

May 24, 1927.

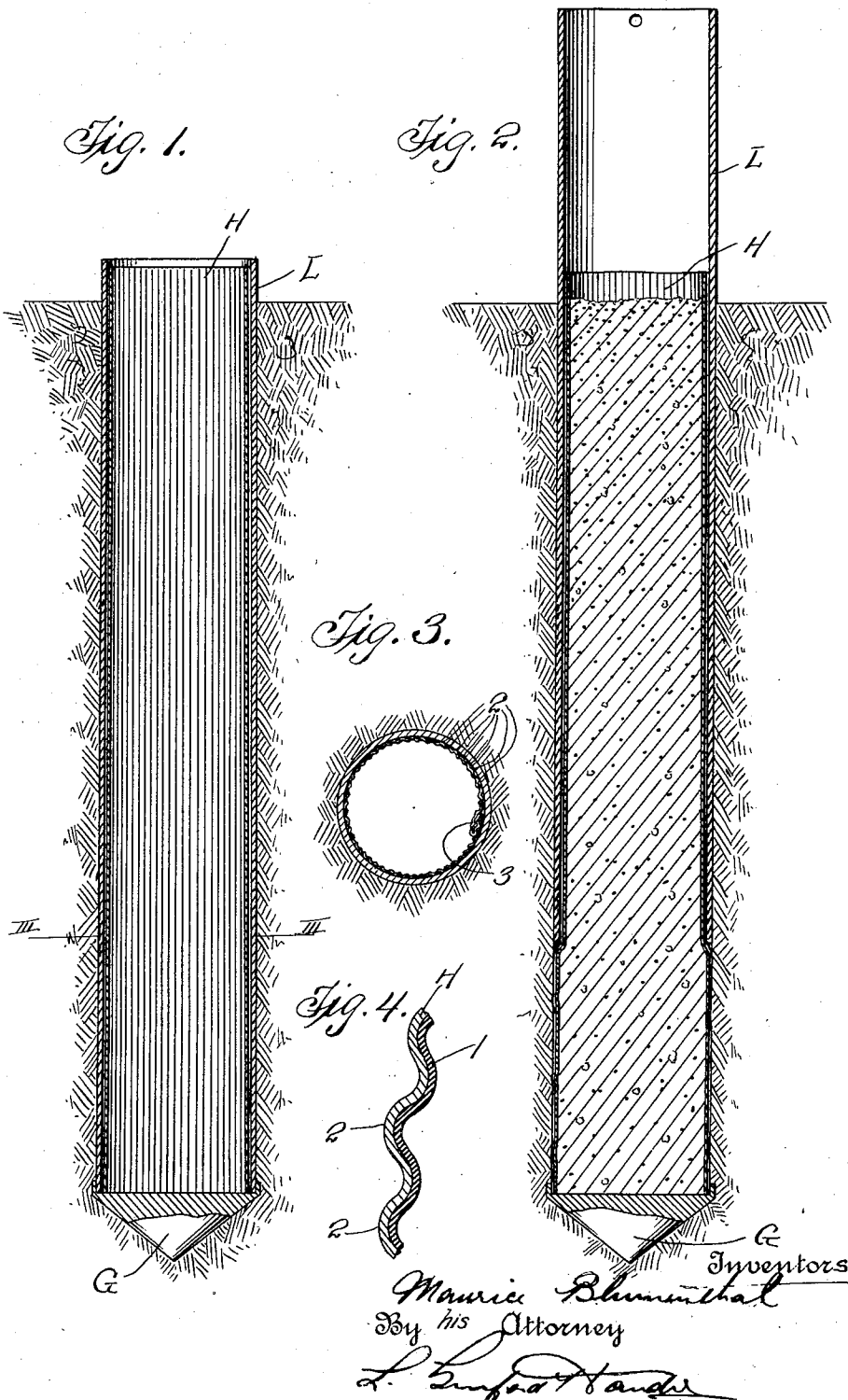
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MEANS FOR SINKING CONCRETE FILES

