Aug. 4, 1970 G. FUENTES, JR 3,522,707

PILING CONSTRUCTION

Filed Nov. 20, 1967 2 Sheets-Sheet 1

Fig. 1

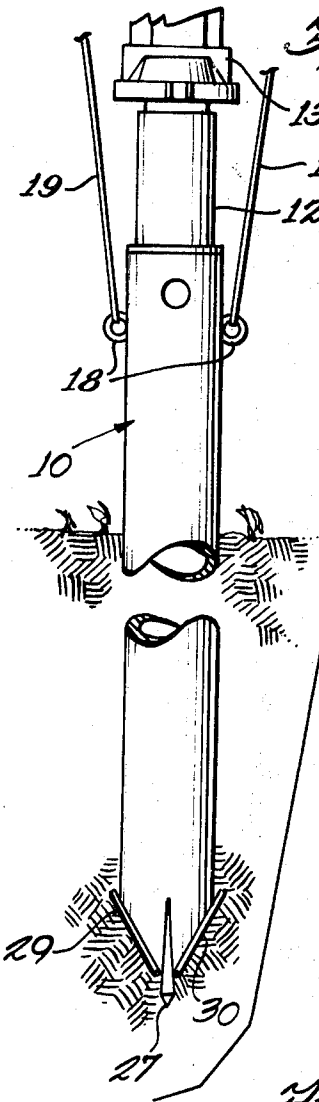



Fig. 2

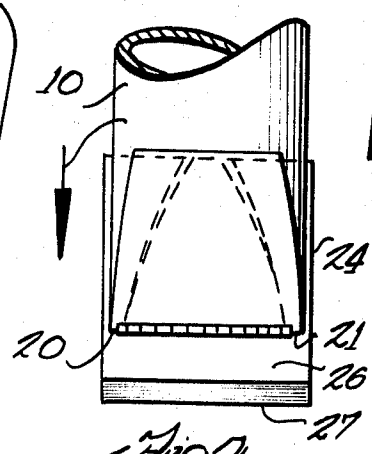



Fig. 3

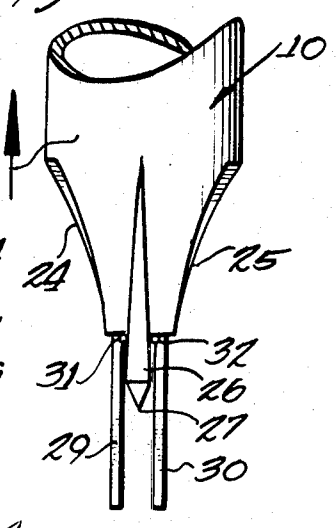



Fig. 4

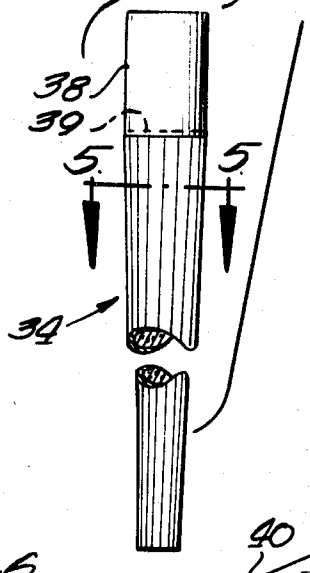



Fig. 5

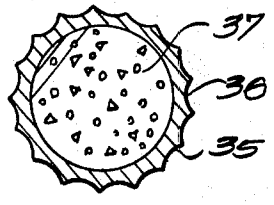



Fig. 6

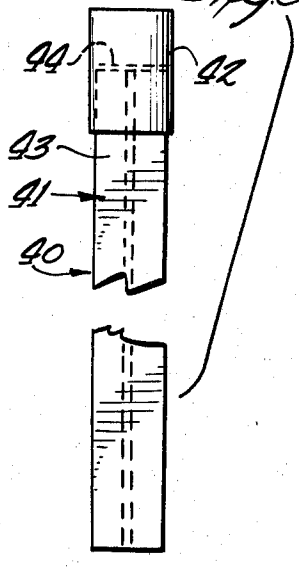



Fig. 7

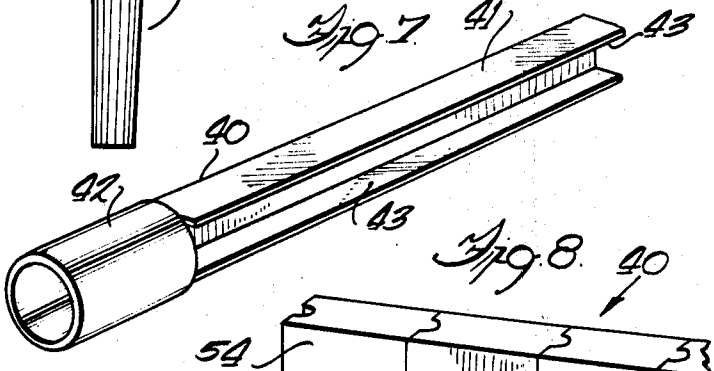
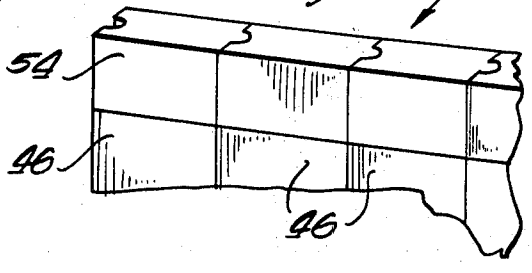



