

June 20, 1939.

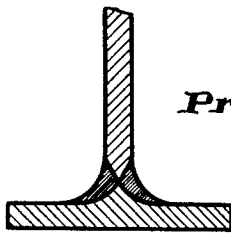
W. PÜNGEL

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WELDED STRUCTURAL ELEMENT

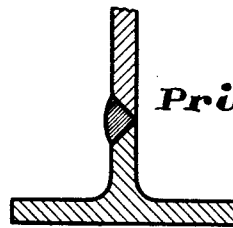
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Fig. 1



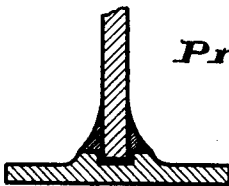
Prior Art

Fig. 2



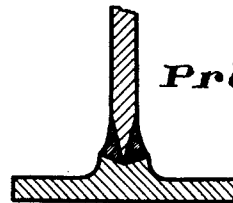
Prior Art

Fig. 3



Prior Art

Fig. 4



Prior Art

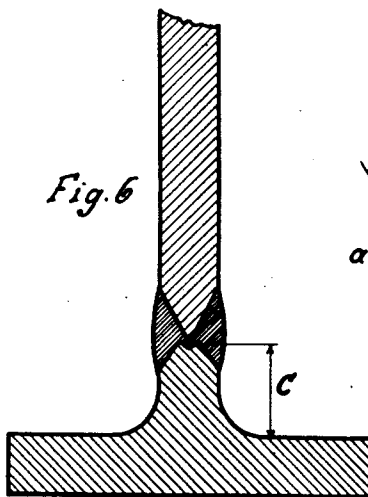


Fig. 6

Fig. 5

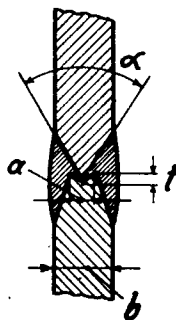


Fig. 5

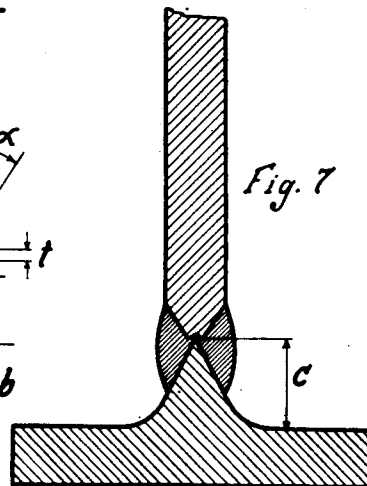


Fig. 7

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WELDED STRUCTURAL ELEMENT

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3 Claims. (Cl. 189-37)

Girders and similar constructional elements are often composed of several parts mostly consisting of rolled sectional materials and plates, the connection being preferably effected by welding. Various forms of construction have been used for this purpose but they possess not only advantages but also great disadvantages.

In the accompanying drawing:

Figs. 1 to 4 are sectional views of various known forms of weldings and,

Figs. 5 to 7 illustrate examples of weldings formed in accordance with the present invention.

Fig. 1 shows an element in which the joint is difficult to make as the flange sections and the web plate must first be clamped in their relative positions by special devices. Furthermore, the testing by means of X-rays can only be carried out with difficulty. This figure illustrates the connection between the flange and the web plate of a T-girder. The web plate 1 is provided with a peaked bevel, forming web surfaces 3, 4. In the center of flange 2 a longitudinal edge 5 is also provided which is formed by an arching curvature in the center of the flange. Seams are welded in the angle formed by the web surfaces 3, 4, and the side surfaces of the edge 5. The element shown in Fig. 2 possesses the same disadvantage of being difficult to connect, the asymmetrical arrangement of the welding seam being also objectionable. According to Fig. 2 the web 1^a is connected with flange 2^a by a V-seam. This type of connection is characterized by the fact that flange 2 is provided with a relatively high projection 6, which forms, to a certain extent, a part of the web. This arrangement is often selected in order to bring the welded seam 7 as close as possible to the neutral axis of the girder.