Original Filed Jan. 27, 1920

2 Sheets-Sheet 1



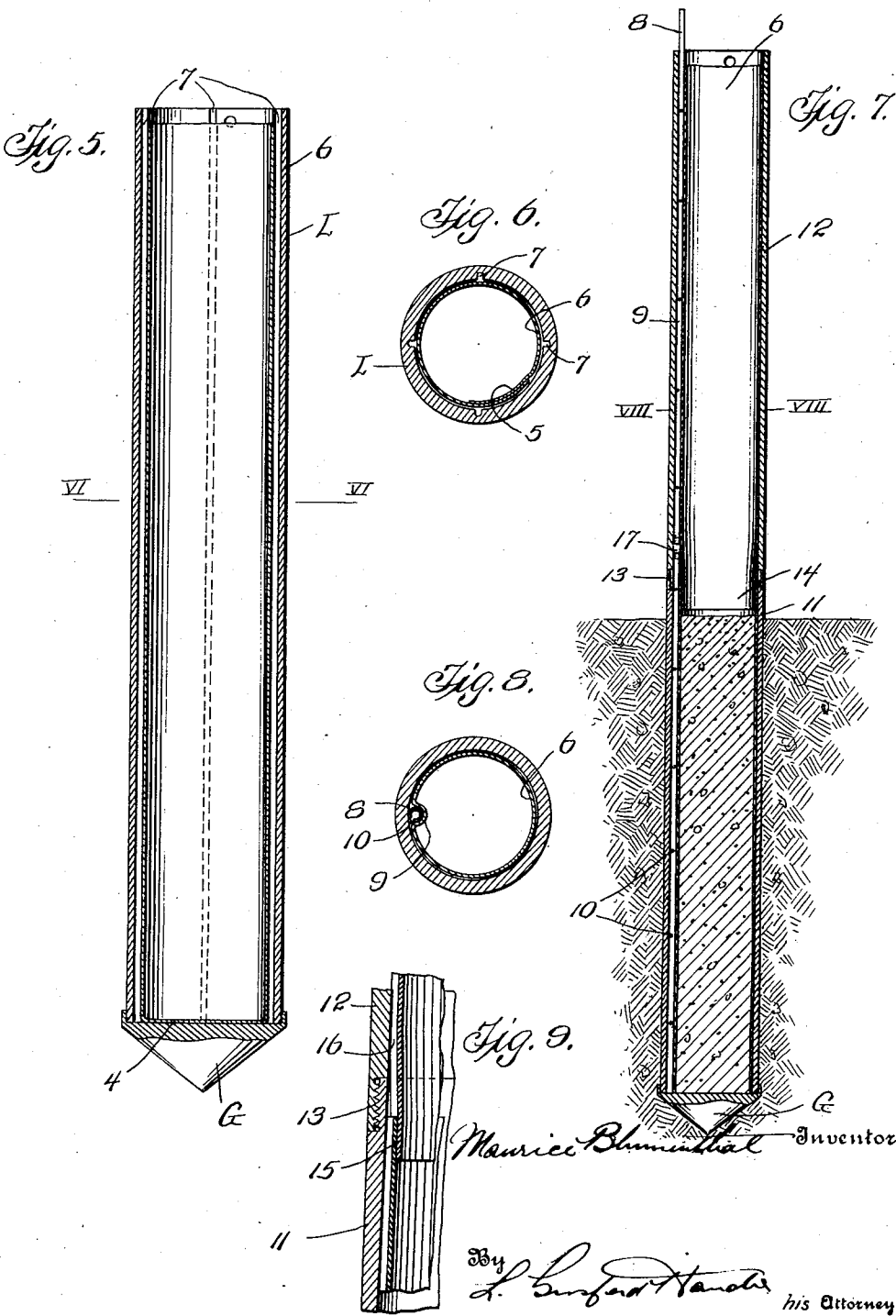
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# UNITED STATES PATENT OFFICE.

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MEANS FOR SINKING CONCRETE PILES.

Substitute for application Serial No. 354,386, filed January 27, 1920. This application filed May 1, 1925.  
Serial No. 27,329.