Fig. 8




Inventor
Gabriel Fuentes, Jr.
Dominik, Stein & Knechtel
Attys

Aug. 4, 1970 G. FUENTES, JR 3,522,707

PILING CONSTRUCTION

Filed Nov. 20, 1967 2 Sheets-Sheet 2

Fig. 9

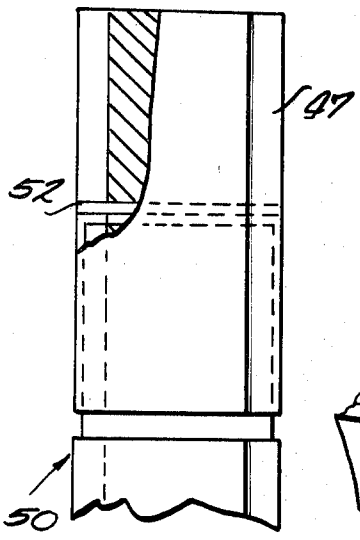



Fig. 10

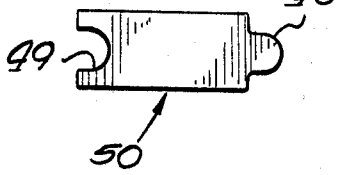



Fig. 11

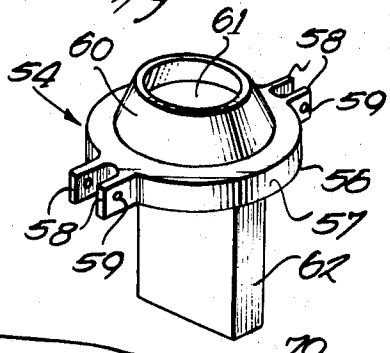



Fig. 12

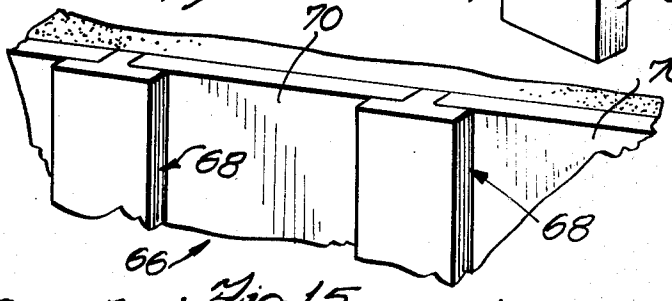



Fig. 13

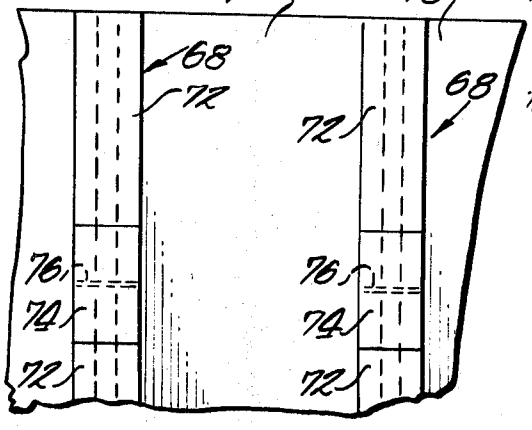



Fig. 14

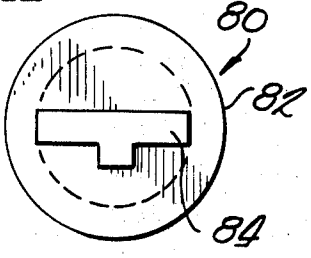



Fig. 15

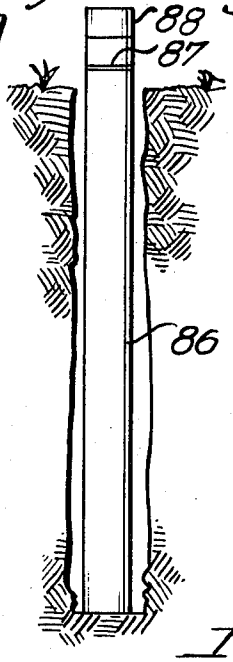
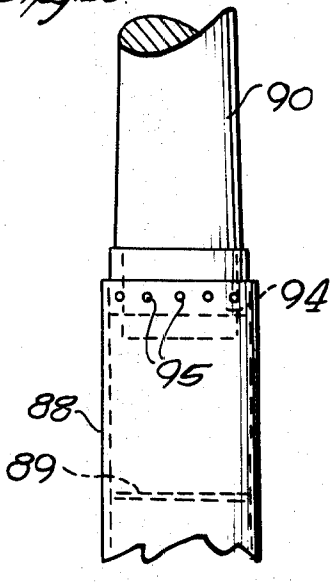



Fig. 16




Inventor
Gabriel Fuentes, Jr.
Dominik, Stein & Saxton
Atty's

United States Patent Office 3,522,707 Patented Aug. 4, 1970



3,522,707

# PILING CONSTRUCTION

Gabriel Fuentes, Jr., 1501 Ashford Ave., Santurce, Puerto Rico 00911

Continuation-in-part of application Ser. No. 609,102, Jan. 13, 1967. This application Nov. 20, 1967, Ser. No. 684,297

The portion of the term of the patent subsequent to June 17, 1986, has been disclaimed

Int. Cl. E02d 5/12, 7/02

U.S. Cl. 61—56 11 Claims

## ABSTRACT OF THE DISCLOSURE

This invention relates to apparatus for driving a concrete piling formed of a number of concrete pile sections which are spliced together to form a piling of a predetermined length including a dummy pile for providing a pilot hole, special pile sections for hard or other special driving conditions, and a sleeve for splicing the pile sections together.

The same technique is applied to forming retaining walls, bulkheads and even to light poles, telephone poles and the like, in which case, the poles are easily repaired or replaced if damaged.

This application is a continuation-in-part of copending application, Ser. No. 609,102, filed Jan. 13, 1967.

This invention relates, in general, to a splice between two members and to the method of effecting said splice. More particularly, it relates to reinforced concrete pilings and the method of splicing sections of said piling together.

In the above-identified copending application, there is disclosed improved reinforced concrete pile sections and a method for driving and splicing them together. Generally, the pile sections are elongated, cylindrical-shaped members, usually 10 inches in diameter and 20 feet in length. These pile sections are driven into the ground, and are spliced together to form a continuous pile, by means of a hollow cylindrical sleeve having an inner diameter corresponding to the diameter of the pile sections and a plate which is fixedly secured therein in