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3,527,310

PILE DRIVING AND GUIDING APPARATUS

Filed Sept. 9, 1968

3 Sheets-Sheet 1

Fig. 1

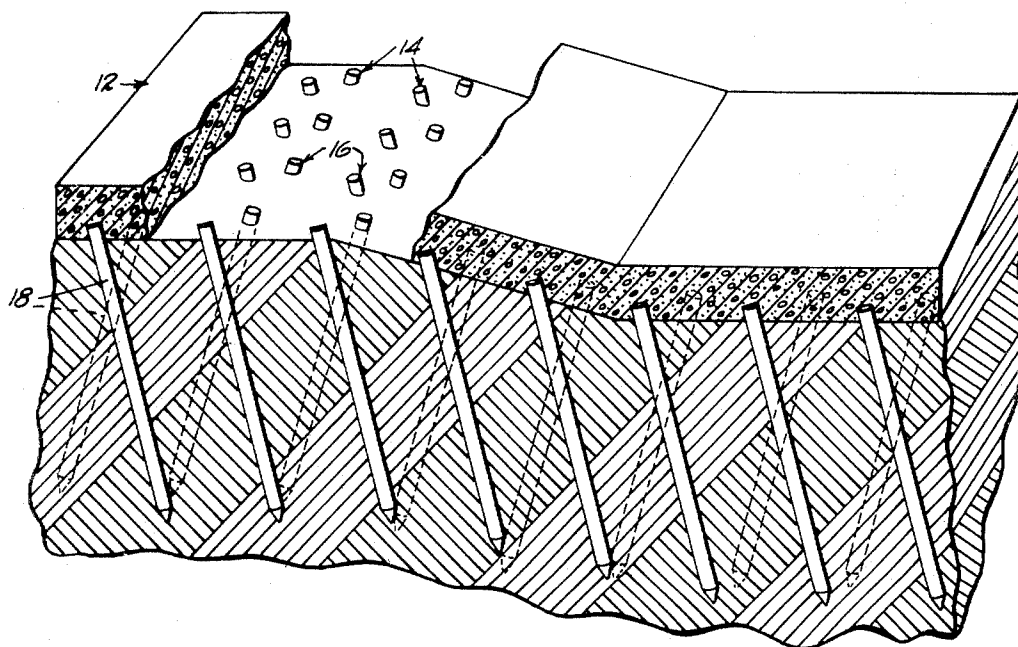


Fig. 2

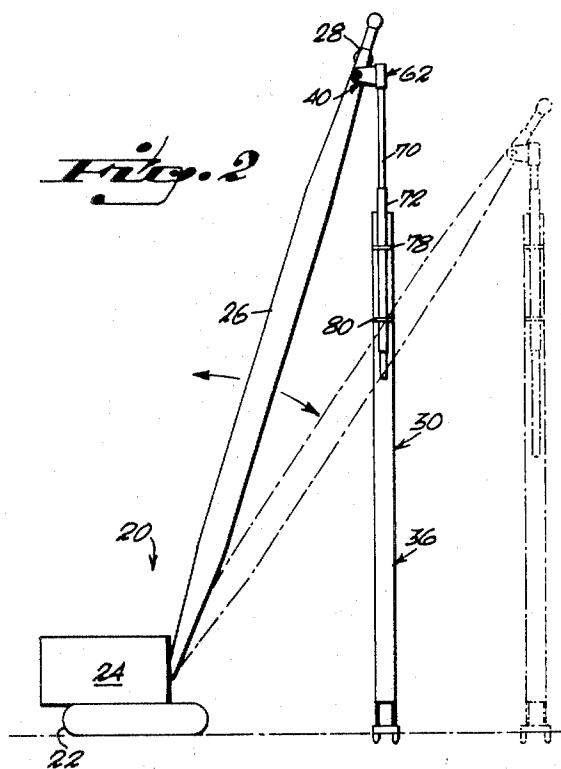
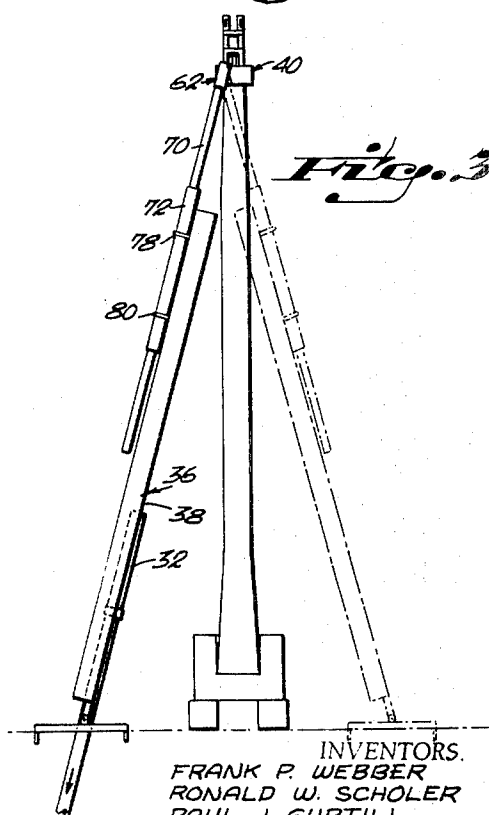


