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Unbuilt Bridges.

Brücken, die nicht gebaut wurden.

Ponts qui n'ont pas été construits.

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At meetings and in the literature, discussion is usually confined to structures which have actually been built, reference being made to their general arrangement, their constructional details and the advantages and disadvantages possessed by this or that type of work.

It is proposed here to direct attention to bridges which have never been built, or, more correctly speaking, to designs which have not been carried into effect at any rate in the particular circumstances for which they were drawn up.

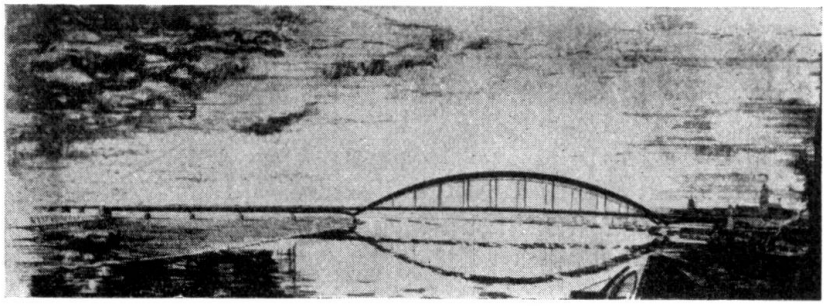

Fig. 1.

It will be suggested, moreover, that in the case of those designs which have gone no further than the design stage, it will often happen that either the external form or the underlying idea can successfully be taken up again later. The intention here is not so much to lament the tragedy of an idea being born before its time as to suggest to engineers that it is well worth while devoting attention to designs that have fallen by the wayside in competitions. Much thought of the highest quality is stored away in the prodigious labour applied to such designs by first class bridge builders, and it happens frequently that this may advantageously be drawn upon in other circumstances. This is true as regards both the design as a whole and the execution of its details.

The author wishes to declare at the outset his intention of quoting the actual names of the works in question, and he trusts that this will be excused

by his colleagues, as he considers such a course more useful than mere mention of the designs without closer designation. He also asks for indulgence in mentioning mainly works, to the design of which he himself contributed.

First a few examples will be given of the general arrangement of bridge design.

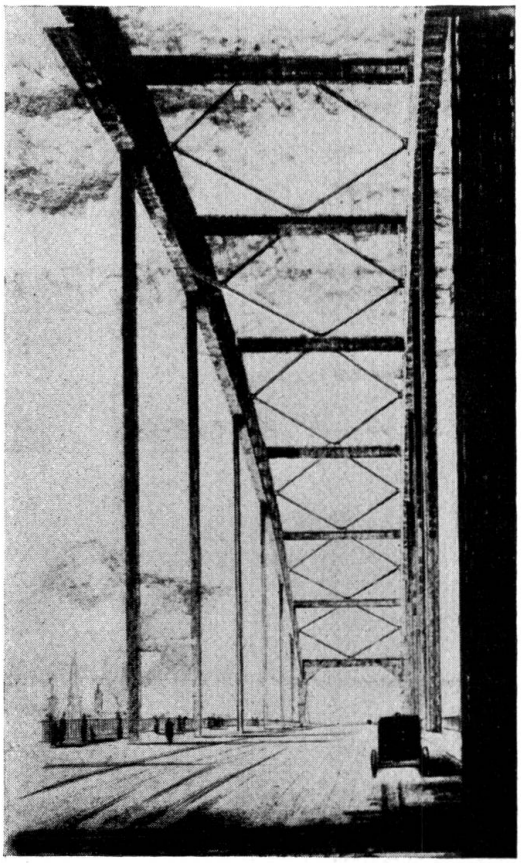

Fig. 2.

In the competition for the Rhine bridge at Cologne-Mülheim an arched design was proposed (Fig. 1) which, having a span of more than 300 m, would have resulted in a bold and remarkable structure. Perfectly feasible technically, it would have had the advantage of allowing motorists on the bridge an unobstructed view of the river (Fig. 2). For reasons which would take too long to explain here, a suspension bridge was chosen instead.

