

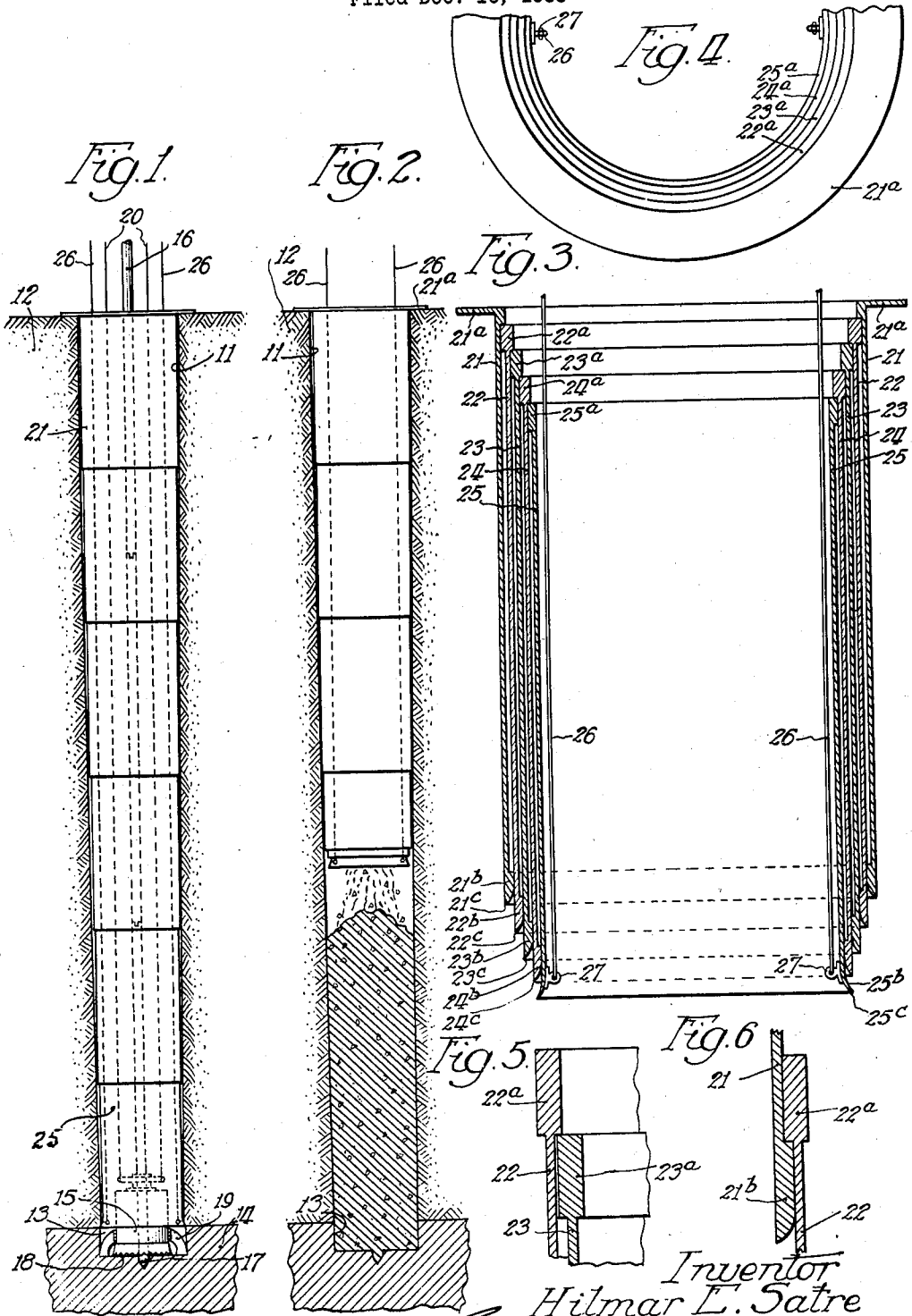
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CAISSON LINER AND METHOD OF APPLYING

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CAISSON LINER AND METHOD OF APPLYING

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8 Claims. (Cl. 255—1)

My invention relates to casings or liners for borings within which concrete or other permanent filling is deposited and the method of applying the liner progressively, the caisson or lining being left within the hole or preferably removed therefrom as the hole is progressively filled.

Problems associated with removable caisson liners are manifold, including assembly and disassembly of the elements, storage and transportation, addition of elements as the depth of the hole increases, skin friction resistance offered by the boring wall of earth, danger of disassociation of the elements within the hole, and many others. Some of these problems attach to caisson liners even when intended to be left permanently within the hole about the filling.