This invention relates to a means for sinking concrete piles and the object of the invention is to provide a shell adapted to be sunk into the earth and to contain the concrete material, and to provide, in combination with such a shell, means for facilitating the subsequent easy removal of the shell and for preventing likelihood of injury to the column of concrete material during the removal of the shell.

A more detailed object is to provide a liner for the shell of a character to contain the concrete material and to hold said material out of contact with the shell so as thus to relieve the shell of the strong frictional engagement which ordinarily occurs between pile shells and the concrete material therein.

A further object is to provide a liner for the purpose indicated which is of a character to provide for a free circulation of air between the interior of the shell and the column of concrete.

A further object is to provide a liner which is waterproof to a suitable degree to hold substantially all of the concrete material including the water therein, out of contact with the shell and to prevent likelihood of the thinner, or watery, portions of the concrete material from flowing out from the main body into the space left by the withdrawal of the shell.

A further object is to provide a liner which is made of paper material, and to provide means whereby the paper is capable of performing its appointed functions.

A further object is to provide a liner of such character that it will suitably accommodate itself to the contour of any irregularities present within the shell.

A further object is to provide a liner which may be placed within the shell in sections and which when thus placed will provide for continuity of the functions of the liner from one section to another.

Other objects and aims of the invention, more or less specific than those referred to above, will be in part obvious and in part pointed out in the course of the following description of the elements, combinations, arrangements of parts and applications of principles, constituting the invention; and the scope of protection contemplated will be indicated in the appended claims.

In the accompanying drawings which are

to be taken as part of this specification, and in which I have shown merely a preferred form of embodiment of the invention:—

Figure 1 is a longitudinal sectional view thru a shell having a liner therein in accordance with this invention.

Figure 2 is a similar sectional view showing the concrete material within the shell of Fig. 1 and the shell being in the course of removal.

Figure 3 is a transverse sectional view taken substantially upon the plane of line III of Fig. 1.

Figure 4 is an enlarged fragmentary transverse sectional view of the liner appearing in Figs. 1, 2 and 3.

Figure 5 is a longitudinal sectional view of a modified form of shell having a liner positioned therein in accordance with this invention.

Figure 6 is a transverse sectional view taken substantially upon the plane of line VI of Fig. 5.

Figure 7 is a longitudinal sectional view thru a shell consisting of a plurality of superposed sections connected together and illustrating in connection therewith a sectional liner and means for providing a circulation of air.

Figure 8 is an enlarged transverse sectional view taken substantially upon the plane of line VIII of Fig. 7, and

Figure 9 is an enlarged fragmentary longitudinal section for illustrating the manner in which adjacent liner sections are connected for providing continuous air passages from one section to the next.

Referring to the drawings for describing in detail the structure which is illustrated therein, the reference character L indicates the pile shell. This shell may be of any appropriate cross section but usually is circular as seen in Figs. 3, 6 and 8. At its lower end it is provided with a driving point G arranged to close the lower end and to serve as means to facilitate entrance of the shell into the earth during the driving operation.

Within the shell is placed the liner H. It is a particular provision of this invention that this liner may be made of paper for various reasons as are partly pointed out in co-pending application of Maurice Blumenthal Serial No. 306,134, filed June 23, 1919 and as more fully pointed out hereinafter. As seen

in Figs. 1 to 4, and in Fig. 9, this liner may be corrugated longitudinally of the shell. It is fitted quite closely to the interior surface of the shell, its nature permitting and causing it to accommodate itself to the contour of the shell. The corrugations provide a series of passages continuously thruout the length of the liner from the top of the shell to the bottom and between the outer surface of the liner and the inner surface of the shell. These passages afford a free circulation of air at all times downwardly within the shell regardless of whether the liner be filled with concrete material or not, and this circulation of air is very important in enabling easier removal of the shell after the concrete material has been poured in that it prevents the formation of a vacuum beneath the lifting shell. The pressure of the concrete material against the liner may partly flatten out the corrugations, but it is intended that the liner shall be of such strength as to prevent flattening out of the corrugations to such extent as would entirely cut off the passages behind it.

