Oct. 1, 1935. K. WILLNER 2,016,064

IRON SHEET PILING

Filed May 8, 1933

Fig. 1

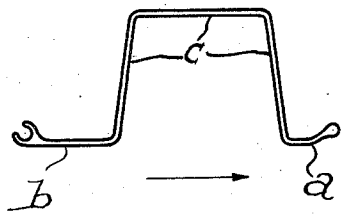


Fig. 2

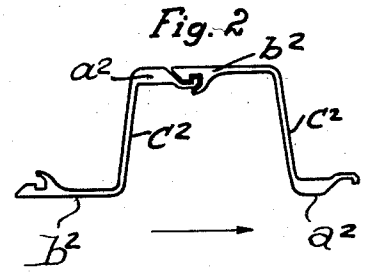


Fig. 3

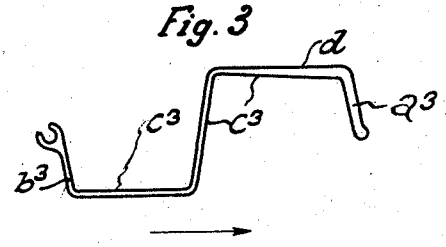
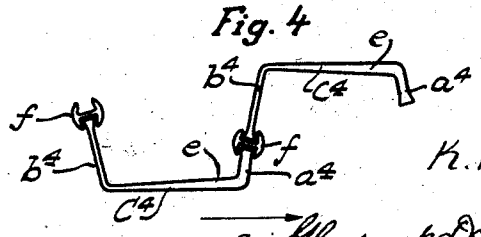


Fig. 4



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IRON SHEET PILING

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In Germany December 15, 1930

7 Claims. (Cl. 61—62)

This invention relates to sheet iron piling, such as employed in reinforcing dams and the like; more particularly, it relates to piling built up of a series of sheet metal sections successively positioned and joined by bulb and claw connections, the members of which are respectively carried by flanges projecting from opposite sides of each section. The chief advantage of a bulb and claw connection is due to the fact that each section can be driven into the earth with the bulb flange in advance to engage the claw of the preceding section. By driving the bulb flange in advance, the earth offers less resistance to the forward movement of the section than would be offered should the claw flange be driven ahead. As the head of the claw is much larger transversely than the bulb, it would be more difficult to force the former through the earth. Furthermore, should the claw flange be driven in advance, the opening in the claw head would be packed with earth to prevent the entrance of the bulb of the previously positioned piling section.

In the known types of sheet piling, employing the bulb and claw connection, the bulb flange is as long, transversely of the section, as is the claw flange, or longer than the same. In such structure the comparatively long bulb flange is not reinforced to the same extent as the claw flange reinforced by the transverse thickness of the claw head. When such a section is driven into the earth with the elongated bulb flange in advance, the latter is liable to be bent and deformed by the resistance of the earth, particularly so should the earth contain stones and other obstacles to the forward movement of the bulb flange. Should there be considerable deformation of the bulb flange, the bulb would not engage the claw head of the preceding section and leaking through the piling would result.

The object of the present invention is to prevent deformation of the bulb flange. This is accomplished by making the bulb flange considerably shorter in the transverse direction of the piling section, or by making the bulb flange of considerable thickness, to reinforce the flange; also, the bulb flange may be made both shorter and thicker to strengthen the same.

By way of example, the invention is illustrated in the accompanying drawing, which shows several embodiments of the invention.

In the drawing the several figures show end views of piling sections embodying the different modifications of the invention. Fig. 1 shows a U-shaped pile section in which the bulb flange is considerably shorter than the claw flange. Fig. 2 shows a U-shaped pile section built-up of two sub-sections, each of which sub-sections includes a bulb-flange shorter and thicker than the claw flange. Fig. 3 shows a zig-zag pile section with a claw flange and a bulb flange thicker than the claw flange, and with the web of the pile section thickened toward the bulb flange. Fig. 4 shows a zig-zag pile section built-up of two sub-sections, each of which sub-sections includes a short thick bulb flange and a web thickened toward the bulb flange, and each of the sub-sections having a reinforcing rib mounted on its claw flange to provide a claw head.

