

Nov. 18, 1947.

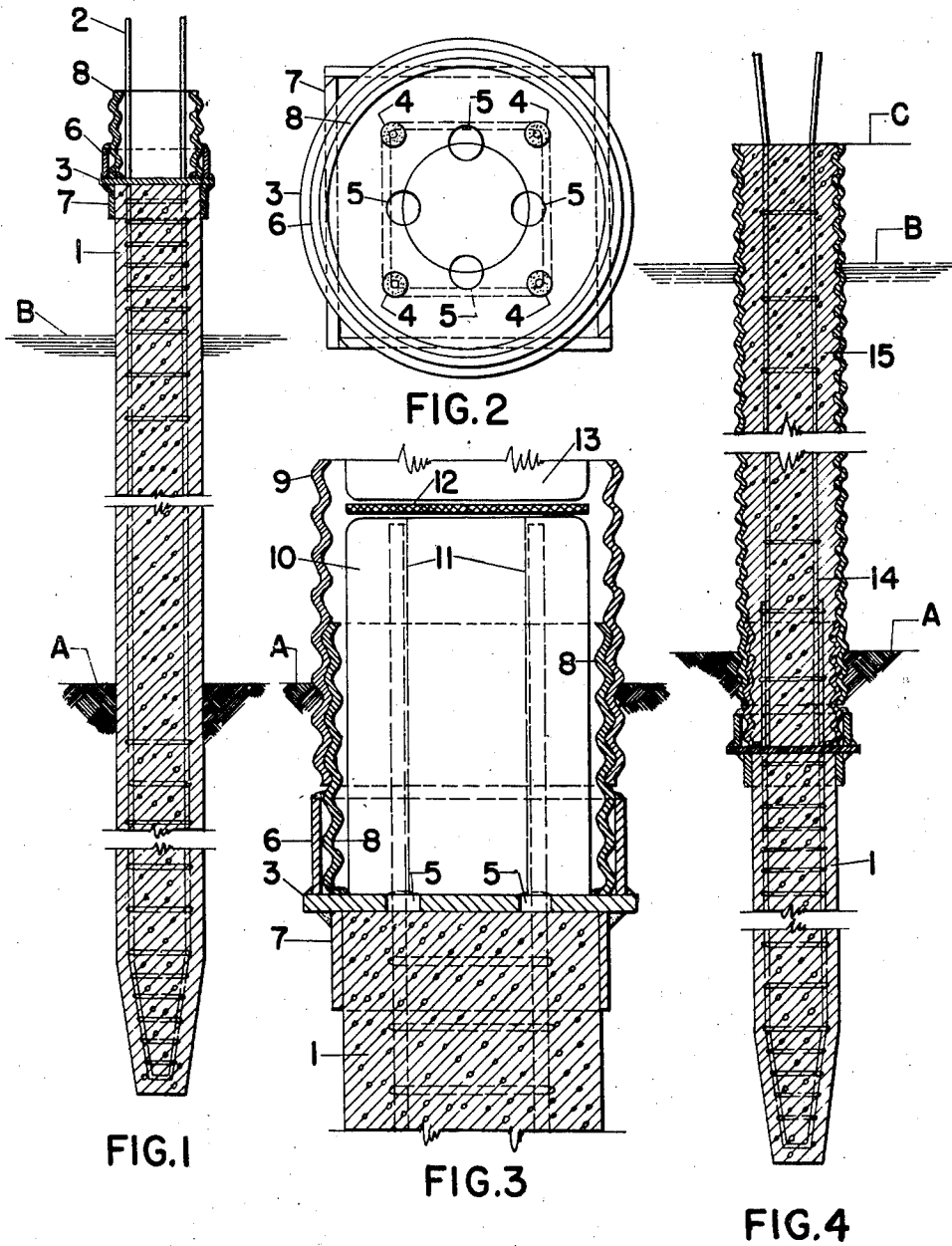
R. R. KOHN

2,430,879

SPliced FILE CONSTRUCTION

Filed Sept. 24, 1945

4 Sheets-Sheet 1



Inventor
RALPH REUBEN KOHN

Ralph L. Chappell

Attorney

Nov. 18, 1947.