The interior surface of the paper liner is preferably coated with a suitable waterproofing compound, as is seen at 1 in Fig. 4. In this way the main body of the paper is kept sufficiently free from moisture and is, therefore, maintained sufficiently stiff so that it is able to resist a very considerable pressure from the concrete material tending to flatten it against the walls of the shell. Of course the whole body of paper may be suitably treated to render it moisture-proof if desired for the same purpose.

Where the shell is lifted while the concrete material is still soft, the corrugations of the liner enable the liner readily to expand under the pressure of the body of concrete material to fill the space beneath the lifting shell and thus to overcome the likelihood of the formation of a void within the earth surrounding the column of concrete. At the same time the liner is sufficiently stiff to prevent its being expanded except under appreciable pressure by the concrete material. Thus there is little likelihood of any portion of the liner moving away from the body of concrete material upon withdrawal of the shell, nor is there likelihood of the liner being pressed away from the main body of concrete merely to allow the thinner watery portions of the concrete material to pass into the space, or downwardly between the liner and the main body. As the concrete spreads to fill the space left by the lifting shell the spreading action of the concrete material is uniform and there is no opportunity for the thinner watery portions to be pressed out from the main body. The quality of the concrete mixture is thus maintained.

While the shell is being lifted no lifting

strain is felt by any portion of the concrete material but is absorbed entirely by the material of the liner so that there is no tendency whatever for the upward movement of the shell to cause any portion of the concrete material to be lifted away from other portions.

The paper material from which the liner is formed may preferably be such as to possess a minimum of frictional holding power upon the shell, that is, the paper may be soft and smooth, it may be waxed or otherwise treated with appropriate lubricating means, or it may simply be ordinary paper which contains no grit or other elements for causing great frictional grip upon the surface of the shell. Also, it will be noted that the corrugated form of the liner presents only spaced points of contact with the shell, (as at 2, in Fig. 4). The frictional engagement between the shell and the liner is thus very greatly reduced.

In instances where the column of concrete is allowed to set to a sufficient degree to hold its column form before the shell is removed, the liner will serve to hold the concrete material entirely out of engagement with the shell and will present to the shell a surface of minimum friction which will enable the easy removal of the shell.

Preferably the paper of the liner is either without a longitudinal seam, as seen in Fig. 8, or is made with an interfolded longitudinal seam, as at 3 in Fig. 3, so as to exclude the likelihood of any liquid passing from the body of concrete exteriorly of the liner into the space between the liner and the shell. The small quantity of liquid which might seep thru beneath the lower edge of the liner is usually inconsequential but where even this may be detrimental the lower end of the liner may be closed, as seen at 4 in Fig. 5. In some instances it may be sufficient to make the paper of the liner simply to overlap at its longitudinal edges, as seen at 5 in Fig. 6.

Also, it will be understood that this invention is not limited in all respects to the use of a liner which is corrugated but, as seen at 6 in Figs. 5 to 8, the liner may be made not corrugated. Where the liner is not corrugated and where, therefore, there is no provision in the liner for the formation of air passages, then the shell itself might be provided upon its inner surface with longitudinally extending grooves 7, as seen in Figs. 5 and 6. Any number of such grooves may be provided and the liner in such case will serve to cover and protect the grooves against being filled or obstructed by the concrete material. Of course such grooves could be used in combination with the corrugated liner, if desired, but usually either one is sufficient without the other.

Where a non-corrugated liner is employed the material from which it is made may be the same in its texture and in its waterproofing features as has already been described with reference to the corrugated liner, and its outer surface portion, for engaging the shell, may be made non-frictional also as above set forth.

In some instances it may be desirable to employ a separate air tube, as 8, see Figs. 7 and 8, for supplying air into the space between the shell and the liner, and beneath the lifting shell. Such a tube or pipe may be bodily inserted into the shell between the shell and the liner, and beneath the lifting shell, and the liner be made to fit about it in an appropriate manner, as seen at 9 in Figs. 7 and 8. This pipe should be open at both its upper and lower end and should preferably be provided with a series of intermediate openings 10, so that air may feed therefrom at substantially any point in the length of the pipe.

