Nov. 10, 1931. K. SCHROEDER 1,831,426

UNDERWATER ANCHORING

Filed May 29, 1930 3 Sheets-Sheet 1

Fig.1.

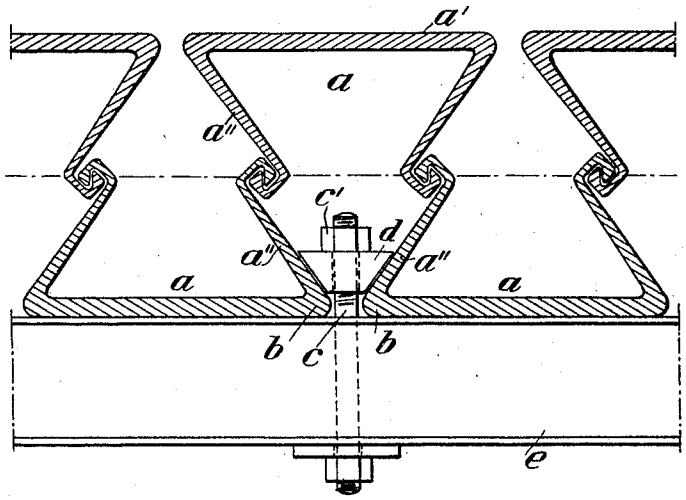
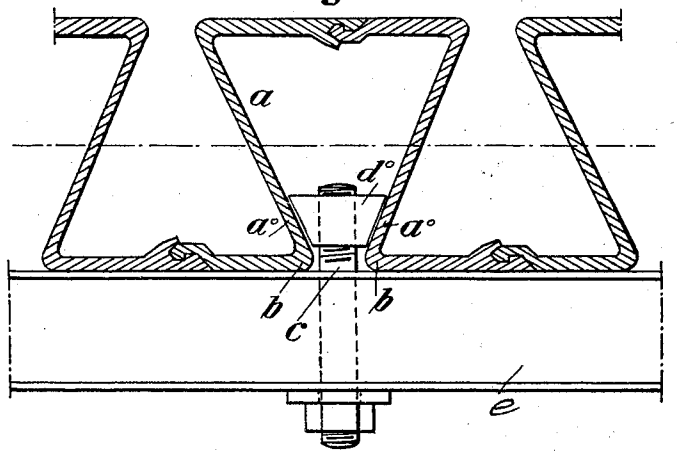


Fig.2.



INVENTOR
Kurt Schroeder.
BY R. Paul Rasmussen
ATTORNEY

Nov. 10, 1931. K. SCHROEDER 1,831,426

UNDERWATER ANCHORING

Filed May 29, 1930 3 Sheets-Sheet 2

Fig.3.

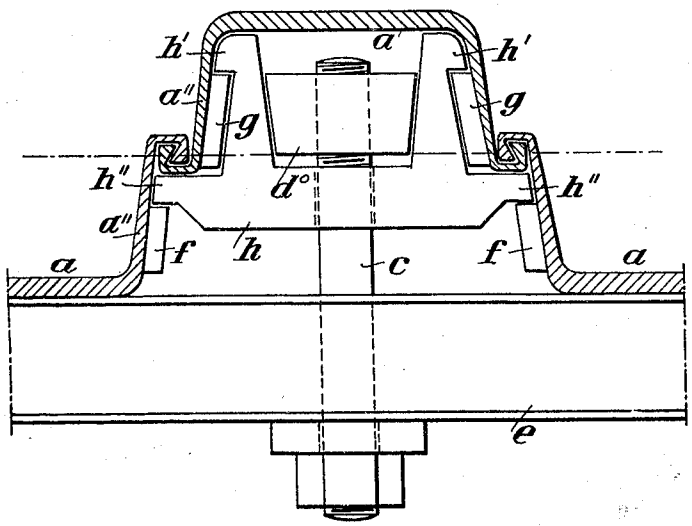
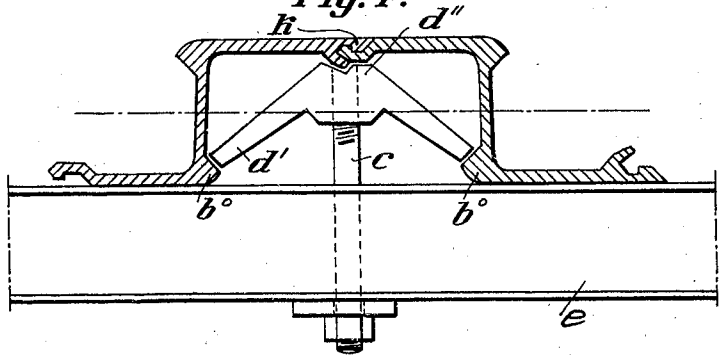


Fig.4.



INVENTOR

Kurt Schroeder.