To carry the Autobahn over the Elbe at Hohenwarthe, the author proposed a suspension bridge (Fig. 3), the lightness of which would have harmonised excellently with the long lines of the approach spans (Fig. 4). Actually a lattice girder bridge was built instead.

For the Elbe bridge at Dömitz he suggested a truss bridge in which all the web members would have been struts of equal inclination (Fig. 5). As there were to have been only two main girders, the effect even of an oblique view through them would have been one of repose. The design actually chosen was a bow-string girder bridge.

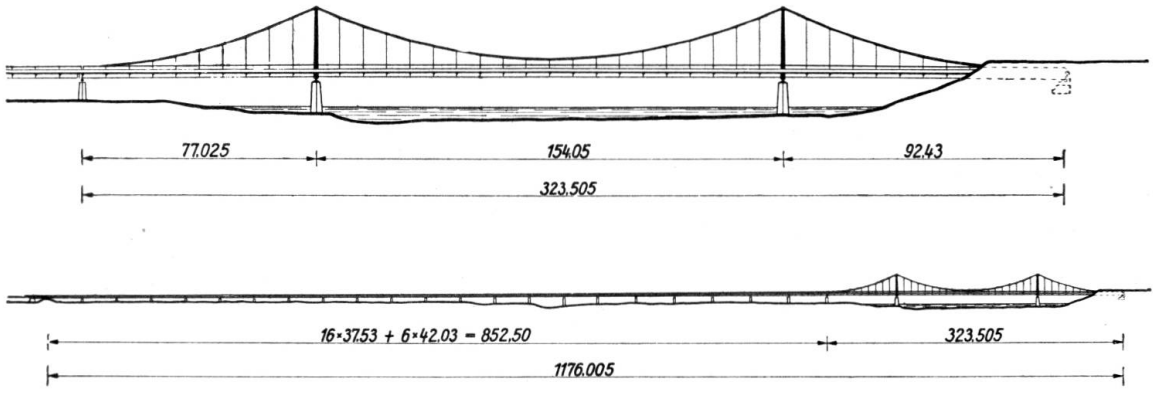

Fig. 3. (Dimensions in metres.)

This completes the circle from arch bridge to suspension bridge, from suspension bridge to trussed girder, from trussed girder to bow-string girder.

Allthough in these cases the wide-span arch bridge and the suspension bridge were not in fact carried out, the author believes that some day an opportunity will arise to make use of ideas embodied in these old designs and to apply these structural systems in similar cases elsewhere.

What is true of designs as a whole is also true, perhaps even more markedly, as regards constructional details. Here two examples will suffice.

Fig. 4.

In the construction of large viaducts with continuous main girders the recent practice has been to adopt tall steel hinged columns or hinged frames for the intermediate supports. In Figs. 6 and 7 a comparison is drawn between this form of construction and the use of slender concrete piers, designed for the Mulden bridge at Siebenlehn. The use of hinged portal frames of great height came originally from a suggestion made by the author in reference to the

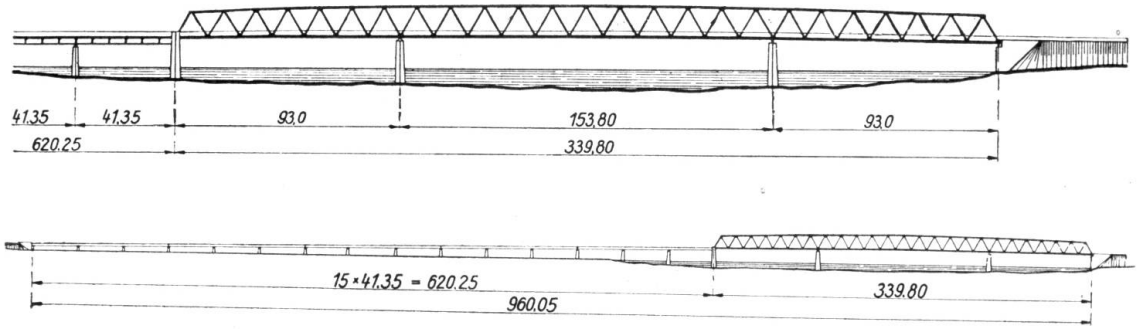

Fig. 5. (Dimensions in metres.)