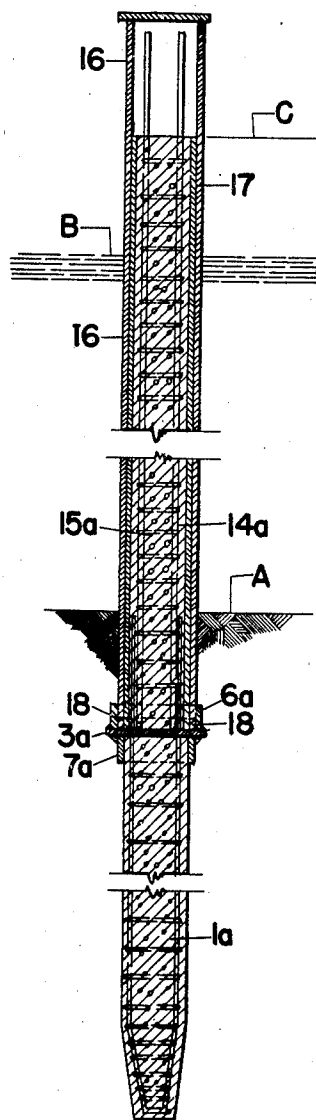
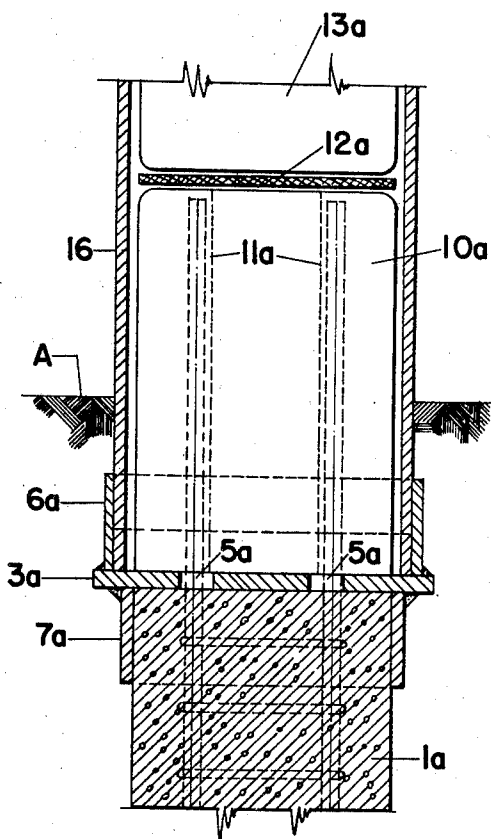
R. R. KOHN

2,430,879

SPLICED PILE CONSTRUCTION

Filed Sept. 24, 1945

4 Sheets-Sheet 2



Inventor

RALPH REUBEN KOHN

By *Ralph L. Chappell*

Attorney

Nov. 18, 1947.

