling, they must be moved inwardly toward each other and this may be accomplished in a simple manner by removing the blocks 24, whereupon the forms may collapse inwardly as indicated in Fig. 3 and be lifted upwardly from between the piling.

The piling is, of course, allowed to set before removal of the forms and after the forms have been removed, is allowed to dry for ten to twenty-four hours before the next series is poured.

I have indicated the first series of piling by the reference character 32.

After the first series of piling has dried for 10 to 24 hours, the second series is poured, as illustrated in Fig. 10, wherein the second series is referred to by the reference character 33. Before pouring the second series, the sides of the first series are covered with a layer of heavy black oil, grease or paraffin

oil. This coating, indicated by the reference character A, prevents adhesion between the vertical faces of the piling.

In preparation for pouring the second series, the butt caps are secured in place by driving stakes against their flanges to secure the flanges against the ends of the first series of piling. The butt caps are secured between the piling in the same way as they were originally secured between the forms 17, with the exception that they are not nailed in place. The nose caps used for the second series are shown at 22^a in Fig. 13 and differ from the caps 22 in that their flanges 23^a are bent at right angles to their sides. Stakes 34 are used to secure them in place.

After the second series has been cast, it is allowed to set and the end caps removed. After ten to twenty-four hours' drying, a sheet 35, red resin paper, similar to the sheet 16, is laid over the upper surface of the piling and the forms are then built upon this second sheet in the same manner as for the first series of piling.

The third series of piling is indicated by the reference character 36 and is cast and allowed to dry in the same manner as the first series. After removal of the forms and drying of the third series, a fourth series is cast between the third series and allowed to set and to dry. Another sheet similar to the sheet 16 is then laid over the second tier of piling and a fifth and sixth series cast in the same manner as the preceding series.

In some cases, it may be necessary to cast four tiers of piling, although I find that the difficulties of removing the upper tier are quite enhanced, as compared with removing the third tier.

In removing the piling, it is necessary to move the outer pile of the upper tier by means of a crowbar or the like until a hook can be inserted behind the pile. A team of horses or a tractor is then hitched to the pile and it is pulled away from the supporting pile beneath and allowed to drop to the ground. The pile may be then snagged to the position where it is to be driven.

In Fig. 2, I have used the reference characters 37, 38 and 39, respectively, to indicate the fourth, fifth, and sixth series of piles.

The advantage of the casting of a large number of piling in a small space is accomplished by several features of my invention. In the first place, by casting the first series of piling in the properly spaced relation, it is possible to fill in the spaces between these first piles, so as to utilize all of the available space between the two outer piles. Another consequence of this operation is the formation of a smooth, flat surface, which forms a perfect supporting surface for a second tier of piling. By utilizing the separating sheet, the second tier may be poured without danger of adhering to the first tier. When the

several tiers have been completed, there is a solid mass of piling filling all of the space above the surface on which the piling is cast to a depth of several feet and easily separable into individual piles.

The present process eliminates fifty per cent of the cost of forms and form setting. It also eliminates casting platforms.

The cost of the operations on the second or third tiers of piling is less than that of the first due to the elimination of the necessity for preparation of the bed or supporting surface, in the latter steps. Above the third layer, the expense is somewhat increased due to increased labor cost in transporting the concrete to the higher levels.

Some changes may be made in the construction and arrangement of the parts of my invention without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. The method of making concrete piling of the type that is square in cross section, comprising the following steps: providing a smooth, flat surface; covering said sheet; building forms upon said sheet, which, when filled with concrete, form a first series of piling, each of which is separated from its neighbor by a space which has the exact dimensions of a pile; allowing said first series to partially cure; utilizing said first series as forms for a second series by filling said spaces with concrete; allowing said second series to partially cure; all of said first and second series being disposed in horizontal positions with one side face of each pile formed against the bottom sheet; covering the upper faces of the first and second series with a second sheet; and repeating the aforesaid steps upon the second sheet.