Mangfall bridge, which on that occasion was not adopted. Figs. 8 and 9 are an elevation and a view from underneath of the bridge, showing the two alternative designs of solid-webbed and open webbed main girders.

The second example that may be cited in this connection is that of the overhead wind bracing. There can be no doubt that from an aesthetic point of view the Vierendeel form of bracing is very attractive, its plain cross members without diagonals giving an effect of repose. In 1934 the author proposed an

overhead wind bracing of this design for the Autobahn bridge at the Kaiserberg near Duisburg, but for statical reasons the deciding authority preferred a K-bracing. More recent bridges of this kind are in fact being built with Vierendeel

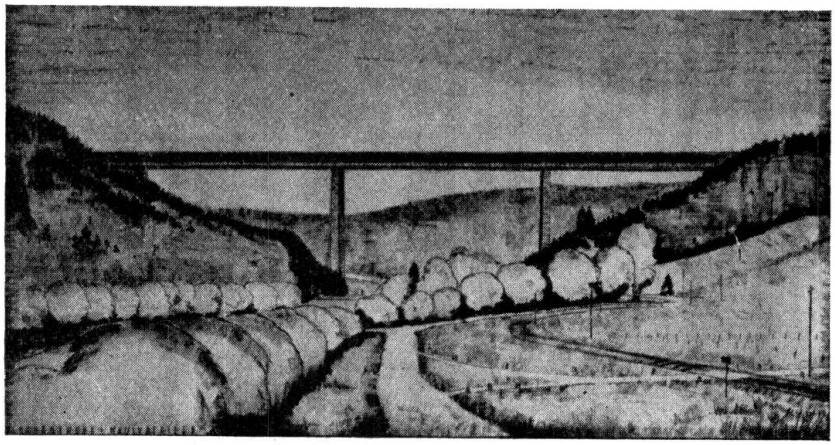

Fig. 6.

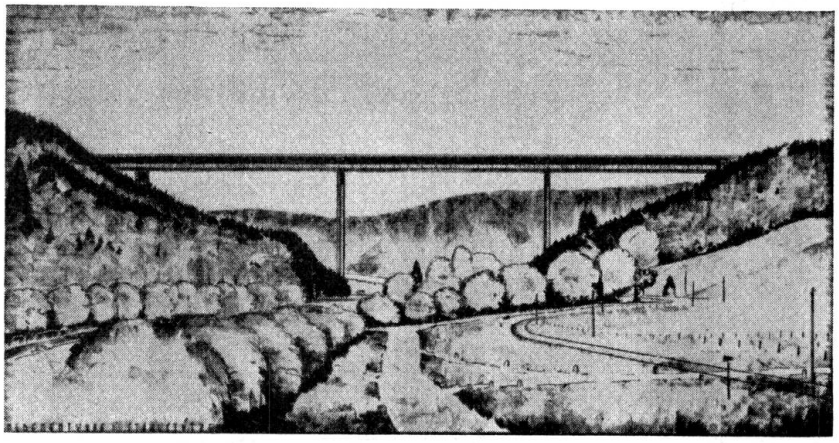

Fig. 7.

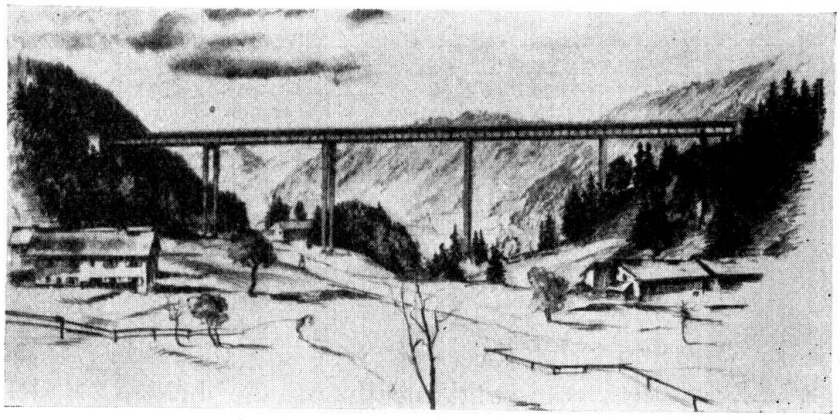

Fig. 8.

type of wind bracing, as, for instance, the Autobahn bridges over the Lech near Augsburg and over the Rhine-Herne canal near Duisburg, the latter having a span of 140 m.