R. R. KOHN

2,430,879

SPLICED PILE CONSTRUCTION

Filed Sept. 24, 1945

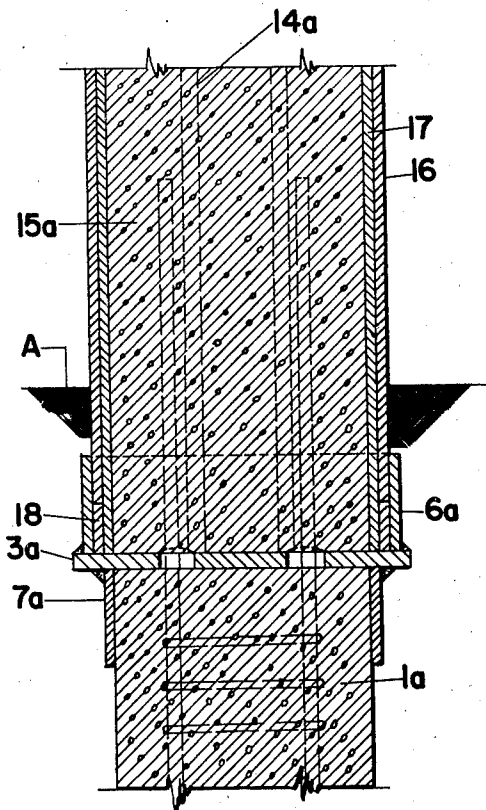


FIG. 7

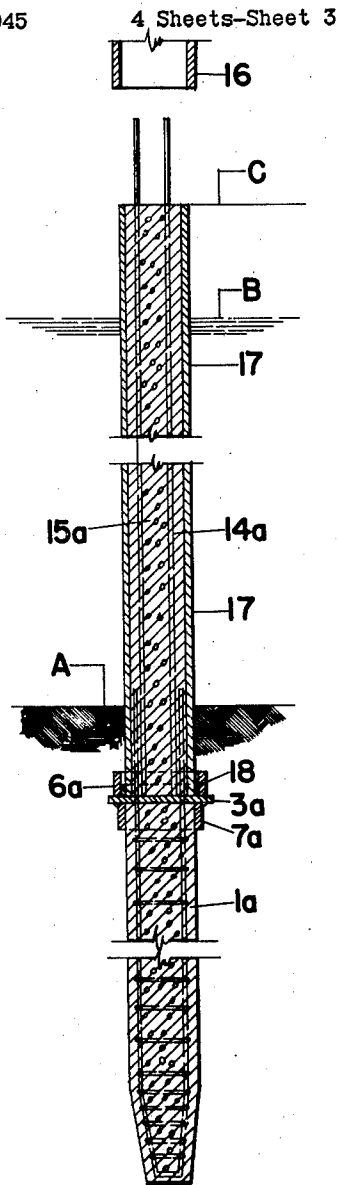


FIG. 8

Inventor

RALPH REUBEN KOHN

By *Ralph L. Chappell*

Attorney

Nov. 18, 1947.

R. R. KOHN

2,430,879

SPLICED PILE CONSTRUCTION

Filed Sept. 24, 1945

4 Sheets-Sheet 4

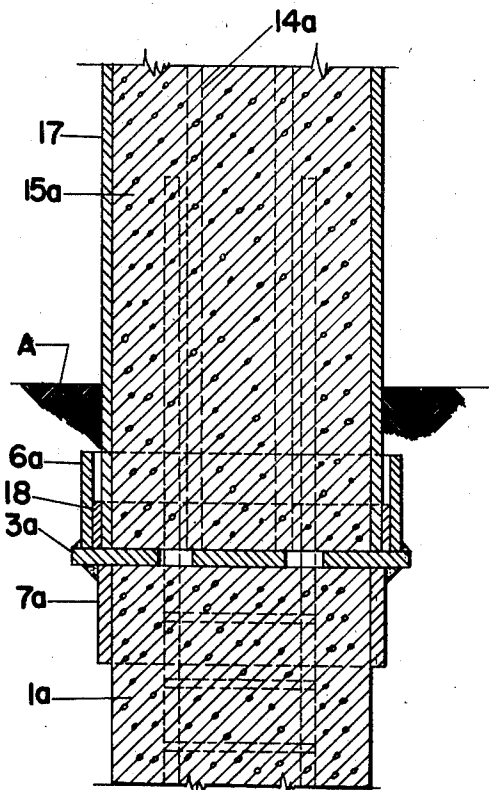


FIG. 9

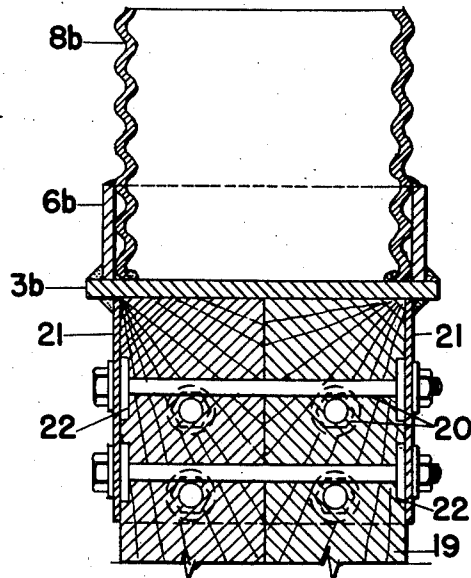


FIG. 10

Inventor

RALPH REUBEN KOHN

By *Ralph L. Chappell*

Attorney

UNITED STATES PATENT OFFICE

2,430,879

SPliced PILE CONSTRUCTION

Ralph Reuben Kohn, Lancaster, Pa.

Application September 24, 1945, Serial No. 618,376

6 Claims. (Cl. 61—57)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The present invention relates to improvements in pile construction and procedure and more particularly to a spliced pile construction.

An object of the invention is to provide a novel and effective spliced pile construction and process of making the same which may be quickly formed and which provides a strong spliced pile.

Another object is to provide a procedure for driving and splicing piles in which the pile may be driven and additional pile portions thereafter spliced thereto, and which avoids delay usually attendant upon waiting for a spliced concrete pile addition to attain sufficient strength to permit driving it to a proper bearing.

