June 29, 1943. J. B. BROCKHURST 2,322,819

SHEET PILING

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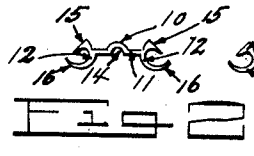


Fig 2

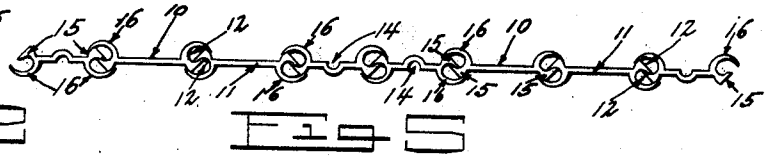


Fig 5

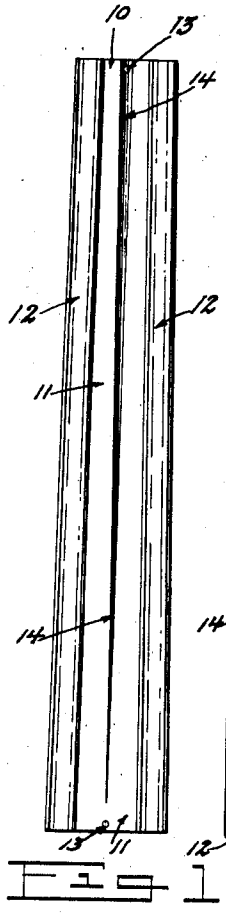


Fig 1

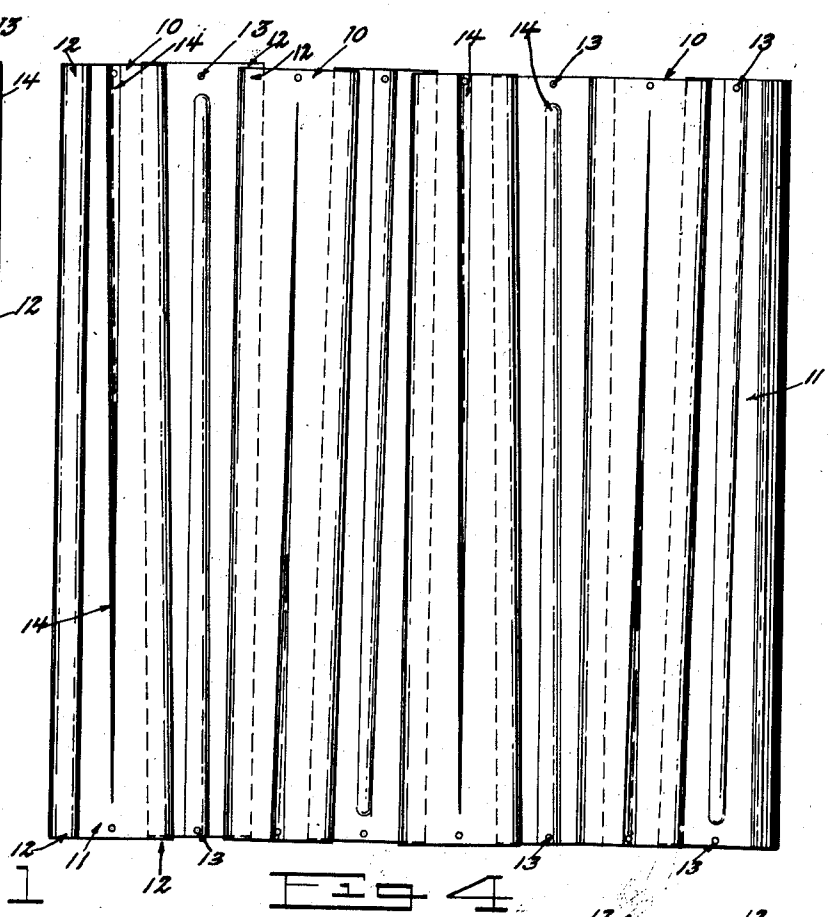


Fig 4



Fig 7

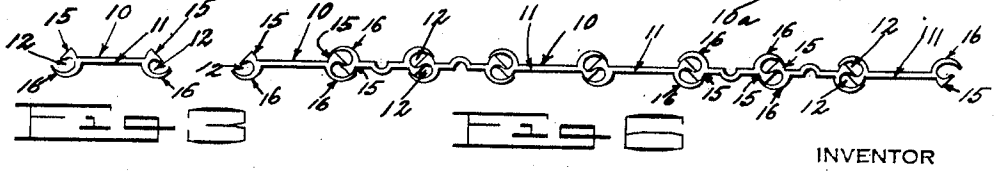


Fig 3

Fig 6

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SHEET PILING

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5 Claims. (Cl. 61—62)

The present invention relates to metal sheet piling comprising piles with slidably interlocking edges and more particularly to improvements in tapered sheet piling with slidably interlocking edges.