Finally, a few words may be said on the subject of arch bridges. There are a considerable number of cases where an arch bridge is not only technically advantageous and competitive, but is also entirely satisfying from an aesthetic

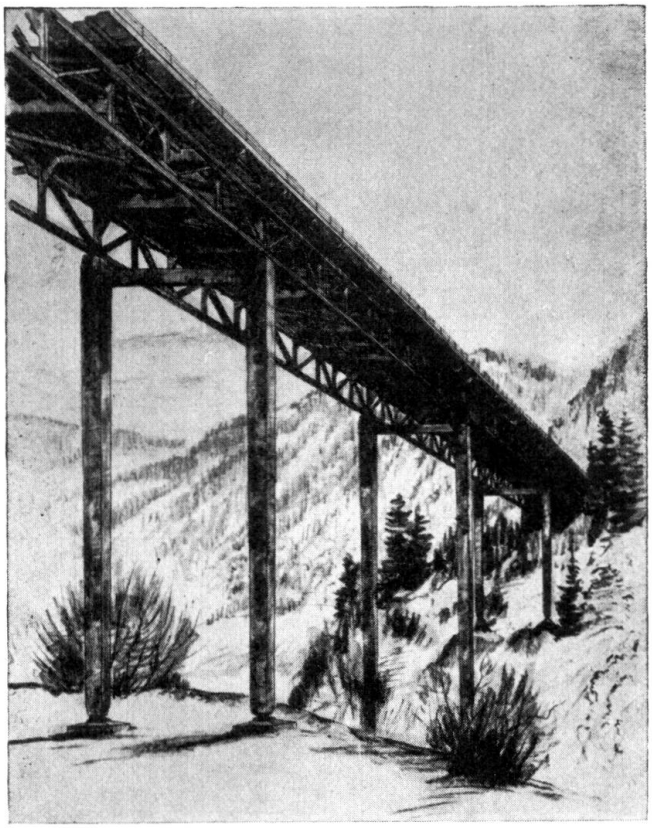

Fig. 9.

point of view, and if this were realised the present urge towards the adoption of nothing but parallel plate girder and lattice girder bridges might happily be varied. Here the author has in mind arch bridges properly so called (whether

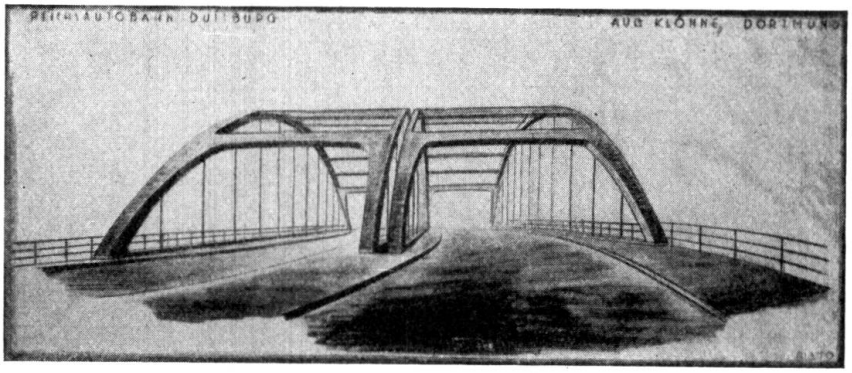

Fig. 10.