Fig. 3



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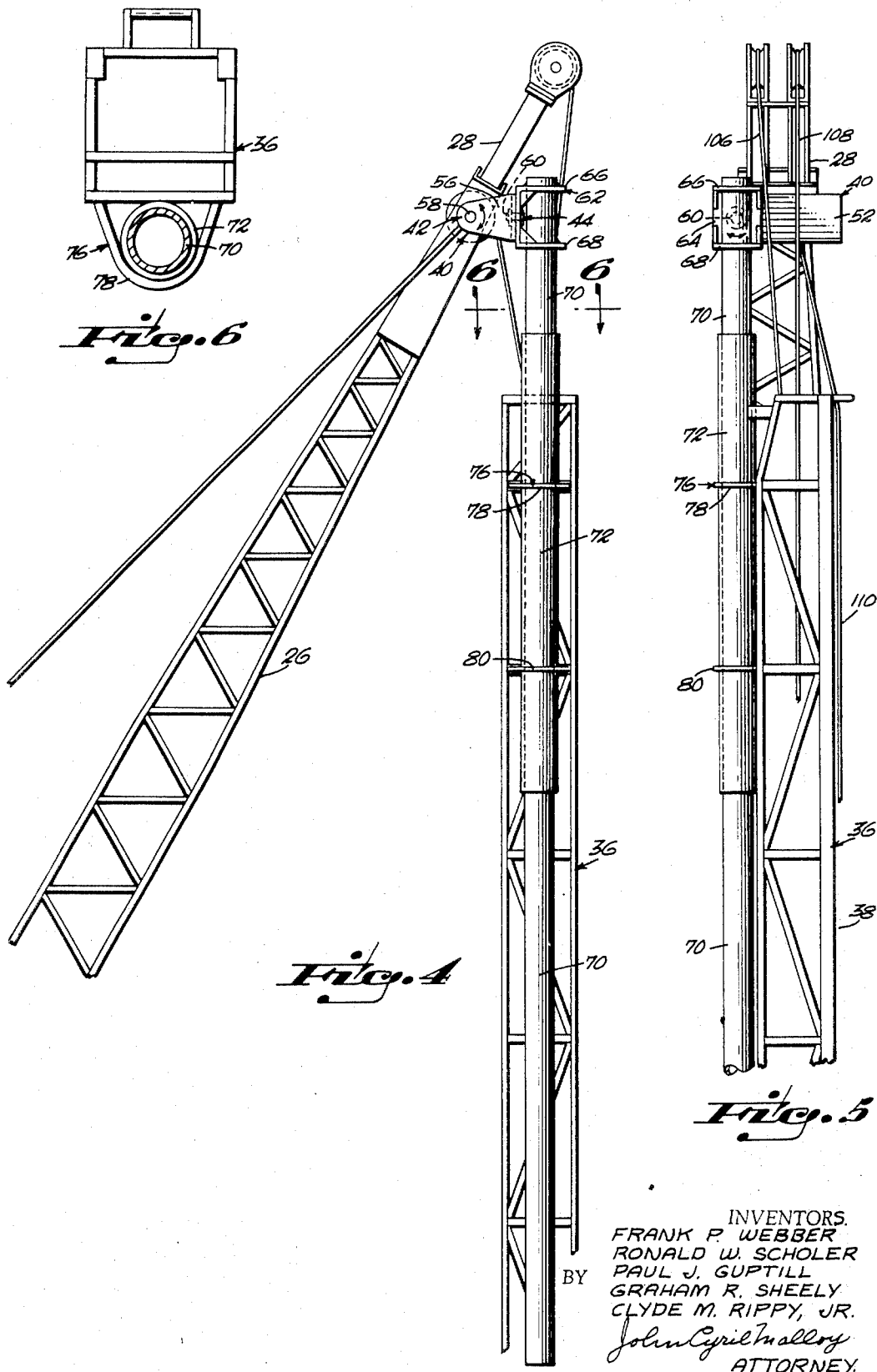
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PILE DRIVING AND GUIDING APPARATUS

