

A. A. RAYMOND.  
 PILE SHELL AND PROCESS FOR FORMING CONCRETE PILES.  
 APPLICATION FILED JUNE 21, 1907.

985,549.

Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.

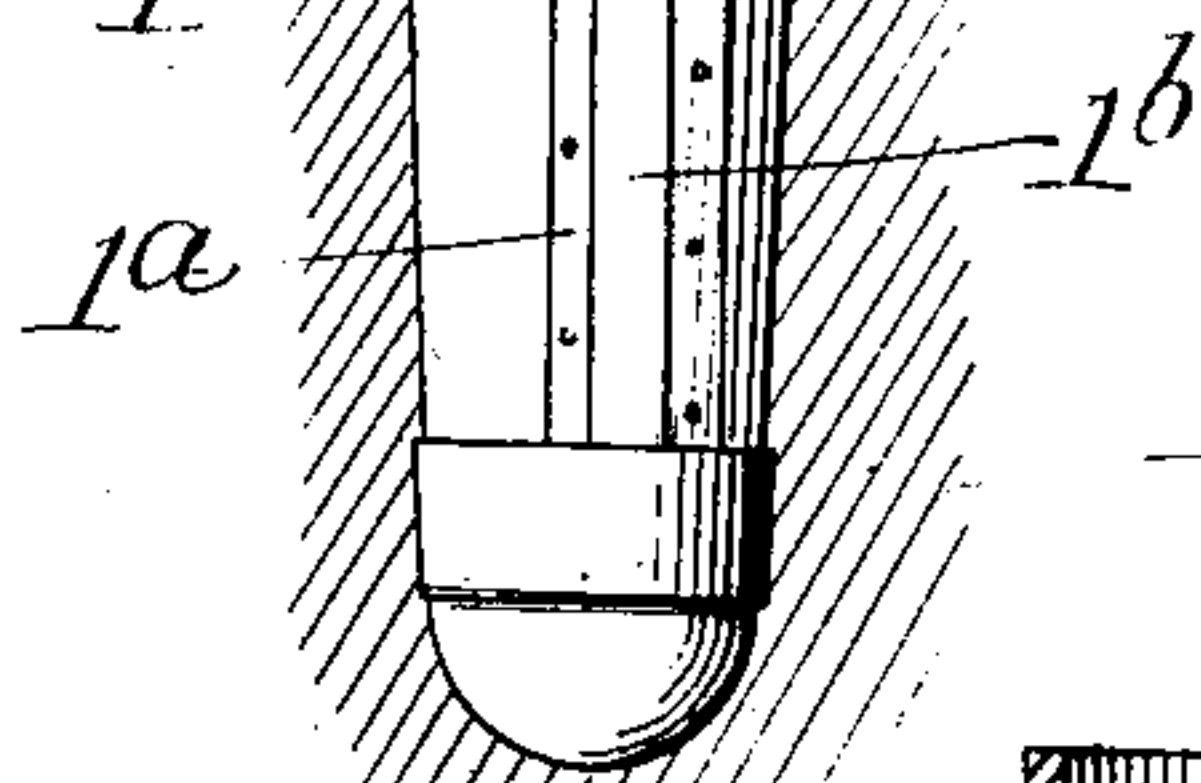
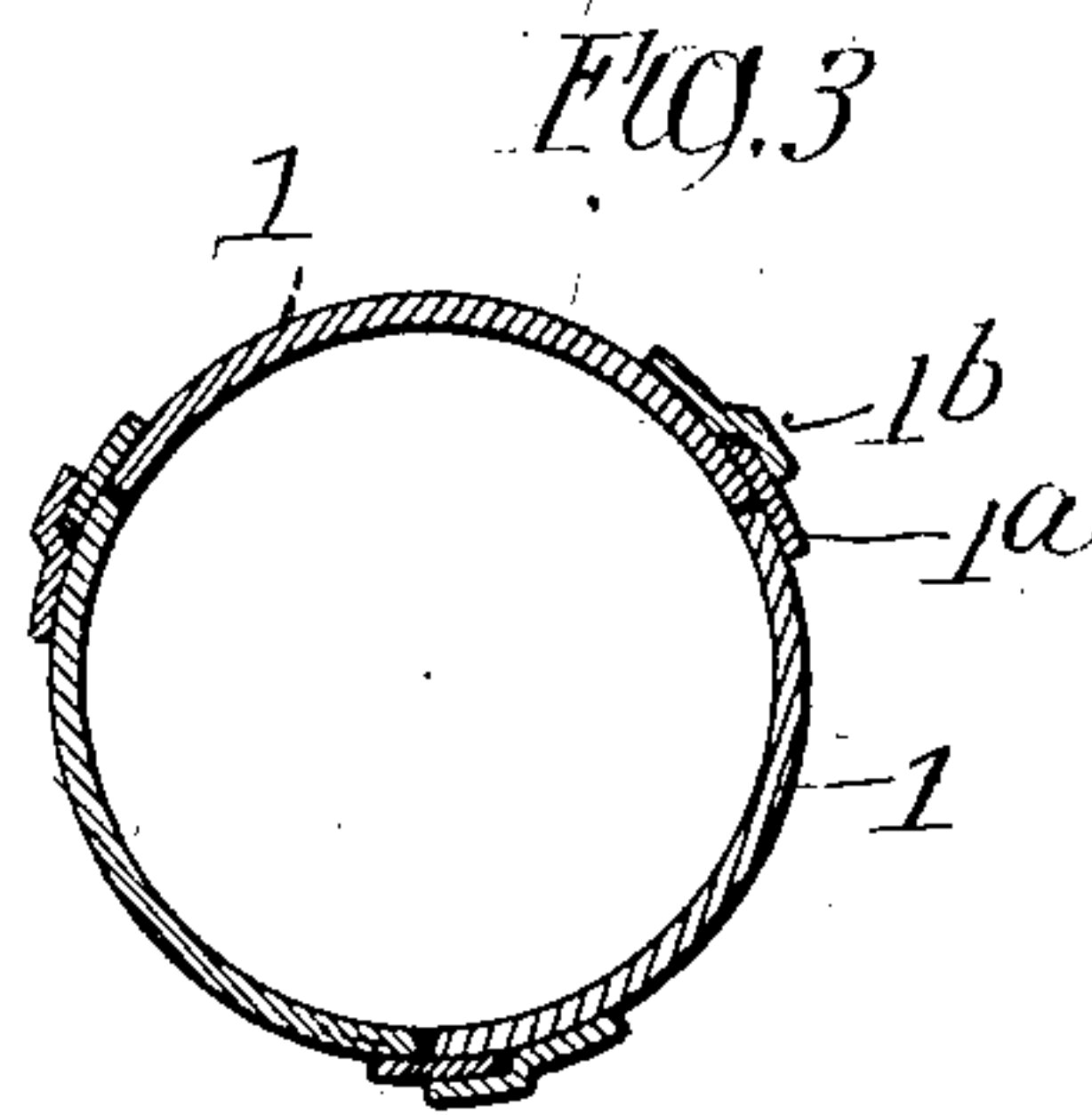
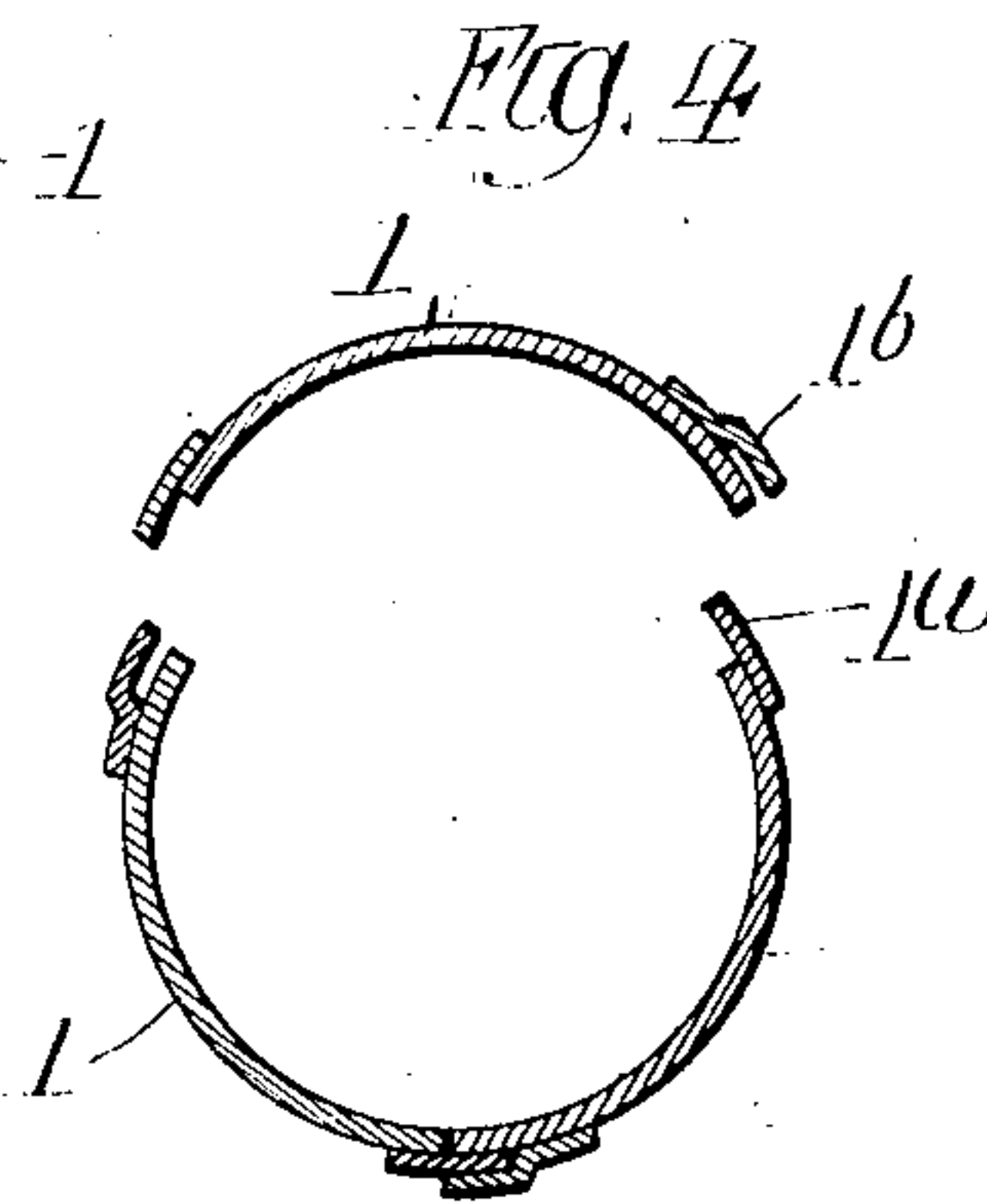