Referring to Fig. 1 of the drawing, the pile is formed of a single iron sheet, and its web c is generally U-shaped. Projecting from one edge of the web is the bulb flange a, and from the other edge projects the claw flange b. In the transverse direction of the pile, the bulb flange is considerably shorter than the claw flange. When the pipe is driven ahead, in the direction indicated by the arrow, to engage the preceding pile, owing to the comparatively short length of the bulb flange, the liability of deformation of this flange by the resistance of the soil is much less than it would be should the flange have considerable length, similar to the claw flange. It is to be noted that the web of the pile does not extend beyond the bulb and claw flanges in a transverse direction of the pile.

As shown in Fig. 2, the body of the pile is generally U-shaped, but comprises two longitudinal sub-sections; each of which is of a zig-zag formation and consists of a web c^2, a bulb flange a^2 and a claw flange b^2. The bulb flange is of less length than the claw flange and has considerable thickness to further strengthen the same. In positioning this pile, each section or sub-section is driven ahead in the direction of the arrow so that the bulb flange a^2 engages the claw flange of the preceding section or sub-section. Owing to the comparatively short length of the bulb flange and its considerable thickness, this flange will be less liable to deformation by the resistance of soil than the bulb flange of Fig. 1.

As shown in Fig. 3, the pile is formed of a single iron sheet, and its web c^3 is of zig-zag formation. Projecting from one end of the web in a transverse direction is the bulb flange a^3 and from the other end of the web projects the claw flange b^3. The bulb flange a^3 is thickened and the web c^3 is thickened toward the bulb flange, as at d. The thickening of the bulb flange and web reinforce the pile to withstand the resistance of the

soil when the pile is driven into place in the direction of the arrow.

As shown in Fig. 4, the pile as a whole is of a general zig-zag formation and it comprises two longitudinal sub-sections. Each sub-section consists of a web c^4, and at one transverse end projects the short thick bulb flange a^4, toward which the web thickens, as at e. Projecting from the other transverse end of the web is the claw flange b^4, mounted on the end of which is the reinforcing strip f to provide the claw head to be engaged by the bulb flange of a succeeding section or sub-section.

In positioning the piling sections shown in Figs. 2 and 4, the section as a whole may be driven through the soil, or the sub-sections may be driven separately. The arrows in the several figures indicate the direction in which the piling sections or the pile sub-sections are driven to form the sheet piling.

What I claim is:—

1. Undulated iron sheet piling with bulb and claw connection, the sheet piles of the piling consisting of at least one web, a bulb flange and a claw flange, the web being not extended beyond the flanges, and the bulb flange which is driven in ahead in the ramming direction being shortened relative to the claw flange.

2. Undulated iron sheet piling with bulb and claw connection, the sheet piles of the piling consisting of at least one web, a bulb flange and a claw flange, the web being not extended beyond the flanges, and the bulb flange which is driven in ahead in the ramming direction being shortened and thickened relative to the claw flange.

3. Undulated iron sheet piling with bulb and claw connection, the sheet piles of the piling consisting of at least one web, a bulb flange and a claw flange, the bulb flange being shortened relative to the claw flange, and the web connected with the bulb flange being thickened towards the same in an increasing manner.

4. Undulated iron sheet piling with bulb and claw connection, the sheet piles of the piling consisting of at least one web, a bulb flange and a claw flange, the bulb flange being thickened relative to the claw flange, and the web connected with the bulb flange being thickened towards the same in an increasing manner.

5. Undulated iron sheet piling with bulb and claw connection, the sheet piles of the piling consisting of at least one web, a bulb flange and a claw flange, the bulb flange being shortened and thickened relative to the claw flange, and the web connected with the bulb flange being thickened towards the same in an increasing manner.

6. Undulated iron sheet piling with bulb and claw connection composed of sheet piles which consist of at least one web, a claw flange arranged at the one end thereof and a bulb flange arranged at the other end in an opposite direction, said bulb flange which is driven ahead in the ramming direction being shorter than the claw flange.

7. Undulated iron sheet piling with bulb and claw connection composed of sheet piles which consist of at least one web, a claw flange arranged at the one end thereof and a bulb flange arranged at the other end in an opposite direction, said bulb flange which is driven ahead in the ramming direction being shortened and thickened relative to the claw flange.

KURT WILLNER.