a fashion such as to divide the interior of the sleeve into two like-size compartments. The sleeve is placed over the end of the pile section to be driven, with the plate abutted against the end of the pile section. The sleeve can be fixedly secured to the end of the pile section with an adhesive but, preferably, the pile section has a metal ring embedded in it to which the sleeve can be fixedly secured, as by welding. The pile section is driven into the ground using a special mandrel. The sleeve prevents the end of the pile section from being damaged, as fully explained in said copending application. The next pile section is spliced to the driven pile section, by inserting its end into the sleeve until it abuts the plate within the sleeve and then affixing the two together by means of an adhesive or by welding, as described above.

Continuing development work has proven that the above-described sleeve and the method of using it to effect a splice between two objects is not limited to the reinforced concrete pile sections disclosed and claimed in said copending application, but can be greatly expanded for use in numerous other applications. For example, the sleeve can be used to splice wooden telephone poles, light poles and the like together. Normally, these poles are of treated timber, and with time they rot at the ground line so that they must be periodically replaced. Using the sleeve, the poles can be initially installed as a two section pole, the sleeve in such cases being partially buried,



or a damaged pole can be cut and re-used by affixing it to another partial pole or the like, using the sleeve.

Also, sectional concrete sheet pilings having a tongue and groove for interlocking them together side-by-side to form a retaining wall or the like can be driven and spliced together in the same manner as the reinforced concrete pile sections described in said copending application. Other retaining walls and bulkheads can be formed with two spaced-apart pilings formed of T-shaped concrete piles which are driven and spliced together using a sleeve of the above-described construction, and then affixing a precast concrete slab between the two spaced pilings.

Specially designed tapered concrete pile sections and pile sections of an H beam construction can be driven and spliced to other standard concrete pile sections, to provide a pile section which can be used as a first pile section for hard driving and other special conditions. Pile sections of these types are more fully disclosed in the paragraphs below.