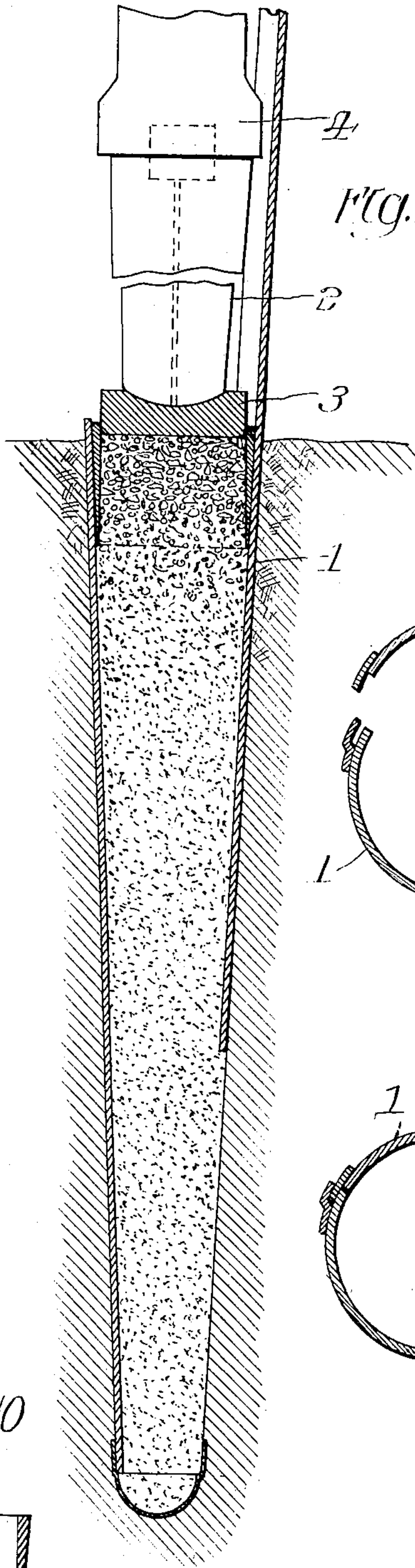
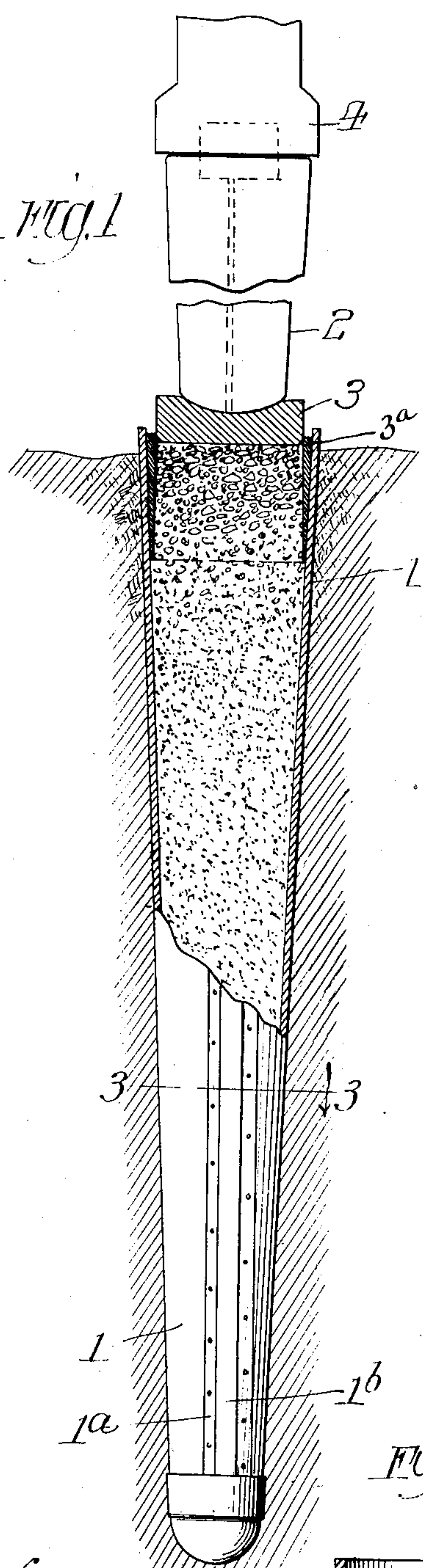
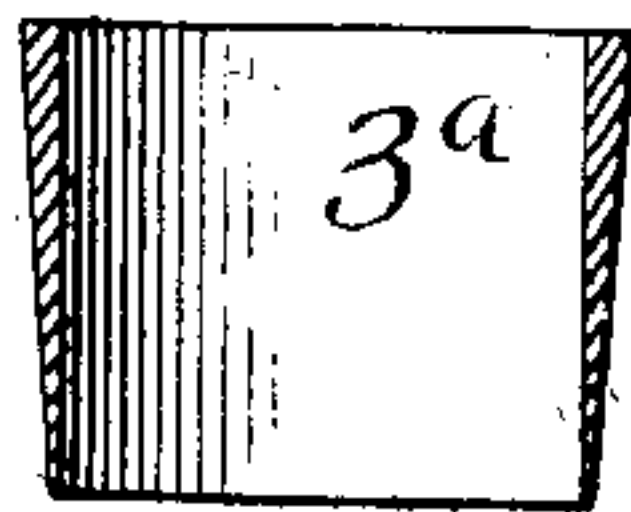