with or without a tie bar) as distinguished from girders stiffened by arches in which the girder dominates the design and emphasises the horizontal line. Even a "through" arch bridge (with the arch ribs rising above the roadway) may present a very attractive appearance. Apart from the example already given

of the arch design for the Cologne-Mülheim bridge, the author puts forward for comparison a design for an arched girder and one for a sickle girder,

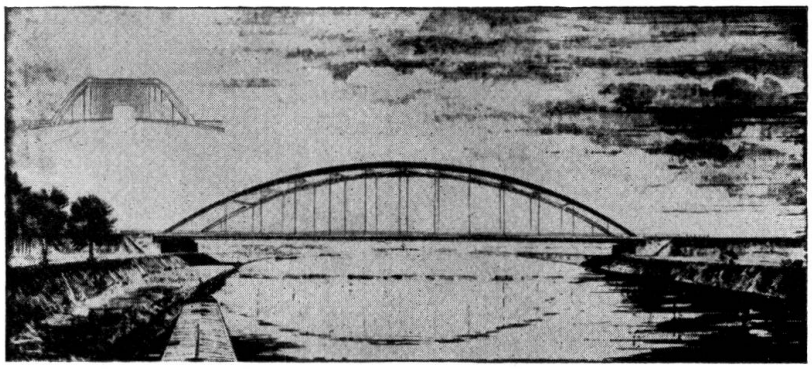

Fig. 11.

appearing in Figs. 11 and 12 respectively, which were worked out for the Rhine-Herne canal bridge.

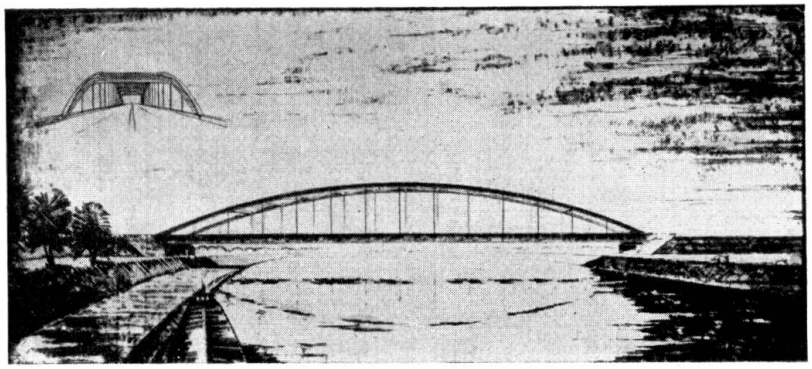

Fig. 12.

It is certain that the principal field of application for the arch bridge, whether of the sickle design or as a fixed arch, will continue to be that of bridging

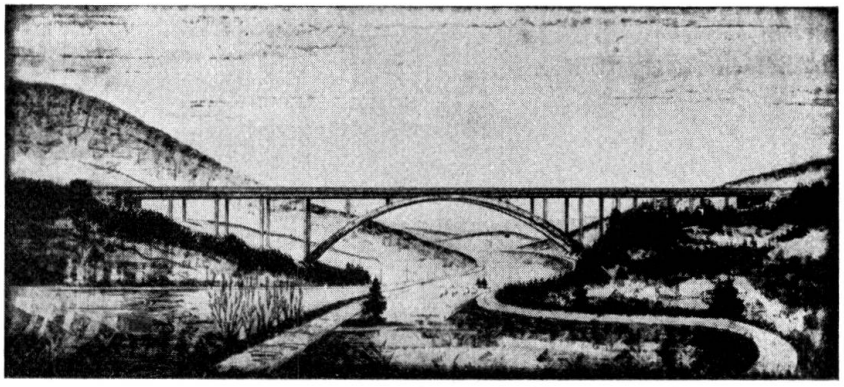

Fig. 13.

wide and deep valleys so that the whole of the arch may be placed below the level of the roadway. Fig. 13 shows a fixed arch for the Helderbachtal bridge,

which serves to illustrate how well this form of construction merges itself into the landscape. The principal dimensions of the design are indicated in Figs. 14 and 15, the former showing a transition from the arch to the girder and the