Also disclosed is a special pile device for opening pilot holes, where obstructions are encountered. This special pile device is adapted to be driven with the same mandrel disclosed in said copending application and used to drive the concrete pile sections. The special pile device is pulled after being driven, to open a pilot hole.

Accordingly, it is an object of the present invention to provide an improved splice between two objects and methods for effecting the same.

Another object is to provide improved pile sections which can be spiced together and which can be driven side-by-side to form retaining walls, bulkheads and the like.

Still another object is to provide improved retaining walls, bulkheads and the like, fabricated of concrete pile sections which are spliced together, either side-by-side or with a precast concrete slab disposed between them.

Still another object is to provide improved telephone poles, light poles and the like, and improved methods for replacing or restoring them.

A further object is to provide improved pile sections which can be used as a first pile section, for hard driving or other special conditions.

A still further object is to provide improved devices for opening a pilot hole for the concrete pile sections.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

FIG. 1 is a side plan view of a pile device for opening pilot holes;

FIG. 2 is a partial side plan view of the end of the pile device, rotated 90° from the position shown in FIG. 1, illustrating the position of the hinged flaps thereon during driving of the pile device;

FIG. 3 is a partial side plan view of the end of the pile device, rotated 90° from the position shown in FIG. 2, illustrating the manner in which the hinged flaps open when the pile device is being withdrawn from the ground;

FIG. 4 is a partial side plan view of a tapered pile section, used for hard driving or other special conditions;

FIG. 5 is a sectional view of the pile section, taken along lines 5—5 of FIG. 4;

FIG. 6 is a partial side plan view of an H beam pile section, used for hard driving or other special conditions;

FIG. 7 is a perspective view of the H beam pile section of FIG. 6;

FIG. 8 is a partial perspective view of a retaining wall constructed with a number of tongue and groove pile sections;

FIG. 9 is a partial side plan view of one of the pile sections illustrated in FIG. 8, showing the manner in which a sleeve for driving and splicing it is affixed thereto;

FIG. 10 is a top plan view of one of the pile sections of FIG. 8;

FIG. 11 is a perspective view of a mandrel used to drive the pile sections of FIG. 8;

FIG. 12 is a partial perspective view of a bulkhead or retaining wall constructed of T-shaped pile sections which are spaced-apart and have a precast concrete slab affixed between them;

FIG. 13 is a partial front plan view of the bulkhead or retaining wall of FIG. 12, illustrating the manner in which the pile sections are spliced together with sleeves to form a continuous length pile;

FIG. 14 is a bottom plan view of a mandrel having a driving head thereon for driving the pile sections of FIGS. 12 and 13;

FIG. 15 is a side plan view, illustrating the manner in which a telephone pole or light pole is erected; and

FIG. 16 is a partial side plan view illustrating the manner in which the telephone pole or light pole of FIG. 15 is spliced together, upon initially erecting it or repairing it.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring now to the drawings, in FIGS. 1–3 there is shown a pile device or dummy pile **10** for opening pilot holes for concrete pile sections, where obstructions are encountered. The dummy pile **10** is fabricated of a heavy gauge metal and is of a tubular construction. One end of the dummy pile is closed with a flat metal plate **11**, and a tubular sleeve **12** is fixedly secured atop it. The sleeve **12** is of a length and has a diameter so as to receive the driving head **13** of a mandrel **14** of the type normally used to drive concrete pile sections with sleeves affixed to them, in the manner disclosed in the above-mentioned copending application. More specifically, the diameter of the sleeve **12** is of a size to receive and to guide the driving head **13** of the mandrel **14**, and is of a length such that the end of the driving head **13** engages the plate **11**, but the mandrel does not engage the upper peripheral edge of the sleeve **12**. With this construction, the driving head **13** drivingly engages the plate **11** to drive the dummy pile **10**, without damage to the sleeve **12**.

At least one aperture **16** is formed in the side wall of the dummy pile **10**, adjacent the plate **11**, for permitting air to flow through the dummy pile when it is being withdrawn from the ground, to break the vacuum to facilitate its withdrawal, as explained more fully below. A pair of rings **18** also are affixed to the side wall of the dummy pile **10**, on opposite sides thereof, for affixing ropes or cables **19** to the dummy pile to support it during driving and to remove it.