Fig. 3 illustrates an arrangement in which the flange 2^b is provided with a rectangular groove 8, which receives the edge of web plate 1^b. The welded seam is formed between the sides of the web plate 1^b and the surfaces lying laterally of the groove in the flange. It is characteristic of this connection that the bottom of the groove, on which the narrow edge of web plate 1 rests, is not welded owing to the thickness of the web plate. On the contrary a space remains between the web plate and the groove bottom so that notch effects occur at this place. On the other hand, the element shown in Fig. 3 is easy to put together but requires that the thickness of the web plate be adapted to the width of the groove in the flange section. Otherwise lining pieces and the like are necessary to fix the web plate exactly in the middle of the groove. Moreover, the

difficulties connected with the testing of the weld by means of X-rays must also be mentioned. In contrast to Fig. 3, the groove in flange 2 in the arrangement shown in Fig. 4 is not of rectangular cross section but has the shape of an angle. As in Fig. 1, the web plate 1^c is provided with beveled surfaces 3^c and 4^c, forming a peaked apex, with which it contacts the bottom of the groove. The welded seam is formed between the beveled surfaces 3^c and 4^c and the beveled surfaces 9 and 10 of the angularly shaped groove. The composite girder shown in Fig. 4 presents welding-technical difficulties, as the seam angle owing to the interengaging angles of web plate chamfer and flange groove will either be very small or the web plate must be chamfered to an excessively sharp angle.

The disadvantages possessed by the forms of construction above mentioned are avoided, but without sacrificing the advantages offered by the different forms of construction, if the apex of the peak-shaped chamfers of one of the two parts to be welded together is provided with a narrow longitudinal groove, in which the apex of the other part engages. It has been found particularly advantageous to make the width of the groove about $\frac{1}{8}$ to $\frac{1}{4}$ of the thickness at the base of the chamfer of the part to be welded; corresponding to these dimensions the depth of the groove is then about $\frac{1}{12}$ to $\frac{1}{8}$ of this thickness. In the case of constructional elements which are composed of a web plate and a flange it is advisable not to make the weld too near the flange. It is therefore proposed to make the apex or the groove of the chamfer of the flange project above the abutting surface of the flange a distance equal to at least the thickness of the flange.

In the examples of the invention illustrated in Figs. 5 to 7, the groove width a is about $\frac{1}{8}$ to $\frac{1}{4}$ of the plate thickness b . The groove depth t is preferably taken to be $\frac{1}{12}$ to $\frac{1}{8}$ of the plate thickness. With the proposed dimensions a good welding through of the weld root is attained. The chamfer angle α , in consideration of the angle of the welding seam to be obtained, may be chosen at about 45°. As shown in Fig. 5 for the connection of two plates, the groove may be made with sharp edges or, as shown in Figs. 6 and 7 for the connection of the parts of a T-girder these edges may be rounded. In the girders illustrated in Figs. 6 and 7 in principle the same construction of the welded joints as in the general example illustrated in Fig. 5 is shown. In the case of girders it is advisable, in order to draw the

welded seam as far as possible out of the highly stressed outer fibres of the girder, to arrange the apex of the chamfer of the flange part at a distance c above the upper surface of a flange part facing the apex, said distance being equal to at least half the flange thickness.

The parts to be welded when constructed according to the invention allow firstly a very simple assembly before the welding, as the two parts to be welded together are positively brought into and maintained in the correct position by the interengagement of apex and groove.

The opening angle of the weld seam may be rather large so that easy and reliable welding is possible. Owing to the interengagement of the web plate points and flange groove or flange web apex and web plate groove being only very slight, a thorough welding through at the seam root is possible so that a weld is produced which is homogeneous in its entire cross-section and detrimental notch effects due to unwelded seam root are reliably avoided. The shape of the joint between flange and web plate according to the invention furthermore allows of a very simple and reliable X-ray testing of the weld of the finished

girder, as the seam is easily accessible and the same thicknesses of material are present on the two sides of the central line of the seam.

I claim:

1. Composite welded constructional elements, comprising at least two parts each having a portion chamfered in peak shape, one of said parts having a longitudinal groove in the apex of its chamfered portion adapted to receive the apex of the chamfered portion of the other part, and a welding seam covering the chamfered portions of both parts.

2. A composite welded constructional element as specified in claim 1, in which the groove width is about $\frac{1}{6}$ to $\frac{1}{4}$ and the groove depth about $\frac{1}{2}$ to $\frac{1}{8}$ of the thickness of the other part at the base of its chamfered portion.

3. A composite welded constructional element as specified in claim 1, in which the two parts consist of a web plate and of a flanged support and the apex of the peak-shaped chamfered portion is drawn up from the abutting face of the flange a distance at least equal to the thickness of the flange.

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