The present invention has for its principal features the construction of the liner from a plurality of telescopically associated sheet metal elements so articulated or flexibly joined as to limit the extent of relative axial movement in both directions, the liner adapted to be extended downwardly automatically by gravity as the digging progresses with its lowermost element surrounding the boring or digging zone; the liner being gradually collapsed, one element at a time, in the act of withdrawal, whereby skin friction is restricted to one element at a time; ease of storage and transportation due to the compactness of the telescoped elements; range of adaptability to different depths of holes to be lined; capacity for the assembly above ground of varying numbers of constituent elements of different individual length and diameter suited to the depth and size of the borings; and other structural features and resultant functional advantages which will appear from the following description of a preferred embodiment of the invention predicated upon the accompanying illustrative drawing, wherein:

Fig. 1 is a side elevation of the caisson liner within a completed boring shown in section;

Fig. 2 is a similar view, the liner partially withdrawn as the boring is charged with concrete;

Fig. 3 is a longitudinal section through the several elements of the liner in collapsed condition;

Fig. 4 is a top plan of Fig. 3;

Fig. 5 is an enlarged sectional detail of the upper edges of the assembled elements; and

Fig. 6 is a similar view of the lower edges of the assembled elements.

Having reference to the drawing, the reference numeral 11 indicates a boring within the earth 12 and the entry of such portion at 13 into bed

rock 14. A conventional boring auger 15, forming no essential part of the present invention, is shown as having a splined connection with a rotary shaft 16 provided with a terminal bit 17, the auger including a lower cutting edge 18 and an adjustable and retractable lateral cutter 19 with auger-hoisting cables 20.

A form of auger such as that disclosed in my copending application, Serial No. 595,755, may be used in connection with the caisson liner of my present invention. However, this caisson liner is adapted for use with various forms of digging devices, and also where the digging is to be manually done.

The construction of my improved caisson liner will be best understood by reference to Fig. 3 wherein the same is shown to comprise a series of nested liner elements 21, 22, 23, 24 and 25 formed preferably of sheet metal, cylindrical in shape and of progressively diminishing diameter in order to permit one to slide within the other. The elements 21, 22, 23 and 24 are provided about their upper ends with flanges 21^a, 22^a, 23^a and 24^a extending laterally both inwardly and outwardly while the innermost element 25 is provided with an outwardly extending flange 25^a. The opposite ends of the elements 21, 22, 23 and 24 are provided with inwardly extending terminal flanges 21^b, 22^b, 23^b and 24^b and preferably these flanges terminate downwardly in beveled cutting or scraping edges 21^c, 22^c, 23^c and 24^c. The lower end of the inner element 25 has associated therewith no integral flange but is preferably flared outwardly at 25^b and provided with a terminal cutting or scraping edge 25^c.

It will be noted with reference to Figs. 1, 2 and 3 that even though the boring be of gradually reduced diameter as it progresses, none of the liner elements except the outermost are in contact with the wall of the excavation until each reaches its ultimate extended position; the inner elements or sections, being free to descend by gravity without skin friction, add their weight to the outer units to pull them down into extended position, assisted by the cutting edges which then come individually into action whereby to overcome the skin friction to which but one unit is at any time subject.

Cables 26 are attached to lugs 27 fixed at diametrically located points on the inner face of the innermost element 25 preferably adjacent the lower end of the same although the point of attachment of the lugs 27 may be near the upper end of the inner element.

It will be observed that the outwardly extending

flange 21^a is adapted to bear upon the upper surface of the earth about the boring and to sustain the outermost liner element or unit in position, while the outwardly extending portions of the flanges 22^a, 23^a, 24^a, and 25^a are adapted to engage the inwardly turned flanges 21^b, 22^b, 23^b and 24^b as the several liner elements tend to settle downwardly as the digging progresses, the engagement of these flanges serving as stops to prevent separation as indicated in Fig. 6.

It will also be noted that the interengagement of the flanges 21^a, 22^a, 23^a, 24^a and 25^a in the collapsed position of the liner elements, as represented in Figs. 3 and 5, prevents disassociation in an upward direction when the caisson liner is in storage or being transported.

The annular bands formed by the flanges at both ends of the elements also serve to strengthen the structure against forces applied laterally whether by rough handling incident to storage and transportation or resulting from the lateral pressure of the earth forming the natural wall of the hole when in use.

The provision of the relatively sharp cutting or scraping lower edges 21^c, 22^c, 23^c, 24^c and 25^c serves to facilitate the settling of the elements as the digging progresses, to maintain the lowermost element in a position surrounding the digging zone, the entire weight of the associated elements being transmitted by gravity to cause such settling and maintaining the liner elements in longitudinally extended relation as permitted by the progress of the work.