A further object is the provision of a pile joint or splice structure which will provide maximum protection and strength to the parts of the pile construction, in the formation and driving of the pile, as well as in the completed spliced pile structure, including the provision of means for embracing and protecting the upper end of the lower portion of the pile during driving thereof prior to the making of the splice or addition thereto.

Other objects and advantages of the invention will be more apparent from the following description taken in connection with the accompanying drawings, which are exemplary, and in which:

Fig. 1 is a sectional elevation showing a pre-cast pile member driven as far as possible without an addition, the pile portion being of insufficient length to develop the required bearing, and showing means applied to the pre-cast pile portion to make it ready to take a splice or addition.

Fig. 2 is an enlarged top plan view of the structure of Fig. 1.

Fig. 3 is an enlarged fragmentary sectional view of the structure of Fig. 1 with additional members illustrating a further step in the procedure.

Fig. 4 is a sectional view of the completed spliced pile.

Fig. 5 is an enlarged fragmentary sectional view similar to Fig. 3 showing a modification of the invention.

Fig. 6 is a sectional elevation showing a subsequent step in the procedure with the structure of Fig. 5.

Fig. 7 is an enlarged fragmentary sectional view of the arrangement of Fig. 6.

Fig. 8 is a sectional view of the finished spliced pile of this modification and Fig. 9 is an enlarged fragmentary sectional view thereof.

Fig. 10 is a fragmentary sectional view of a further modification of the invention.

When precast concrete piles are not long

2

enough to give proper bearing, they are usually lengthened by splicing on an additional poured-in-place piece. The poured-in-place splice necessitates exposing about 2'-0 of the reinforcing, then making a form and using high early strength Portland cement to bond to the lower section and then waiting about seven days to permit this addition to develop sufficient strength to permit driving to a satisfactory bearing. When driving is resumed either the material around the pile takes a hold on the pile and the driving becomes harder than on the original, or the material at bottom releases the built up compression and the pile now drives easier. In either event the formula for bearing has to be modified by some indeterminate coefficient. Moreover the new length is often too long and the additional piece then has to be shortened.

Referring to the drawings, the numeral 1 represents the pre-cast concrete pile with a portion of its reinforcing 2 exposed, for example, about a two foot length of exposed reinforcing rods extending above the pile portion 1.

The pile 1 is driven to a depth such that the need for splicing an additional length of pile becomes apparent, the pile not being long enough to develop the required bearing.

In making the top of the pre-cast pile 1 ready to take a splice, a preferably circular cushion plate 3, desirably of steel about one inch thick, is placed to overlie the upper end of the pre-cast pile portion 1. This acts as a cushion to distribute the hammer blows to the pre-cast concrete pile portion 1. The plate 3 is provided with openings 4 permitting it to be threaded over the reinforcing rods 2. The plate 3 is preferably welded to the reinforcing rods 2, as indicated, so as to prevent a lifting-off or separation from the pre-cast pile of the cast-in-place addition before the latter has developed the full bond strength on the approximately two foot length of projecting reinforcing rods.

The plate 3 is also preferably provided with openings 5 to permit the new vibrated concrete of the cast-in-place addition to make an additional bond and seal by bonding to the pre-cast concrete pile portion 1, through said openings 5, which may desirably be two inch diameter holes.

In Fig. 1, a tubular member 6 which is preferably a cylindrical ring and desirably of steel or other suitable material, is provided overlying the plate 3 and is secured thereto, desirably by welding as shown. The tubular outer ring member 6 may be desirably about six inches deep and

3

one inch thick but may be of any other suitable dimensions.

Also preferably welded to the plate 3 is a depending embracing member 7 which may desirably be of rectangular shape to fit snugly about the pile portion 1 which may desirably be rectangular. The depending embracing member 7 desirably may be of welded steel plates of about six inches in depth and one inch thick, or may be of other suitable shape and dimensions to conform to and embrace the pre-cast pile portion 1.

Also overlying the plate 3 is a relatively short cylindrical section or reinforcing intermediate tubular member or casing section 8 desirably of corrugated or threaded steel, which fits within the tubular member or outer ring 6 and is welded thereto and to the plate 3.

When a pile is too short, the aforementioned structure may be applied, and then a section of tubular casing 9, preferably corrugated or threaded, is turned onto the tubular member or section 8. A follower 10 is applied clearing the reinforcing rods, by means of openings 11 therein receiving the rods. A cushion 12, desirably of plywood, is preferably applied, and the core 13 is applied over the cushion.