2. The method of making concrete piling of the type that is square in cross section, comprising the following steps: providing a smooth, flat surface, covering said surface with a bottom sheet; building forms upon said sheet which, when filled with concrete, form a first series of piling, each of which is separated from its neighbor by a space which has the exact dimensions of a pile; allowing said first series to partially cure; utilizing said first series as forms for a second series by filling said space with concrete; allowing said second series to partially cure; all of said first and second series being disposed in horizontal positions with one side face of each pile formed against the bottom sheet.

3. An apparatus for forming concrete piling of the type that is square in cross section, comprising: a plurality of pairs of elongated flat forms; each form having projecting elements on its side adjacent to its partner

form; spacing blocks adapted to be secured to or removed from, said projecting elements without disturbing the positions of the forms; and end caps adapted to be secured between adjacent forms of adjacent pairs of forms to close the spaces therebetween and to maintain the pairs in properly spaced relation.

4. An apparatus for forming concrete piling of the type that is square in cross section, comprising: a plurality of pairs of elongated flat forms; each form having projecting elements on its side adjacent to its partner form; spacing blocks adapted to be secured to or removed from said projecting elements without disturbing the positions of the forms; and means adapted to close the spaces between adjacent forms of adjacent pairs of forms, and to support the pairs in properly spaced relation.

5. An apparatus for forming concrete piling of the type that is square in cross section, comprising: a plurality of pairs of elongated flat forms; spacing blocks adapted to be secured to or removed from said forms without disturbing the positions thereof; and end caps adapted to be secured between adjacent forms of adjacent pairs of forms to close the spaces therebetween and to maintain the pairs in properly spaced relation.

6. An apparatus for forming concrete piling of the type that is square in cross section, comprising: a plurality of pairs of elongated flat forms; spacing blocks adapted to be secured to or removed from said forms without disturbing the positions thereof; and means adapted to close the spaces between adjacent forms of adjacent pairs of forms, and to support the pairs in properly spaced relation.

7. The method of making concrete piling of the type that is square in cross section, comprising the following steps: providing a smooth, flat surface; covering said surface with a bottom sheet; building forms upon said sheet which, when filled with concrete, form a first series of piling, each of which is separated from its neighbor by a space which has the exact dimensions of a pile; allowing said first series to partially cure; oiling the vertical side faces of said first series of piling; utilizing said first series as forms for a second series by filling said spaces with concrete; allowing said second series to partially cure; all of said first and second series being disposed in horizontal positions with one side face of each pile formed against the bottom sheet; covering the upper faces of the first and second series with a second sheet; and repeating the aforesaid steps upon the second sheet.

8. The method of making concrete piling of the type that is square in cross section, comprising the following steps: providing a smooth, flat surface, covering said surface with a bottom sheet; building forms upon said sheet which, when filled with concrete, form a first series of piling, each of which is

separated from its neighbor by a space which has the exact dimensions of a pile; allowing said first series to partially cure; oiling the vertical side faces of said first series of piling; utilizing said first series as forms for a second series by filling said spaces with concrete; allowing said second series to partially cure; all of said first and second series being disposed in horizontal positions with one side face of each pile formed against the bottom sheet.

9. The method of making concrete piling of the type that is square in cross section, comprising the following steps: providing a smooth, flat surface, covering said surface with a bottom sheet; building forms upon said sheet which, when filled with concrete, form a first series of piling, each of which is separated from its neighbor by a space which has the exact dimensions of a pile; allowing said first series to partially cure; providing means against the side faces of said first series of piling, to prevent adhesion of a second series to said first series; utilizing said first series as forms for a second series by filling said spaces with concrete; allowing said second series to partially cure; all of said first and second series being disposed in horizontal positions with one side face of each pile formed against the bottom sheet.

Signed this 8th day of November, 1928, in the county of Woodbury and State of Iowa.

FRANCIS T. LEEDER.