Fig. 10



Witnesses:  
 H. G. Bennett  
 Louis B. Erwin

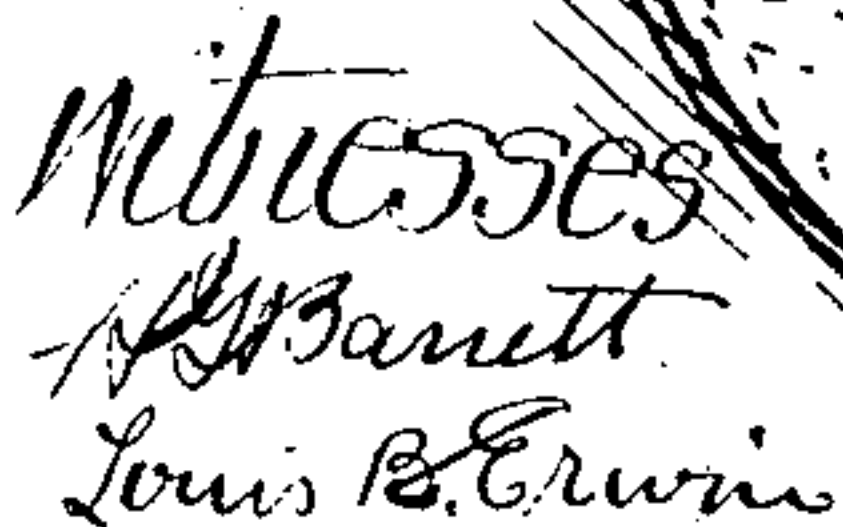
Inventor:  
 Alfred A. Raymond  
 By Rector, Hibben & Davis  
 his Attys



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2 SHEETS—SHEET 2.