The pile is then driven to the proper depth such that the penetration will give the necessary bearing value required.

Additional sections of corrugated steel casing (not shown) may be added if needed, until the proper penetration is reached.

The core 13, cushion 12, and follower 10 are then withdrawn by any suitable means, and the casing is then cut off at the desired or proper elevation.

The casing is then pumped out, as may be desirable if water is encountered, and a cage 14 of reinforcing bars, for example with $\frac{3}{8}$ inch diameter bands and 12 inch centers, is added. The new concrete 15 is then poured into the casing and vibrated to the new top.

The pre-cast concrete pile portion is thus spliced and lengthened by the cast-in-place pile portion within the casing 9, so that the completed spliced and lengthened pile will fetch up with the proper bearing capacity.

In Figs. 5 to 9, there is shown a modification of the invention in which the tubular member or casing section 8 of Fig. 1 is omitted, and there is provided a casing or tube section 16, desirably of steel, received within the tubular member or outer ring 6a. The follower 10a, plywood cushion 12a and the casing section 16 are placed upon the plate 3a and within the outer ring 6a. The core 13a is then inserted and the pile is driven to such penetration as is required by the bearing value specified.

The core 13a, cushion 12a, and the follower 10a are then removed in any suitable manner, and the steel casing 16 desirably is pumped out if water is encountered.

A permanent casing or tube section 17, desirably of steel, is then applied within the casing section 16, to extend from the plate 3a to the cut-off line. A cage 14a of reinforcing rods is added, as before, and the new concrete 15a is poured and vibrated to the cut-off line at the top of the casing 17.

The external casing 16 is then removed, the permanent casing 17 and the concrete 15a being suitably held in place while the external casing is removed.

Preferably, a tubular member or reinforcing

4

intermediate ring 18, desirably of steel coated with asphalt, may be applied on top of plate 3a, directly below the external casing 16. The tubular member 18 acts as a seal for the new concrete and being disposed and remaining between the outer ring 6a and the permanent casing 17, it acts to hold the permanent casing 17 in position after the external casing is removed.

In Fig. 10 there is shown a modification of the invention, similar to that shown in Figs. 1 to 4, but utilizing a built-up wood pile in place of the pre-cast concrete pile. The build-up wood pile portion 19 is preferably made of four pieces of wood held together by bolts 20, passed through splice plates 21 preferably welded to the plate 3b and depending therefrom. Desirably eight bolts may be employed with shear plates 22, and disposed in a staggered relationship as shown. The plate 3b does not have openings therein, none being required for bonding purposes, and there being no reinforcing bars in the lower pile section which in this modification is of wood. The cushion plate 3b acts, as before described, to distribute the hammer blows to the wood pile section, and the tubular member or outer ring 6b is welded thereto and to the corrugated casing section 8b. The pile section of Fig. 10 is then spliced to a cast-in-place section of concrete in the manner as set forth in connection with Figs. 1 to 4, except that no follower is needed because there are no reinforcing bars projecting through the plate 3b which would require a follower to clear them. In the modification of Fig. 10 the plywood cushion and core are placed on the plate 3b without a follower. Otherwise the procedure is the same as in Figs. 1 to 4 and a spliced wood and concrete pile results, as is apparent.

The drawings show pile splices under a water condition, such as for piers, but the splices can be made on land also. In the drawings the ground or earth line is indicated at A and the water line is indicated at B. The cut-off line is indicated at C.

It will be apparent that the sizes and shapes of the piles and various splicing parts and plates or members may be varied to suit field and office requirements without departing from the scope of the invention. The upper and lower pile sections may be of shapes other than as shown. A cylindrical concrete addition is shown as spliced to a rectangular pile, but the invention is not confined to the particular shapes shown.

This splice can be used not only for lengthening a pile to attain a proper bearing, but also where the proper length is indeterminate, or is too great to permit easy handling, or too long for the boom, leads or jet capacity.

It will be understood that various changes in the construction and details of the structure and procedure illustrated and described herein, may be made without departing from the spirit of the invention and it is intended that the invention is not to be limited except by the terms of the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A pile construction comprising a pre-formed pile portion, a plate member overlying the upper end of said pre-formed pile portion, an outer ring member overlying and secured to said plate, a reinforcing tubular member of limited length

5

overlying said plate and disposed within and in engagement with said outer ring member and thereby providing a structure of limited extent readily applicable to the upper end of the pre-formed pile portion, a tubular casing in engagement with said reinforcing intermediate tubular member and extending above the same, and a cast-in-place concrete pile portion within said tubular casing and overlying said plate and means securing said structure to said pre-formed pile portion.