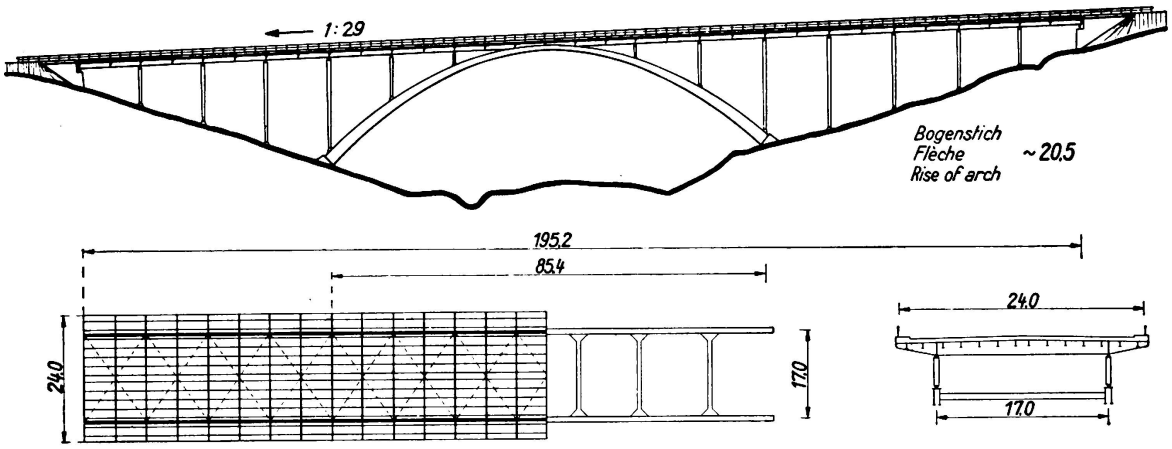

Fig. 14. (Dimensions in metres.)

second showing these two elements separated. The second form is the one which the present author prefers.

He hopes that these brief comments will have served the purpose of demonstrating that bridge designs which have not in fact been carried out are often worthy of notice, and may, indeed, predict future lines of development.

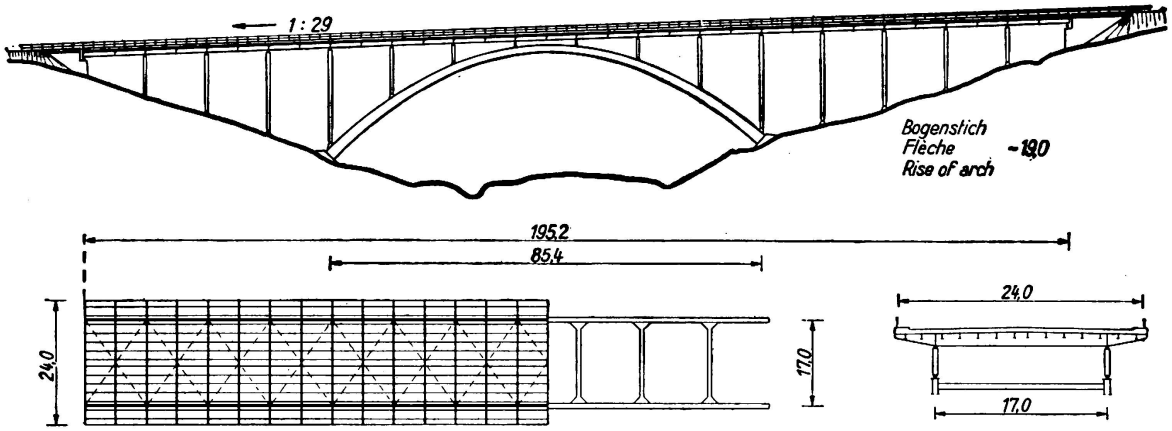

Fig. 15. (Dimensions in metres.)

We ought always to remember that bridges should be built not merely with a view to their structural performance; but, just as in appraising a man we look first for character, so should we expect to find that quality in a bridge. Such bridges cannot be "constructed", they must be "created".

The engineer thereby establishes his mastery, in that he brings the requirements of economy into harmony with those of beauty — a factor which he must never leave out of account.