BY A. Van Rensselaer

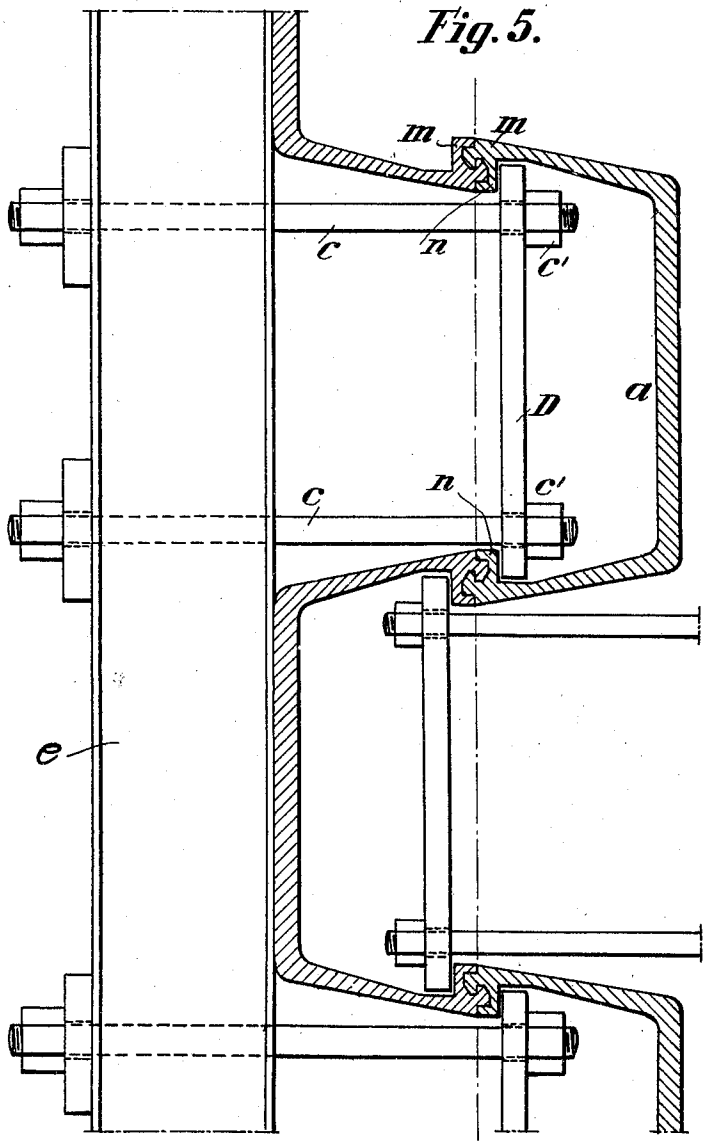
ATTORNEY

Nov. 10, 1931. K. SCHROEDER 1,831,426

UNDERWATER ANCHORING

Filed May 29, 1930 3 Sheets-Sheet 3

Fig. 5.



INVENTOR
Kurt Schroeder.
BY
ATTORNEY

Patented Nov. 10, 1931 1,831,426

UNITED STATES PATENT OFFICE

KURT SCHROEDER, OF DORTMUND, GERMANY

UNDERWATER ANCHORING

Application filed May 29, 1930, Serial No. 457,271, and in Germany May 29, 1929.

In the construction of shore walls of sheet piling, anchoring is usually necessary, and, for statical reasons, must be disposed below the water line. Anchorings of this kind have hitherto been established by attaching the requisite constructional parts by means of a diver, a method giving rise to considerable difficulty and expense.

The present invention simplifies such attachment by inserting the anchorings, from above, in guides, thus dispensing with any operations under water. That is to say the elements forming the sheet piling are so constructed that when driven into position and interlocked to form a continuous structure with its medial lines lying approximately in one and the same vertical plane, said structure will present upon one or both faces thereof a series of parallel, vertically extending channels, the inner surfaces of which form, or are provided with, undercut grooves or lugs with which properly shaped key-members may engage, and then anchoring a plurality of such key-members to one face of a horizontally extending beam forming a tie-member, inserting the projecting key-members in the upper ends of the undercut grooves or channels in the assembled sheet piling and driving said tie-member down to the desired depth along said grooves. In this way the sheet piling assembly is straightened out to form a perfect plane surface the elements of which are rigidly bound together and maintained in such position without requiring the services of divers or any under-water operations whatever.

The accompanying drawings illustrate typical embodiments of the invention.

Figs. 1–5 representing various forms of sheet piling, with suitable anchorings. In all the figures a dot and dash line indicates the median plane (so-called neutral axis) of the wall.

In the embodiment according to Fig. 1, the trough shaped sheet piling members a are provided with lateral walls a'' disposed at an acute angle in relation to the bed a' of the trough, or "convergent", so that only a fairly narrow gap is left at the corners b of the finished wall. In the resulting space, of triangular cross section, is inserted the anchor c on to which is screwed the nut c' which presses against the piling a member d, corresponding in shape to the gap between the two flanges a'', a'' of the adjacent pile member a. The anchor c is attached, in known manner, to the reinforcement e which distributes the anchor stresses.