Such a pipe may be withdrawn after the shell is withdrawn, and if the concrete material be still unset the weight of the concrete material will serve to press the liner outwardly for filling the space left by the retreating pipe.

In all cases the liner is, of course, allowed to remain in the earth as a part of the completed pile. Its life will depend upon the nature of its construction but ordinarily will be short. It will gradually decay and disappear leaving the concrete column by that time fully set and hardened in its appointed place within the earth. It may be mentioned in this connection that the material from which the liner is formed may, if desired, be such as will present a more or less permanent waterproofing coating for the pile, as set forth in copending application of Maurice Blumenthal Serial No. 336,263, filed Nov. 7, 1919. The interior coating, as 1 in Fig. 4, may be of such character as to afford a permanent waterproofing quality for the pile while the main or outer portion of the liner may be depended upon to hold this waterproofing element in proper position during the formation and setting of the pile.

As above suggested, it is a feature of this invention also to provide a liner which may be inserted within the shell in sections. Such an arrangement is illustrated in Figs. 7 and 9 wherein it is seen that the shell is made in two sections, as 11 and 12, detachably connected together by screw threads or the like, as 13. The liner for the section 12 is formed separately from the liner for the section 11. After the section 11 is driven into the earth, the section 12 is threaded thereinto, and both sections driven together further into the earth. The

liner for the section 12 has its lower end portion, as 14, fitted into the upper open end of the liner of the section 11. Any number of sections, with liners, may be attached together in this way and the concrete material poured downwardly therein will not have access to the space behind any of said liners. The joint between the adjacent liner sections may be made in any appropriate way for preventing passage of the concrete material therethru but usually it is sufficient to lap the upper sections into the lower sections, as indicated in Fig. 7.

Where the liners are of corrugated material the corrugations thereof in adjacent sections are mated where they overlap, as at 15, in Fig. 9, across the joint from one section to the next.

Of course the use of such sectional liners is not to be understood as being limited to the employment of sectional shells, as obviously the sectional liners may be employed, if desired, irrespective of whether the shell be in separable sections or not.

It should be mentioned also that this invention is not to be understood to be limited to the use of a liner which is formed of paper as obviously liners of other materials may, if desired, be employed for accomplishing certain of the results above described. Also, it is to be understood that the liner need not be corrugated since the same results may be obtained by making the material of the liner in various forms for producing a passage, or passages longitudinally between the liner and the shell. The material of the liner, especially where paper is used, might, for instance, consist of what is known as crepe paper. Or, it might be ordinary smooth paper suitable rumpled. Also it will be understood that the portions of the liner which are shaped to provide an opening or passage longitudinally of the shell may be reinforced and that in fact the pipe illustrated in the drawings Figs. 7 and 8 is an illustration of one way in which the reinforcing element may be applied. Other and more or less practical ways may suggest themselves to those skilled in this art.

As many changes could be made in this construction without departing from the scope of the following claims, it is intended that all matter contained in the above description or shown in the accompanying drawings, shall be interpreted as illustrative only and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a separately formed paper liner for said shell having a longitudinally extending

groove therein providing an air passage longitudinally of the shell between the liner and the shell.

2. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a liner for said shell, said liner being corrugated and the corrugations extending in a direction longitudinally of the shell whereby to provide a plurality of air passages between said liner and said shell.

3. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of an impervious liner for said shell having means providing only spaced points of contact between itself and the shell circumferentially of the shell.

4. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a liner for said shell having a plurality of ribs thereon extending longitudinally throughout the length thereof and arranged to engage the surface of the shell only at

spaced points in the circumference of said surface.

5. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a separately formed paper liner for said shell, and said shell and liner having parts cooperative to provide an air passage longitudinally of the shell.

6. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a separately formed paper liner for said shell comprising a plurality of sections, and said sections having parts cooperative to provide an air passage longitudinally throughout the length of the shell.

7. The combination with a pile shell adapted to be driven into the earth and to contain a quantity of concrete material, of a liner for said shell formed of corrugated paper, the corrugations of the paper extending longitudinally of the liner.

In testimony whereof I affix my signature.

MAURICE BLUMENTHAL.