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3 Sheets-Sheet 2



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PILE DRIVING AND GUIDING APPARATUS

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3 Sheets-Sheet 3

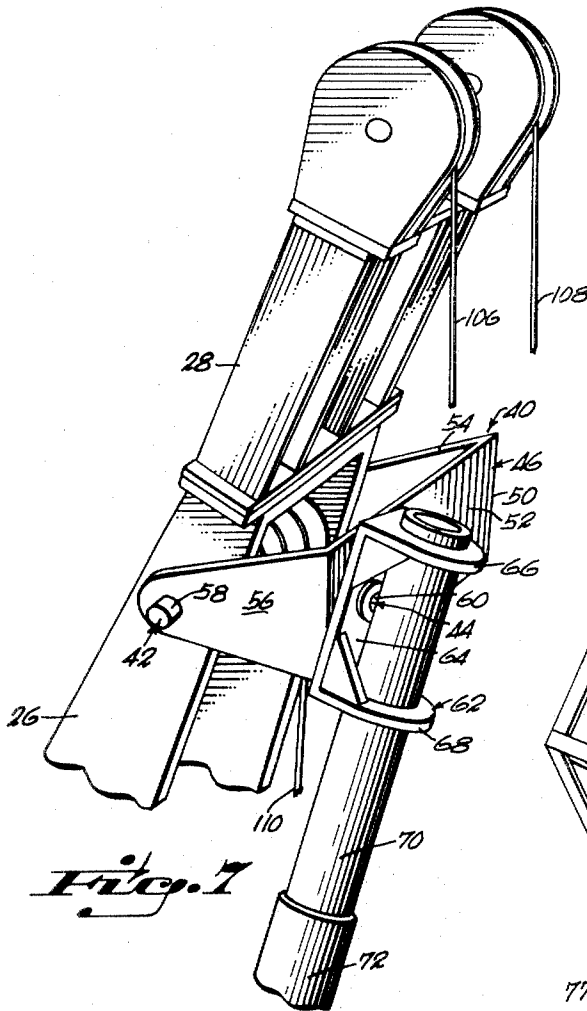


Fig. 7

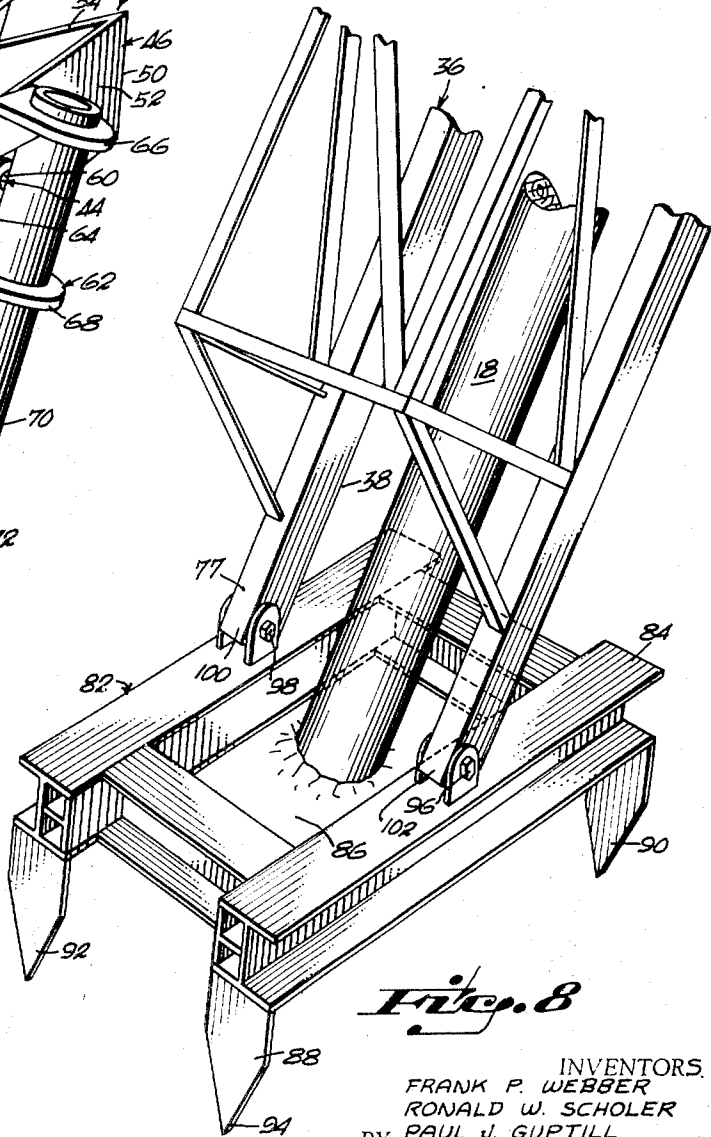


Fig. 8

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3,527,310

PILE DRIVING AND GUIDING APPARATUS
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7 Claims

ABSTRACT OF THE DISCLOSURE

An improved means to connect a pile driving apparatus to the upper end of a crane boom, which includes a first and a second horizontal pivot axis for effecting relative swinging movement of the pile driving apparatus through an angle of elevation and an azimuth angle so that a plurality of piles may be installed in a row and column relation while the crane remains in a fixed station.

As is well known, it is quite often required to install pilings in a pattern of rows and columns, for instance, in a spillway construction adjacent a dam. In such pile driving installations, it is an expensive operation because much time is required in changing the position of the crane to adjust the attitude and location of the pile driving apparatus with the precision required for installing each of the piles. The present invention provides a connection of the pile driving apparatus with the crane boom by which such adjustment may be accomplished without movement of the crane. This is done by providing for swinging movement about two horizontal and perpendicular axes and for adjustable extension of the pile driving apparatus. It is thus an object to provide extensible means to connect a pile driving apparatus to the upper end of a crane boom and to provide a first horizontal pivot for swinging of the pile driving apparatus inwardly or outwardly with respect to the vertical plane of the boom and a second horizontal pivot in perpendicular relation to the first pivot for lateral swinging movement of adjustment of the apparatus in planes which are perpendicular to the vertical boom plane.

It is, accordingly, an object of this invention to provide an improved pile driving apparatus which includes means to connect the apparatus to a boom, the said means to connect including a first and a second pivot axis, both being horizontally aligned and arranged for effecting relative swinging movement of the pile driving apparatus through an azimuth angle range and an elevation angle range in perpendicular planes with respect to one another.

It is another object of this invention to provide an improved device as set forth in the preceding object wherein the structure includes a clevis means to connect a swinging web to the upper end of a boom and a pivotal yoke to the web for carrying a pile driving apparatus.