Inventor:  
Alfred A. Raymond  
By Rector, Hibben & Davis  
his Attys



# UNITED STATES PATENT OFFICE.

ALFRED A. RAYMOND, OF CHICAGO, ILLINOIS, ASSIGNOR TO RAYMOND CONCRETE PILE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

PILE-SHELL AND PROCESS FOR FORMING CONCRETE PILES.

85,549.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed June 21, 1907. Serial No. 380,153.

To all whom it may concern:

Be it known that I, ALFRED A. RAYMOND, citizen of the United States, residing at Chicago, Cook county, Illinois, have invented a certain new and useful Pile-Shell and Process for Forming Concrete Piles, of which the following is a specification.

My invention relates to the art of forming concrete piles or the like to be used for foundations for buildings and other structures as well as wharves, piers and the like, and the same has for its object a new process of forming piles and the provision of a new and useful pile shell which is particularly adapted for use in pile forming in accordance with the general process set forth in my Letters Patent of the United States No. 589,026, dated August 31, 1897.

My new pile shell is used preferably in connection with such general process of pile forming and consequently the same is driven with a pile core as seen therein or as illustrated in my later United States Patent No. 777,351, dated December 13, 1904, but as will be hereinafter made apparent, my new shell may be driven by itself, that is, without a core, if so desired.

The pile shell constitutes a temporary shell in the sense that it is left temporarily in the ground and is employed as a mold for the concrete or other plastic filler introduced therein and is then withdrawn in condition to be used over and over again. The pile shell is accordingly constructed in such manner that this result may be accomplished and, as hereinafter described, the same is made in sections withdrawable separately.

In the drawings, Figure 1 is an elevation partly in section of a tapered pile and shell, illustrating conditions after the shell has been filled but before the same has been withdrawn; Fig. 2 a longitudinal section of the shell and pile, illustrating conditions when one of the shell sections is partly withdrawn; Fig. 3 a cross-section of the shell on the line 3—3 of Fig. 1; Fig. 4 a cross-section thereof with one section detached; Fig. 5 a longitudinal section of a cylindrical form of pile and shell; Fig. 6 an elevation of same parts showing one of the shell sec-

tions partly withdrawn; Fig. 7 a cross-section of a two-section form of shell; Fig. 8 a cross-section of a square form of shell; Fig. 9 a cross-section of a hexagonal form of shell, and Fig. 10 a longitudinal section of the lining cylinder at the top of the shell.

It will be understood that my invention is applicable to both forms of piles, that is, tapered and the straight as well as to different shapes thereof. For instance in Figs. 1 and 2 I have illustrated the tapered form of pile and shell, and in Figs. 5 and 6 the straight form thereof. In Fig. 8 I have shown a form of shell square in section whereas the shells of the other figures are circular.

Referring to Figs. 1 to 4, the pile shell herein shown is made in sections of suitable material and of the desired length so that when assembled they form a mold for a tapered pile. The shell is sectioned longitudinally into two or more sections, there being in the present instance three of these sections 1, and the same being arranged for interlocking connection. To this end and as shown, the adjacent or meeting edges have tongue and groove connection, the tongue being formed by the plate or strip 1<sup>a</sup> secured to and projecting beyond the edge of each section and the groove being formed by the plate or strip 1<sup>b</sup> secured to and projecting beyond the edge of each plate as clearly shown in Figs. 3 and 4. By these means the sections are kept in position until the shell has been filled with the suitable filler and are prevented from collapsing when the core is removed.

After the shell has been filled with the suitable filler, the shell is withdrawn section by section, leaving the filler in place. Any suitable means are employed to withdraw the section, for instance, some of the same apparatus used in drawing and in practice the pile core shown at 2 is rested upon a pressure plate 3 placed on the top of the concrete or filler, and the weight of such core as well as the hammer 4 is utilized to keep the pile in position during the operation of withdrawing the pile shell sections one at a time.