Fig. 2 shows a substantially similar anchoring arrangement for a sheet-piling wall composed of Z-sections. In this case also, the shape of the section a is designed so as to leave a narrow gap of triangular section between the acute edges of the adjacent pile members, into which space the anchor c can be inserted. In this case the webs a^0 of the sections a form an abutment for the shaped member d^0 which, in this instance, is screwed directly on to the anchor.

In the embodiment according to Fig. 3, the sheet piling is constructed of trough sections, as in Fig. 1, but in this case the flanges a'' are not convergent but are provided with lateral lugs f and g. Behind these lugs an intermediate member h can be inserted from above, said member engaging, by means of two lateral lugs h' behind the lugs g—projecting towards the inner side of the central pile member a in Fig. 3—and engaging by means of two further lugs h'', behind the lugs f provided on the outer side of the flanges of the adjacent pile member a. The anchor c acts upon said intermediate member h by means of a nut d^0, which is substantially similar to that employed in Fig. 2.

In the embodiment according to Fig. 4 the sheet piling wall is again composed of Z-sections, as in Fig. 2, which are provided, on the web ends opposite the flanges with lugs b^0 behind which the two wing ends of an angular bridge member d' can be inserted, the central portion d'' of said member, designed as a nut for the anchor c, supporting at the same time the lock k (opposite the anchor) between the two adjacent Z-sections secured by the anchor.

The embodiment of the wall according to Fig. 5 is again composed of trough sections, as in Fig. 3. In this embodiment the lock members m connecting the pile members are

designed as lugs *n*, disposed approximately parallel with the median plans of the wall and projecting towards the interior of the several trough sections. Behind each two lugs of a section *a* rests a bridge member D, on which two anchors *c* act by means of nuts *c'*. In this embodiment an anchoring is indicated on both sides of the wall.

The invention is not restricted to the embodiments shown, modifications being possible within the scope of the appended claims For example, the lugs provided on the pile members to support the anchoring can be otherwise formed or attached by methods which will be obvious to those skilled in the art, and various other changes in details of construction can be made without departing from the basic novelty of the invention, so long as the general relative arrangement of the parts herein shown and described, and their mutual cooperation, are retained within the limits defined in the appended claims.

It is to be understood, of course, that in all the modifications shown the piling elements *a*, *a*, are first set, or driven down into the earth, in interlocked position with their medial lines located as nearly as possible in one and the same plane indicated by the broken line in each figure of the drawing, and that thereafter the key-members *d*, *d°*, *d'* or D are respectively anchored to the beam *e*, or other horizontally extending tie-member, inserted in the upper ends of the undercut grooves formed in, or by, the channels in one face of the piling assembly, and finally forced down along said grooves any desired distance by driving the tie-member *e* downwardly.

Two or more of said tying assembles so formed may be driven down one after another and left in properly spaced apart positions to give the contemplated piling structure any desired degree of rigidity. Also the key members could be connected to any other suitable anchorage in place of the beam *e*. In either case the main advantage of the invention would be retained, as the assembled piling can be connected with the anchorage of whatever description after the sections of piling have been driven into the earth in assembled relation, and this without requiring the services of a diver for adjusting the connection of said piling to said anchorage.

I claim:

1. A plurality of interlocking sections of sheet piling presenting, when assembled side by side, a plurality of channels, extending parallel to the medial plane of the piling assembly, said channels containing undercut surfaces, combined with a tie-member adapted to extend across said face and provided with a series of key elements anchored thereto and adapted to extend into said channels and interlock with said undercut surfaces.

2. A combination such as defined in claim 1 in which a cross section of said assembled piling has a generally zigzag outline of substantially uniform thickness.

3. A combination such as defined in claim 1 in which a cross section of said assembled piling has a generally zigzag outline of substantially uniform thickness, said walls themselves forming said undercut surfaces with which said key-members may directly engage.

4. A combination such as defined in claim 1 in which said undercut surfaces are formed by lugs located on the inner faces of each section of sheet piling.

5. A combination such as defined in claim 1 in which certain of said sections of sheet piling have outwardly flaring side walls provided on their inner surfaces with projecting lugs with which said key-members may interlock.

6. A plurality of interlocking sections of sheet piling presenting, when assembled side by side, a plurality of channels extending vertically parallel one to another and to the medial plane of the piling assembly, said channels containing undercut surfaces, combined with a key member adapted to be slid into the upper end of any one of said channels downward along the same so as to interlock with the undercut surface therein, a suitable anchorage for said piling, and means connecting said key member with said anchorage.

In testimony whereof I affix my signature.

KURT SCHROEDER.