It is also an object of this invention to provide an improved means to connect of a pile driving apparatus to a boom end which includes, in addition to a first and a second horizontal pivot means in perpendicular relation to one another, an elongation means for adjusting the effective length of the pile driving apparatus and locating the lower terminus of that apparatus with respect to a ground location at which a piling is to be installed.

It is also an object of this invention to provide an improved device as set forth in the preceding paragraph which includes a positioning base means for the lower end of the pile driving apparatus for securing alignment and holding the pile driving apparatus in a predetermined attitude.

It is a general object of this invention to provide an improved connection for a pile driving apparatus to a boom which is simple in construction, inexpensive to manufacture, adapted for use with existing equipment and which is otherwise well adapted for the purposes which are specified herein.

In accordance with these and other objects which will become apparent hereinafter, the instant invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a partial perspective view in cross section and illustrating an installation site of pilings;

FIG. 2 is a schematic elevation view illustrating a crane and pile driving apparatus in a main and a dotted view to illustrate a range of adjustment of the boom of the crane;

FIG. 3 is an elevation view which is somewhat similar to FIG. 2 and illustrating the range of azimuth angle adjustment of the pile driving apparatus;

FIG. 4 is an enlarged partial elevation view of the upper end of the boom, pile driving apparatus and the means to connect the pile driving apparatus to the boom;

FIG. 5 is a front elevation view of FIG. 4;

FIG. 6 is a view taken along the plane indicated by the line 6—6 of FIG. 4 and looking in the direction of the arrows;

FIG. 7 is an enlarged, fragmentary view of the upper end of the boom and the means to connect the pile driving apparatus to the boom; and

FIG. 8 is an enlarged perspective view of the lower end of the pile driving apparatus provided with positioning base means to locate a pile within respect to the earth for installation.

Referring to the drawings, wherein like reference characters designate like or corresponding parts throughout the various views, and referring particularly to FIG. 1, there is shown a construction site 12 in which a pattern of rows 14 and columns 16 of pilings 18 are installed in criss-crossing angular relation with respect to one another, as is a pattern commonly to be found in a spillway-type installation, which is intended to be illustrated by the site 12 of FIG. 1. As shown in FIG. 2, a crane 20 including a tractor 22 with a cab 24 is utilized, the said crane including a boom 26 having an upper extending end 28 from which there depends an assembly 30 comprising means to carry and to guide a pile as well as a hammer 32 for generally vertical reciprocal movement and holding means comprising a cap to protectively cover the upper end of the pile on the battering operation of the hammer.

In the generally encountered construction, the pile driving apparatus consisting of the crane and the means to carry the pile includes a frame portion seen in FIG. 8 and known in the trade as leads 36. The leads in the embodiment shown are of generally downwardly-opening channel form into the mouth 38 of which a piling 18 is received with the upper end of the piling being secured to the cap 34 which in turn is slidably fixed within the leads 36 in close adjacent relation to the hammer 32.

Means are provided as seen in FIG. 7 and in FIG. 8 for use of the driving apparatus with increased convenience in installing a pattern of pilings in the row and column fashion indicated in FIG. 1. Referring to FIG. 7, there are shown means to connect 40 the upper end 28 of the boom 26 to the leads 36. The means to connect includes a first horizontal pivot axis 42 and a second horizontal pivot axis 44 which are at all times maintained by the means to connect in perpendicular relation with respect to one another and with the second pivot axis intersecting medially of the effective length of the first pivot axis.

In the preferred embodiment, clevis means 46 are provided to effect the first pivot axis, the said clevis means

including a bifurcated portion 50 having a web 52 and a pair of extending arms 54 and 56 through the terminal ends of which pivot pin means 58 comprising the pivot means extend. From the web 52 in the preferred embodiment, the pivot pin 60 interconnects with a yoke 62 with the base 64 of the yoke being secured to the pivot pin 60 and with the arms 66 and 68 of the yoke being provided with a depending swingable member 70 in spanning relation thereof. The member 70, comprising a depending swingable guide member, it will be noted, is adapted for swinging movement with respect to the plane of the web and to be carried by the clevis in swinging movement about a horizontal axis through the end of the boom. To the guide member 70 a carriage 72 is connected for linear movement along the guide member. The carriage is rigidly secured to the leads 36 by suitable means 76, such as the welded braces 78 and 80.