For the purpose of preventing the filler



from flowing up around the pressure plate, I employ, near the top of the shell and loosely fitting therein, a lining cylinder 3<sup>a</sup>, the inner surface of which is cylindrical in shape, the outer surface tapering to conform to the inner surface of the shell. The pressure plate 3 fits easily within the lining cylinder 3<sup>a</sup>. As a further means of preventing the filler from flowing upward past the pressure plate, the lower portion of the shell is by preference filled with soft concrete or filler, and the upper portion with dryer concrete which will not be so readily squeezed upwardly around the pressure plate 3. The lining cylinder 3<sup>a</sup> may in fact be dispensed with under some conditions, and the difference in character of the layers of the filler serve alone to prevent the filler from flowing up around the pressure plate. The weight of the pile core and the hammer thus resting upon the plate presses the filler in the space left by the withdrawal of the shell and prevents a vacuum. If desired the pressure plate may be gently driven down by the hammer to insure the filling of the space thus left by the withdrawal of the shell so that, in every instance, the filler will come in close contact with the surrounding earth and thereby secure the greatest wedging and frictional resistance for the pile.

In this manner, I provide a simple and efficient temporary pile shell or covering adapted to be driven with or without a core, and arranged to be withdrawn in section. If a core is employed, the sections may be again attached thereto after withdrawal and redriven as many times as desired.

As shown in Figs. 5 and 6, the pile shell may be cylindrical for the formation of such shaped piles as distinguished from the tapering type. The pile shell here shown is composed of straight sections 5 at whose lower end a shoe 5<sup>a</sup> may be located.

As hereinbefore suggested, the shell is divided into a plurality of sections, two or more, and while I have referred to the three section type of shell I have also illustrated the two section (Fig. 7) and the four section (Fig. 8) types. In Fig. 7 the two sections 6 have tongue and groove connection as shown although the form of connection shown in Figs. 3 and 4 might be used. In Fig. 8 the four section shell therein shown is square in cross-section being composed of the four sections 7 with tongue and groove connections at their corners. In Fig. 9 is shown a hexagonal form of shell comprising the six separately removable sections 8 having tongue and groove connection.

I claim:

1. A pile shell or covering tapering longitudinally from top to bottom, a lining cylinder therefor correspondingly tapered on

its exterior surface and adapted to fit within said shell at the top thereof and having a cylindrical bore, and a pressure plate or plunger movable in the bore of said lining cylinder.

2. The process of forming piles of concrete and the like which consists in driving simultaneously a plurality of shell sections together constituting a pile shell or covering formed in longitudinal sections, filling the same with a filler to form the pile, and withdrawing the shell sections one at a time while exerting an independent stress pressing upon the top of the pile; substantially as described.

3. The process of forming piles of concrete and the like which consists in driving simultaneously a plurality of shell sections together constituting a sectional pile shell or covering formed in longitudinal sections, filling the same with a plastic filler to form the pile, and withdrawing the shell sections one at a time while said filler is still in a plastic condition and while exerting an independent stress pressing upon the top of the mass of filler; substantially as described.

4. The process of forming piles of concrete and the like which consists in driving a sectional pile shell or covering, filling the lower portion of the same with a soft filler and the top portion with a dryer filler, said fillers forming the pile, pressing upon the top of the pile and then withdrawing the shell sections one at a time; substantially as described.

5. The process of forming piles of concrete which consists in driving a pile shell or covering, filling the lower portion of the same with a comparatively soft concrete and the top with a comparatively dry concrete, said concrete forming the pile, pressing upon the top of the pile and withdrawing the shell sections one at a time; substantially as described.

6. The process of forming piles which consists in driving simultaneously a plurality of shell sections together constituting a pile shell formed in longitudinal sections, filling the same with a plastic filler, imposing pressure upon the top of such filler and by independent force withdrawing the shell sections one at a time while such pressure is applied.

7. The process of forming concrete piles which consists in driving simultaneously a plurality of shell sections together constituting a tapering shell formed in longitudinal sections, filling the same with a plastic filler to form the pile, and withdrawing the shell sections one at a time while exerting an independent stress upon the top of the pile; substantially as described.

8. The process of forming concrete piles



which consists in driving simultaneously a plurality of shell sections together constituting a tapering shell formed in longitudinal sections, filling the same with a plastic  
5 filler to form the pile, and withdrawing the shell sections one at a time while said filler is still plastic and while exerting an inde-

pendent stress upon the top of the mass of filler; substantially as described.

ALFRED A. RAYMOND.

Witnesses:

ROBERT DOBBERMAN,  
LOUIS B. ERWIN.