The side wall of the dummy pile **10**, at the end opposite the plate **11**, is cut away so as to provide two substantially pointed tips **20** and **21** on opposite sides thereof and tapered openings **24** and **25** to the interior thereof. The side wall on two opposite sides of the dummy pile **10** also is split to receive a cutting blade **26** in the form of a solid rectangular-shaped length of steel stock having a cutting edge **27** formed along the forward edge thereof fixedly secured, as by welding, as illustrated in FIGS. 2 and 3. The cutting blade **26** also is tapered rearwardly, to facilitate installation. A pair of flaps **29** and **30** are affixed by means of hinges **31** and **32**, respectively, to the cutting blade **26**, in a fashion such that they swing about the hinges to close the tapered openings **24** and **25**, respectively, when the dummy pile **10** is being driven, as illustrated in FIGS. 1 and 2. These flaps **29** and **30** also extend slightly outwardly of the peripheral edge of the side wall of the dummy pile **10**, as illustrated in FIG. 1, so that they are engaged by the ground and caused to pivotally swing downwardly to open the tapered openings **24** and **25**, when the dummy pile is withdrawn.

As indicated above, the dummy pile **10** is used to open pilot holes for concrete pile sections, when obstructions or other special conditions are encountered. As illustrated in FIG. 1, the dummy pile **10** is supported in a vertical position for driving, by means of ropes or cables **19** affixed to the rings **18**. The driving head **13** of the mandrel **14** is inserted within the sleeve **12** affixed to the plate **11** of the dummy pile. When a driving force is applied to the mandrel **14**, the driving head **13** bears upon the plate **11** of the dummy pile **10**, to drive the same into the ground. As the dummy pile **10** is being driven, the flaps **29** and **30** are positioned to close the tapered openings **24** and **25**, to prevent dirt from entering the dummy pile. The cutting blade **26** extends beyond the end of the dummy pile and is sufficiently rigid and is sufficiently strong to cut through rock, stones and the like.

Upon withdrawing the dummy pile **10**, the dirt about the end thereof engages the flaps **29** and **30** and forcibly urges them open. Air enters the apertures **16** formed in the side wall of the dummy pile and exits through the tapered openings **24** and **25**. This air functions to break the vacuum created about the dummy pile to facilitate its withdrawal. After the dummy pile **10** has been removed to provide a pilot hole, a standard concrete pile section then can be driven.

In FIGS. 4 and 5, there is illustrated a tapered pile section **34** which is particularly applicable for use as a first section, for hard driving and other special conditions. In particular, the tapered pile section **34** can be driven into the pilot hole formed by the dummy pile **10** of FIGS. 1–3, to facilitate driving a pile formed of a number of sections of concrete pile sections of the type disclosed in the above-mentioned copending application. The pile section **34** comprises an outer tubular metal shell **35** having flutes **36** formed about its exterior periphery. The shell **35** can be completely filled with concrete **37**, as illustrated, or alternatively, only its tip can be filled. For example, the pile section **34** can be formed 17 feet in length and with a fluted shell **35** formed of 11 gauge sheet metal. The entire pile section or approximately 2 feet of its length at its tip is filled with concrete.

The pile section **34** also has a sleeve **38** which is closed at one end by means of a flat plate **39** affixed to its upper end, for driving it. The sleeve **38** has a length and a diameter corresponding to that of the sleeve **12** of the dummy pile **10** of FIGS. 1–3, so that it can be driven with a mandrel like the mandrel **14** illustrated in FIG. 1.

It may be noted that the sleeve **12** of the dummy pile **10** and the sleeve **38** of the pile section **34** actually corresponds to only one half of the sleeve disclosed and claimed in the above-mentioned copending application. Only one half sleeve length is required since the ends of the sleeves **12** and **38** can be fixedly secured, as by welding, directly to a plate such as the plate **11** or to the pile section itself, as in the case of the pile section **34**. The sleeve **38**, in addition to permitting the pile section **34** to be driven without damage to its end, also permits the pile section **34** to be easily and quickly spliced to another pile section, in the manner described above and as more fully explained in said copending application.

In FIGS. 6 and 7, there is disclosed still another pile section **40** which is intended to be used as a first section, for hard driving and other special conditions. The pile section **40** is formed of a heavy gauge H beam **41** having a sleeve **42** fixedly secured, as by welding, to its one end. The flanking sides **43** of the H beam **41** are cut back

sufficiently so that the H beam can be received within the sleeve 42, with its end abutted against the plate 44 centrally affixed within the sleeve 42.

The pile section 40 can be driven in the same fashion as the concrete pile sections disclosed in the above-identified copending application, or the dummy pile 10 and the tapered pile section 34. In this case also, the driving head of the mandrel used to drive the pile section drivingly engages the plate 44 within the sleeve 42, so that the sleeve 42 is not damaged. Also, the sleeve 42 permits the H beam pile section 40 to be spliced to another pile section, as explained above.

In FIGS. 8–10, there is illustrated a retaining wall 40 constructed with a number of piles 46 which are driven side-by-side and interlocked with one another by means of the tongues 48 and grooves 49 formed therewith. Each of the piles 46, in turn, is formed with a number of pile sections 50 which are affixed together to form a pile 46 of a predetermined length using a sleeve 47.