2. Steps in a process comprising applying a plate to overlie the upper end of a pre-formed pile portion together with an outer ring member overlying and secured to said plate, applying a tubular member overlying said plate within and in engagement with said outer ring member, said tubular member being of less height than said outer ring member, applying a temporary tubular casing upon the top of said tubular member and extending above the same, driving said pile, inserting an inner tubular casing within said temporary tubular casing and said tubular member, casting in place a concrete pile portion within said inner tubular casing and overlying said plate, and removing the temporary outer tubular casing.

3. A pile construction comprising a pre-formed pile portion, a plate member overlying the upper end of said preformed pile portion, an outer ring member overlying and secured to said plate, a reinforcing tubular member of limited length overlying said plate and disposed within and in engagement with said outer ring member and thereby providing a structure of limited extent readily applicable to the upper end of the pre-formed pile portion, a tubular casing in engagement with said reinforcing intermediate tubular member and extending above the same, and a cast-in-place concrete pile portion within said tubular casing and overlying said plate, said pre-formed pile portion being of reinforced concrete, said plate having openings therein through which extend reinforcing rods of said pre-formed concrete pile portion, said reinforcing rods being secured to said plate as by welding, whereby a lifting-off or separation from the pre-cast pile of the cast-in-place portion is prevented before the cast-in-place portion has developed the full bond strength on the projecting reinforcing rods.

4. A pile construction comprising a pre-formed pile portion, a plate member overlying the upper end of said pre-formed pile portion, an outer ring member overlying and secured to said plate, a reinforcing tubular member of limited length overlying said plate and disposed within and in engagement with said outer ring member and thereby providing a structure of limited extent readily applicable to the upper end of the pre-formed pile portion, a tubular casing in engagement with said reinforcing intermediate tubular member and extending above the same, and a cast-in-place concrete pile portion within said tubular casing and overlying said plate, said reinforcing intermediate tubular member being threaded and secured to said outer ring, and said

6

tubular casing being threaded and in threaded engagement with said tubular member.

5. A pile construction comprising a pre-formed pile portion, a plate member overlying the upper end of said pre-formed pile portion and extending laterally beyond the same, an outer ring member overlying and secured to said plate, a reinforcing tubular member of limited length overlying said plate and disposed within and in engagement with said outer ring member and thereby providing a structure of limited extent readily applicable to the upper end of the pre-formed pile portion, a tubular casing in engagement with said reinforcing intermediate tubular member and extending above the same, a cast-in-place concrete pile portion within said tubular casing and overlying said plate, and means secured to the under side of said plate and depending therefrom inwardly of its laterally extended edges and in embracing engagement with the upper part of the pre-formed pile portion, said reinforcing intermediate tubular member being substantially no nearer to the center line of the pile than is the depending pile embracing means, whereby the cast-in-place pile portion is substantially as large in diameter as the pre-formed pile portion.

6. A pile construction comprising a pre-formed pile portion, a plate member overlying the upper end of said pre-formed pile portion, an outer ring member overlying and secured to said plate, a reinforcing tubular member of limited length overlying said plate and disposed within and in engagement with said outer ring member and thereby providing a structure of limited extent readily applicable to the upper end of the pre-formed pile portion, a tubular casing in engagement with said reinforcing intermediate tubular member and extending above the same, and a cast-in-place concrete pile portion within said tubular casing and overlying said plate, said reinforcing intermediate tubular member being threaded and secured to said outer ring, and said tubular casing being threaded and in threaded engagement with said tubular member, said reinforcing intermediate threaded tubular member being welded to the upper end of said outer ring and being welded at its lower end to the said plate member providing a reinforced welded wall at the joint.

RALPH REUBEN KOHN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
885,337	Gilbreth	Apr. 21, 1908
969,136	Cranford	Aug. 30, 1910
1,688,064	Upson	Oct. 16, 1928
1,805,253	Nadel	May 12, 1931
1,832,404	Marsden	Nov. 17, 1931
1,856,609	Watt	May 3, 1932
1,936,540	Mechlin	Nov. 21, 1933
2,168,459	Upson	Aug. 8, 1939