In interlocking and successively fixing metal sheet piles with slidably interlocking edges in solid material, such as that of the sea bottom, to form a continuous line, it is difficult, if not impossible, to fix successive units vertical, because the interlocking joint between the last unit fixed and the next preceding is usually upset during the pumping action. This condition may be due to the fact that it is usually necessary to drive or otherwise force the successive piles into progressively denser material with the increased depth of penetration into the material of the sea bottom, for example. Consequently either one of the cooperating members, or comembers of an interlocking joint may be upset, thus permitting sand, gravel and other sea-bottom material to enter the joint at the bottom and separate or space the cooperating members permanently while the upper part of the joint is not usually affected to the same extent nor in the same manner. Eventually, as successive units are thus thrown more and more out of verticality with the progressive growth of the line of piling, the condition arises in which it becomes impracticable to proceed further in the same manner and the front edge of the line must be realigned in substantially vertical position as by the use of one or more tapered piles made particularly to meet this condition.

Heretofore, it has been the usual practice to make a tapered pile of the kind under consideration by utilizing individual members having interlocking devices at longitudinal side edges thereof and riveting such individual members to the longitudinal side edges of a tapered central web so as to form a fabricated taper pile with interlocking devices at its edges. This method of construction is expensive and has other disadvantages. Obviously such tapered piles are particularly expensive where they have to be made of special size to meet the requirements of a particular situation.

An important object of the invention is to provide a novel and advantageous form of tapered sheet pile. Another object is to provide a unitary tapered sheet pile with interlocking devices at the longitudinal side edges thereof to cooperate with corresponding devices on adjacent piles. Another object is to provide a unitary tapered sheet pile adapted when used with its broad end up or with its narrow end up to slidably interlock with an adjacent pile. A further object is to provide a metal tapered sheet pile having a central web decreasing uniformly in width from its broad end toward its narrow end and having a trough increasing progressively in cross-sectional area from a point near its broad end to its narrow end. A further object is to provide a unitary tapered sheet pile which is advantageous in use and economical to manufacture. A further object of the invention is to provide metal sheet piling composed of unitary sheet piles, certain of which are tapered and may be driven broad end up or narrow end up to provide inclined joints between successive piles so as to resist direct upward movement thereof. A further object of the invention is to provide a unitary tapered sheet pile having a central web containing the same weight of metal from end to end but progressively narrowed from one end by progressively increased corrugation. A further object of the invention is to provide a new and advantageous method of making metal tapered sheet piles.

According to one form of carrying out the invention, the tapered sheet pile may be made by rolling a pile of uniform central web and edge portions comprising interlocking devices adapted to cooperate in a sliding manner with corresponding interlocking devices of an adjacent sheet pile having the same type of interlocking devices. Later in the operation of manufacture, the metal of the central web may be displaced progressively away from the principal plane of the web from one end to the other to form a longitudinal crest of gradually increasing height thereby progressively narrowing the pile. In a specific instance the pile may be progressively narrowed by forming a longitudinal trough of progressively increasing cross section from one end to the other. In order that the piles may be used either with broad end up or with the narrow end up, the interlocking devices at the opposite edges of the central web may be turned towards the same side of the metal pile. The tapering of the central web may also be effected by corrugating the metal of the central web to a progressively increasing extent from one end of the pile to the other by pressing the channel of a uniformly channeled pile progressively deeper from one end of the pile to the other to draw the side edges progressively toward each other, or by pressing a central part of uniform width out of the plane of a plane web to produce a channel of uniform width at the bottom but of varying

depth and varying width at the top. Tapered piles of the general character just described may be used to build up a complete line of piling, successive piles being arranged with their broad ends up or broad ends down according to the requirement of the situation, and it may be necessary to drive a plurality of successive piles, either with their narrow ends up or their narrow ends down. In view of the fact that the tapered piles are to be used with either end up, a handling device such as a hole should be provided at each end of a pile in order that it may be lifted out of the ground by either end or lowered with either end up preparatory to driving.

Heretofore in building, in the usual manner, walls of steel sheet piling having parallel longitudinal side edges, the ramming and pumping operations upset the interlocking joint between the successive sections and cause them to incline approximately 1 degree. When this splaying action has accumulated to approximately 5 degrees at the outer end of a line of piles, the work gets out of hand and a specially made taper section is added to return the outer end to vertical alignment in order to continue the work. According to the present invention, the splaying action is not allowed to accumulate, being corrected as fast as it begins to build up.

Other objects, features and advantages will appear upon consideration of the detailed description of the drawing in which:

Fig. 1 is an elevation of a pile of the present invention with its narrow end up;

Fig. 2 is a view looking down upon the top of the pile shown in Fig. 1;

Fig. 3 is a view showing a projection on a horizontal plane of the lower end of the pile of Fig. 1;

Fig. 4 is a line of piling made up of piles corresponding in shape to that shown in Fig. 1;

Fig. 5 is a top plan view looking down upon the upper ends of the piles shown in Fig. 4;

Fig. 6 is a view showing a projection on a horizontal plane of the lower ends of the piles shown in Fig. 4; and

Fig. 7 is a cross-section of another form of tapered pile in which the taper is produced by varying the depth of the channel progressively from one end to the other.