As can be best seen in FIGS. 9 and 10, the pile sections 50 are generally rectangular-shaped in cross-section and have a tongue 48 formed on one side thereof and a groove 49 formed in its opposite side. The tongue on one pile section, of course, is adapted to interlock with the groove formed in another pile section. The sleeve 47 is correspondingly shaped, and the ends of the pile sections 46 preferably are reduced in size and the sleeves formed so that the outer surface of the sleeve is flush with the other surface of the pile section when the two are affixed together, as illustrated in FIG. 9. A metal band (not shown) can be cast into the pile section 50, for affixing the sleeve 47 to the pile section or, alternatively, the sleeve and the pile section can be affixed together with an adhesive. Preferably, however, the metal band is provided and the two are affixed together by welding them.

The sleeve 47 also has a plate 52 affixed centrally therein, to divide the same into two like compartments for receiving the ends of the pile sections 50. The ends of the pile sections abut against the plate 52 so that they are protected from damage while being driven.

The last pile section 50 of each of the piles 46 can be driven with a similar sleeve, or one that is specially adapted to be removed after the pile section is driven. In the former case, the sleeve preferably is cut in half just above the plate 52, so that the latter remains affixed atop the pile 46. In the latter case, a pre-formed cap or cover 54 (FIG. 1) generally corresponding to a sleeve cut in half in the manner described above, is fixedly secured atop the last pile section to provide a finished appearance. These sleeves or caps preferably are welded together along the length of the joints between them, to prevent the piles 46 from separating.

In FIG. 11, there is illustrated a mandrel 54 which is specially adapted to drive the pile sections 50. The mandrel 54 includes a body portion 56 formed of a circular-shaped plate 57 having a pair of spaced ears 58 affixed to it, in diametrically opposed positions. Each of the ears 58 has an aperture 59 in it, for receiving a cable or the like for supporting the mandrel. A ring-shaped member 60 is fixedly secured atop the plate 57, and is adapted to receive a pile driver therein. A wooden disc-shaped member 61 preferably is retained within the ring-shaped member 60, to eliminate metal-to-metal engagement between the pile driver and the plate 57.

A driving head 62 is affixed to the underside of the plate 57. This driving head 62 is rectangular-shaped and is of a size such that it will snugly seat with a sleeve 47 affixed to the end of a pile section 50. It also is of a length such that the underside of the plate 57 will not engage the top edge of a sleeve 47 when the end of the driving head is seated atop the central plate within a sleeve 47. The exterior surface of the driving head 62 can be coated with an elastic or resilient material such as rubber, if desired, so that it is firmly seated or confined within the sleeve.

In FIGS. 12 and 13, there is illustrated a cantilever bulkhead 66 formed with a number of spaced-apart T-shaped concrete pilings 68 having pre-formed concrete slabs 70 affixed between pairs of them. Each of the concrete pilings 68 is formed of a number of T-shaped pile sections 72 which are affixed or spliced together, by means of sleeves 74. The sleeves 74 are hollow and generally correspond in cross-section to the cross-section of the pile sections 72. Center plates 76 are provided in the sleeves 74 and divide the same into two compartments for receiving the ends of the pile sections to be spliced together. The ends of the pile sections 72 abut against the opposite sides of the center plate, and can be fixedly secured therein by means of an adhesive or by means of a metal ring (not shown) imbedded into the ends of the pile sections 72. The sleeve 74 is fixedly secured as by welding to the metal rings, in the manner described above.

The pile sections 72 are driven and spliced together to form the pilings 68, and the pre-formed concrete slabs 70 are secured between each spaced-apart pairs of the pilings, as illustrated. Using this construction, the bulkhead 66 can be formed as wide and to a depth, as required.

In FIG. 14, the underside of a mandrel 80 used to drive the pile sections 72 is illustrated. The mandrel 80 has a body portion 82 which is like the body portion 56 of the mandrel 54. Its driving head 84, however, is T-shaped so as to seat within the open end of the sleeves 74 used to affix the pile sections 72 together, in the same fashion as the driving head 62 of the mandrel 54 seats within the sleeves 47. The pile sections 72 therefore can be driven, without damage to their ends or to the sleeves 47.

In FIGS. 15 and 16, there is illustrated a method for economizing on the fabrication of light poles, telephone poles, and the like. Usually, these poles are of treated timber and, with time, they rot at the ground line so that periodic replacement of them is required. With the method described below, this situation is corrected and the installation or replacement of the poles is simplified. Also, a great number of the poles can be recovered, for re-use.