In operation, it is thus seen that a pile 18 carried in the leads is adapted to be driven by a hammer 32 battering against the holding cap 34 into the earth as indicated in FIG. 8. As the lower terminal end 77 of the leads 36 is moved through the ranges of movement permitted by reason of the pivot means 40 and 42, the need for elongation of the portion depending from the end 28 of the boom is required and is effected by relative movement of the carriage 72 along the guide member 70 to effect close adjacent positioning of the lower terminal end 76 of the lead 36 in the desired location for installation of a piling. To hold and maintain the lower end 76 of the lead 36 in the predetermined location for installing each of the individual pilings of the pattern in row and column form, a position base means 82 is provided which includes a sturdy frame 84 preferably of I-beam lengths defining a central opening 86 through which the piling passes in installation. From the frame a plurality of ground-engaging members such as 88, 90 and 92 with sharpened terminal ends 94 which depend which are secured depthwise in the earth at the desired location. Also, pivot means 96 and 98 are provided to connect the members 100 and 102 of the end 77 of the lead 36 to the upper surface of the base means 82. From the base means 82 two pairs of spaced ears are provided defining by aligned holes through each an axis of pivot of the base means 82 for swinging movement relative to the end 77 of the leads 36. It is thus seen that once a piling has been installed the leads may be raised by lifting the carriage along the guide member 70 to carry it upwardly; and, thence, it may be swung about the pivot means 40 and 42 until the lower end 36 of the leads is at the desired location for the next pile installation, whereupon it is lowered into the precise position with the ground-engaging members 88, 90 and 92 penetrating the earth and providing the securement for the lower end of the leads.

For effecting displacement of the carriage, a pulley system generally indicated by the numeral 106 is provided and for effecting displacement of the hammer a pulley 108 is provided, each of which are utilized in a conventional manner. Also, the cable 110 shown in FIG. 7 is employed for lifting the upper end of the piling for use in securing it to the holding cap.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the

invention, which is, therefore, not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims so as to embrace any and all equivalent apparatus and articles.

What is claimed is:

1. For use with pile driving apparatus including:

- (a) a crane having a boom, and
- (b) means to carry a pile in depending relation from the upper end of the boom including hammer and holding means for (1) aligning, (2) guiding, and (3) driving a pile into the earth,

the improvement which comprises:

- (A) means to connect the extending end of the boom to the means to carry;
- (B) said means to connect including a first horizontal pivot means and a second horizontal pivot means, said first pivot means comprising a lateral pin connected to said boom proximally of said end,
- (C) said pivot means being in perpendicular relation with respect to one another for effecting relative swinging movement of the means to carry and a carried pile about said pivot means,
- (D) so that the apparatus may be used repeatedly from a single crane station while installing a plurality of piles in a pattern of rows and columns.

2. The device as set forth in claim 1 wherein positioning base means are provided to locate the extending lower terminal end of said means to carry with respect to the station during operation of the apparatus of installation of a pile.

3. The improved device as set forth in claim 1 wherein said means to connect includes

- (a) a first guide member, and
- (b) a second carriage member captivated for movement along the guide member,
- (c) for effecting elongation of said means to carry, said means to carry being secured to said carriage member.

4. The improved device as set forth in claim 1 wherein said first pivot means comprises a clevis connection of said means to connect to the extending end of said boom.

5. The improved device as set forth in claim 4 wherein said second pivot means includes a yoke pivotally secured to the clevis connection, said yoke being operatively connected to said means to carry.

6. The improved device as set forth in claim 3 wherein said second pivot means includes a yoke pivotally secured to the clevis connection and said guide member is secured in spanning relation of the crotch of said yoke.

7. The device as set forth in claim 2 wherein said positioning base means comprises a guide frame with a central opening for passage of the pile therethrough on installation, a plurality of ground engaging elements, and pivot means to connect opposing sides of said frame to the lower terminal end of said means to carry.

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