In Figs. 1 through 6 there is illustrated a unitary tapered sheet pile 10 constituting a preferred form of the invention. The pile 10 may comprise a central web 11 and interlocking devices 12 at the longitudinal side edges of the central web, these interlocking devices 12 being adapted to slidably interlock with similar interlocking devices on adjacent piles which may be either tapered or straight. Inasmuch as these piles are to be used with either end up, each pile may be provided at each end with a handling device such as a hole 13.

In order that these piles may be made by rolling, each pile 10 may be rolled originally with a straight central web 11 and interlocking devices 12 at the edges thereof and the taper may be produced by continuing the rolling so as to displace metal therein out of the plane of said web to produce a trough 14 of cross section progressively increasing in cross-section from one end which retains its original width to the other end which becomes the narrow or narrower end.

In order that successive tapered piles 10 may interlock with each other, the interlocking devices at the edges of each of these piles are arranged to face in the same direction and such piles must be 180 degrees apart with reference to their vertical axes as shown best where two narrow ends are shown together in Figs. 5 and 6. When the second of two piles with their narrow ends together is inserted, it will have to be turned 180° about its vertical axis to enable interlocking with the other pile.

For the purposes of the present invention all of the interlocking devices 12 should be of the same kind thus allowing the interlocking device at either edge of a pile 10 to be locked to either edge of another pile. As illustrated, the desired result may be attained by the use of interlocking devices each of which comprises a hook 15 and a hooked flange 16.

It will be obvious that a line of piling may be made up entirely of tapered piles 10 or of some of these tapered piles and straight piles having corresponding locking devices at their edges.

In Fig. 7, there is shown a cross section of a tapered pile 10*a* constituting another embodiment of the invention. Each tapered pile 10*a* comprises interlocking devices 12*a* at the longitudinal side edges thereof and a central web 11*a* in the form of a channel. The interlocking devices 12*a* may be the same as devices 12 of pile 10 and the tapering of each pile 10*a* may result from making a pile with devices 12*a* at its edges and the same amount of sheet material across the web at all points but with the web tapered from end to end by the formation, from one end to the other of the pile, of a channel progressively deeper from one end to the other. In connection with a pile of the cross section shown in Fig. 7, the variation in the depth of the channel and width of the pile may result from variation of the angles between the sides of the channel and the bottom thereof.

It should be understood that various features may be changed and that certain features may be used without others, without departing from the true spirit and scope of the invention.

What I claim is:

1. A unitary tapered metal sheet pile having at its longitudinal side edges devices adapted to slidably interlock with the corresponding parts of adjacent piles of similar construction irrespective of the direction in which the tapers of adjacent piles extend, and a connection between said side edges formed of a single central web having therein a longitudinal trough starting near the wider end of the pile and increasing in cross-sectional area toward the other end of the pile to provide the taper of the pile.

2. A unitary tapered metal sheet pile having at its longitudinal side edges devices adapted to slidably interlock with the corresponding parts of adjacent piles of similar construction irrespective of the direction in which the tapers of adjacent piles extend, and a connection between said side edges formed of a single central web corrugated with a crest and trough extending in the same general direction as the axis of the pile and gradually increasing in height and depth respectively from the broad end to the narrow end of the pile to produce the taper of the pile.

3. Metal sheet piling comprising interlocking unitary tapered metal sheet piles, each pile having a single central web and at its longitudinal side edges devices relatively inclined lengthwise to produce the taper and adapted to have a sliding interlock with corresponding devices at the edges of adjacent similar piles, each of said central webs being longitudinally corrugated and

each corrugation increasing in depth from the broader toward the narrower end of its respective pile to provide said taper, and the tapered sheet piles being driven either narrow end up or broad end up to avoid excessive tilting of any of the piles.

4. A unitary tapered metal sheet pile having at its longitudinal side edges devices adapted to slidably interlock with the corresponding parts of adjacent piles of the same construction irrespective of the direction in which the tapers of adjacent piles extend, and a connection between said side edges formed of a single central web having a longitudinal trough provided by a depression on one face and a corresponding elevation on the other face, said trough increasing in depth toward the narrower end of the pile.

5. A unitary tapered metal sheet pile having at its longitudinal side edges devices adapted to slidably interlock with the corresponding parts of adjacent piles of similar construction irrespective of the direction in which the tapers of adjacent piles extend, and a connection between said side edges formed of a single central web having at one face a crest formed of metal displaced from the main plane of said web and increasing gradually in height toward one end as the pile decreases in width.

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