More particularly, as illustrated in FIG. 15, a hole of larger diameter than the section 86 of a pole to be installed is first pre-drilled. The section 86 comprises a preformed concrete pile like those disclosed in the above-mentioned copending application, having a length so as to adequately support the finished pole. The section 86 is installed in the pre-drilled hole, plumbed, and the hole back-filled.

The section 86 also has a steel band or ring 87 imbedded into it, about its periphery at a spaced distance from its upper end. A tubular sleeve 88 having a center plate 89 (FIG. 16) in it, dividing it into two compartments, is placed over the end of the pole section 86, with the end of the pole section abutting against the center plate 89. The sleeve 88 is fixedly secured to the steel ring 87 by welding them together.

The upper pole section 90 which is a wooden section then is affixed to the pole section 86. The pole section 90 may be of a larger diameter than the concrete pole section 86 and, in such cases, is has a tenon 92 formed on its end of a size as to fit tightly within the upper end of the sleeve 88, with the end of the tenon abutting against the center plate 89. A steel band or ring 94 is imbedded into and fixedly secured as by nails 95 driven through it at its upper end, so that the pole sections 86 and 90 can be fixedly spliced together, by welding the upper end of the sleeve 88 to the ring 94.

The upper end of the concrete pole section 86 preferably extends approximately 4 to 5 feet above the ground line, so that the problem of having the poles rot at the ground line is eliminated. Also, it is apparent that the wooden pole sections 90, if damaged, can be completely replaced, or the damaged portion thereof cut off, a suitable tenon made on the uncut portion, and a new section affixed to it by means of another sleeve 94. In the event the poles are to be entirely removed, the con-

crete pile sections **86** can be salvaged and re-used since they will not rot or deteriorate like wooden poles.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

Now that the invention has been described, what is claimed as new and desired to be secured by Letters Patent is:

**1.** A pile section for forming a pilot hole comprising: a cylindrical-shaped tubular body portion having a flat closure plate affixed across one end thereof; a cylindrical-shaped tubular sleeve fixedly secured atop said closure plate for receiving the driving head of a mandrel for driving said pile section; the opposite end of said body portion being cut-away so as to form a generally pointed tip and having a cutting edge fixedly secured thereto across the diameter thereof; a pair of closure flaps hingedly affixed to said body portion, said closure flaps being adapted to close the openings into said body portion formed when said pointed tip is provided thereon as said pile section is driven into the ground and to open said openings as said pile section is withdrawn from the ground; and means in said body portion for permitting air to flow into said body portion at its upper end.

**2.** The pile section, as claimed in claim **1**, wherein said cutting edge comprises a rectangular-shaped plate member having a short pointed tip formed on one end thereof and a lengthened generally pointed tip formed on the other end thereof; the side wall of said body portion being split in two diametrically opposed positions so as to receive said lengthened generally pointed tip therein.

**3.** The pile section, as claimed in claim **1**, wherein said closure flaps are hingedly affixed to the opposite sides of said cutting edge.

**4.** In combination, a plurality of pile sections spliced to one another and forming a piling of a predetermined length comprising at least one pile section having a metal band secured thereto a fixed distance from the end thereof, the outer surface of said band conforming to the contour of the outer surface of said pile section, another one of said pile sections having a tubular metal sleeve secured to its one end, said sleeve having an interior cavity sized to fit tightly about the exterior surface of the end of said pile section having said band secured to it, a plate fixedly secured within said sleeve, said pile section being driven by engaging a mandrel with said plate within said sleeve and being spliced to said pile section having said metal band affixed to it by receiving the end thereof within said sleeve and welding the end of said sleeve to said metal band.

**5.** The combination of claim **4**, wherein said pile section having said tubular metal sleeve secured to its one end is for hard and other special driving conditions and comprises a generally cylindrical-shaped tubular outer shell which tapers from one end thereof to the other so as to form an end portion and a smaller diameter tip portion, said outer shell having at least the tip portion thereof filled with concrete, said plate fixedly secured within said sleeve being affixed across the open end at the end portion of said shell, said sleeve receiving the driving head of a mandrel for driving said pile section and receiving the end of said pile section having said metal band secured to it, whereby said pile sections can be spliced together by welding said sleeve to said metal band.

**6.** The combination of claim **5**, wherein the outer periphery of said outer shell is scalloped along the length thereof.

**7.** The combination of claim **4**, wherein said pile section having said tubular metal sleeve secured to its one end is for hard and other special driving conditions and comprises an elongated body portion having an H-shaped cross-section, said plate within said sleeve being centrally disposed therein dividing the same into a pair of compartments, the outwardly projecting flange portions of said H-shaped body portion at one end thereof being cut so that said end extends into said sleeve and abuts against said plate therein, said sleeve being fixedly secured to said flange portions and receiving the driving head of a mandrel for driving said pile section and receiving the end of said pile section having said metal band secured to it, whereby said pile sections can be spliced together by welding said sleeve to said metal band.