The longitudinal length of the individual elements and the total length overall of the extended caisson liner as represented by a multiple of the individual element lengths by the number of units employed is determined by the depth of the boring which is to be lined. So, also, the diameter of the column of concrete to be placed in the excavation determines the diameter of the caisson liner and its constituent elements.

During the progress of the work, the digging device represented by the auger 15 in Fig. 1 is periodically withdrawn through the liner upwardly to be emptied and again lowered to its operative position at the bottom of the hole by means of the cables 20. After the boring is completed to the requisite depth, usually fixed by reaching bed rock, as represented in Fig. 1, the auger and shaft are entirely withdrawn and removed from the boring, whereupon the concrete or other filling is poured into the liner, settling into the bottom of the hole as represented in Fig. 2. Concurrently with the pouring of the concrete, the liner is progressively withdrawn by means of the cables 25 attached to the innermost element until it is lifted entirely out of the boring when the latter is completely filled.

It will be observed that inasmuch as the liner is withdrawn, one element at a time, the resistance of skin friction is confined wholly to that element whereas if the liner were integral and required to be drawn bodily from the hole, the resistance of skin friction would be very great and would require many times the amount of power to effect withdrawal, rendering the task in some instances impossible.

It will be appreciated that where an integral liner is employed for a hole of considerable depth the construction and handling and storage of such liners would entail much labor, expense and inconvenience; that if a sectional liner were employed made up of elements added from above as the depth increased, the work would have to

be suspended during the addition of other elements and the danger of disconnection between the elements in the act of removal would be present in addition to the difficulty of removal due to skin friction over the entire extent of the liner; that according to my invention the diameter and depth of the hole merely requires liner elements of corresponding diameter and the addition of a larger or smaller number of elements corresponding to the predetermined depth; that the liner increases in length overall automatically by gravity alone as the digging progresses without any cessation in the work; that the skin friction in removing the liner is confined to one element at a time and thus reduced to a minimum; that after removal from one boring, the transference of the liner to another involves the handling only of a structure having length corresponding to one of the elements, with no associated disassembly and reassembly; and that the problems of transportation and storage, ease of handling and space required are reduced to a minimum.

I claim:

1. A caisson liner comprising a plurality of sheet metal cylindrical sections telescopically assembled for longitudinal extension and retraction, the elements articulated to prevent separation in either direction, the several elements provided with lower cutting edges.

2. A caisson liner comprising a plurality of sheet metal cylindrical sections telescopically assembled for longitudinal extension and retraction, the elements articulated to prevent separation in either direction and equipped with lower cutting edges, means for telescoping the liner elements to effect removal from the boring by force applied to the innermost element from above, said means comprising cables attached to opposite sides of the inner element and extending upwardly through the liner to a point above the surface.

3. The combination with an earth auger, of a caisson liner supporting the surrounding earth about and above the digging zone, said liner comprising a plurality of sections telescopically assembled for longitudinal extension and retraction, the elements articulated to prevent separation when fully extended, certain of the elements provided with lower cutting edges.

4. The combination with an earth auger, of a caisson liner supporting the surrounding earth about and above the digging zone, said liner comprising a plurality of sections telescopically assembled for longitudinal extension and retraction, the elements arranged to extend by gravity as the depth of the boring increases and articulated to prevent separation when fully extended, and means for telescoping the liner elements within the boring by lifting force applied to opposite sides of the innermost element from above.

5. The combination with an earth auger, of a caisson liner supporting the surrounding earth about and above the digging zone, said liner comprising a plurality of sheet metal cylindrical sections telescopically assembled for longitudinal extension and retraction, the elements extensible by gravity as the digging proceeds and articulated to prevent separation in either direction, means for telescoping the liner elements to effect removal from the boring by lifting force applied to the innermost element from above, said means comprising cables attached to the lower element and extending upwardly through the liner to a point above the surface.

6. The method of progressively lining caisson borings which consists in loosely surrounding the boring auger with a telescoped series of liner sections and permitting the sections to settle successively by gravity as the excavation proceeds, the innermost section occupying a position about the auger in the work zone.
7. The method of progressively lining caisson borings which consists in loosely surrounding the boring auger with a telescoped series of liner sections and permitting the sections to settle successively by gravity as the excavation proceeds, the innermost section occupying a position about

the auger in the work zone, and upon the completion of the work removing the liner progressively section by section by lifting the innermost section first and the others in order.

8. The method of progressively lining caisson borings which consists in supporting within the upper initially excavated space a pendant telescopic series of cylindrical liner units so marginally interlocked as to preclude axial separation, and causing the inner unit to follow by gravity along the progressive excavation.

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