**8.** The combination of claim **4**, wherein said pile sections further are adapted to interlock with similar pile sections driven along side of them to form a retaining wall, said pile sections comprising elongated, solid generally rectangular-shaped body portions having a groove formed in one edge thereof and a tongue formed on the opposite edge thereof, said tongue and groove being adapted to interlock with like tongues and grooves formed in other like pile sections, said sleeve having a cross-section generally corresponding to the cross-section of said body portion and said plate being centrally disposed therein dividing said sleeve into two compartments, one end of a body portion being fixedly secured within one of said compartments in said sleeve with the end thereof abutted against said plate, said sleeve receiving the driving head of a mandrel for driving said pile section and receiving the end of another like pile section having said metal band secured to it, said pile sections being spliced together by welding said sleeve to said metal band.

**9.** The combination of claim **4**, wherein said pile sections comprises elongated T-shaped pile sections, said sleeves affixed thereto having a cross-section generally corresponding to the cross-section of said T-shaped pile sections and having a plate centrally disposed therein dividing said sleeve into two compartments, said sleeve being affixed to the end of said T-shaped pile sections with said plate therein abutting against the end of said T-shaped pile section, the opposite end being adapted to receive therein the driving head of a mandrel for driving said pile section and to receive therein the end of another one of said T-shaped pile sections for splicing said two T-shaped pile sections together by welding said sleeve to the metal band on the latter pile section, said combination further including pre-formed concrete slabs secured between adjacent pairs of said pilings, whereby said pile sections and said slabs form a cantilever bulkhead.

**10.** In combination, a plurality of pile sections spliced to one another and forming a piling of a predetermined length comprising at least one pile section having a metal band secured thereto a fixed distance from the end thereof, the outer surface of said band conforming to the contour of the outer surface of said pile section, another one of said pile sections being a special pile section for hard and other special driving conditions and comprising a generally cylindrical-shaped tubular outer shell which tapers from one end thereof to the other so as to form an end portion and a smaller diameter tip portion, said outer shell having at least the tip portion thereof filled with concrete, said special pile section having a tubular metal sleeve affixed to its one end having an interior cavity sized to fit tightly about the exterior surface of the end of said pile section having said metal band secured to it, a plate fixedly secured within said sleeve and affixed across the open end at the end portion of said shell, said sleeve receiving the driving head of a mandrel for driving said pile section by engaging said mandrel with said plate within said sleeve and receiving the end of said pile

section having said metal band secured to it, said pile sections being spliced together by welding said sleeve to said metal band.

**11.** In combination, a plurality of pile sections spliced to one another and forming a piling of a predetermined length comprising at least one pile section having a metal band secured thereto a fixed distance from the end thereof, the outer surface of said band conforming to the contour of the outer surface of said pile section, another one of said pile sections being a special pile section for hard and other special driving conditions and comprising an elongated body portion having an H-shaped cross-section, said special pile section having a tubular metal sleeve affixed to its one end having an interior cavity sized to fit tightly about the exterior surface of the end of said pile section having said metal band secured to it, a plate fixedly secured within said sleeve and dividing the same into a pair of compartments, the outwardly projecting flange portions of said H-shaped body portion at one end thereof being cut so that said end extends into said sleeve and abuts against said plate therein, said sleeve being fixedly secured to said flange portions and receiving the driving head of a mandrel for driving said pile section by engaging said mandrel with said plate within said sleeve and receiving the end of said pile section having said metal band secured to it, said pile sections being spliced together by welding said sleeve to said metal band.




**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 756,805 | 4/1904 | Shuman | 175—19 |
| 969,136 | 8/1910 | Cranford | 61—53 |
| 985,681 | 2/1911 | Konopinski | 52—728 X |
| 1,275,470 | 8/1918 | Pruyn | 61—53.7 |
| 1,936,540 | 11/1930 | Mechlin | 61—56 |
| 2,168,269 | 8/1939 | Orr et al. | 61—53 |
| 2,430,879 | 11/1947 | Kohn | 61—53 X |
| 3,199,300 | 8/1965 | Fiore | 61—53 |
| 3,343,614 | 9/1967 | Parisien | 175—19 |
| 1,954,070 | 4/1934 | Cook | 61—56.5 |
| 2,698,519 | 1/1955 | Lloyd | 61—56 |
| 3,198,614 | 10/1965 | Powell | 61—49 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 1,009,499 | 11/1965 | Great Britain. |



JACOB SHAPIRO, Primary Examiner

U.S. Cl. X.R.

61—39, 49, 53.5, 59