The several openings of the three viaducts are spanned by a wrought-iron frame bridge, with top and bottom chords, between which a system of diagonal braces in one direction and vertical struts is introduced.

Both the flanges are of this II form, the vertical plates of the flanges having the same dimensions over the whole length of the bridge. The reduction of the area of the flanges from the middle towards the ends is effected by diminishing the number of the horizontal plates.

The diagonal braces are thin tension bars of rectangular section, but in the middle of the spans some of these bars have to resist compressive strains during some positions of the rolling load, and as their thin form renders them unfit for this, in such parts of the girders a cross diagonal bracing is introduced.

The vertical struts are of an I section, while the end verticals above the piers are strengthened by iron cross plates. The solidity of the vertical struts in the main span of the Knielembrug Viaduct, having in the centre of that span a height or depth of about 65 ft. 7 in., has been secured by introducing two series of C bars between the verticals.

The several openings of the three viaducts are separately spanned, a little space being left vacant on each pier between the two successive superstructures. The girders, of 490, 392, and 328 ft. span, have been made with curved top flanges, this form rendering possible an important economy. The smaller depth, necessary for the other girders of the bridges of 262 ft. 5 in. and 187 ft. opening, rendered in their case the rectangular form with a parallel top and bottom flange most economical.

Between the vertical struts the girders are connected at the top side by upper cross girders, and at the under side transverse girders are introduced between them, these carrying the longitudinal girders, whereas the transverse timbers or sleepers are laid that support the rails. The lateral stiffness of the bridges is further increased by two systems of diagonal wind-ties, resting on the horizontal plates of the top and bottom flanges and secured to them.

The transverse and longitudinal girders are of an I section. These girders, and also the wind-ties, are for the greater part constructed of steel plates and angles. The bridges over the piers are supported by hammered cast-steel girders of the form shown in Figs. 5 and 8 of Plate LXXVI. To provide for the changes in length, produced by variations of temperature, these girders are placed at one end of every span upon steel rollers, while at the other end the bottom flanges are riveted to the upper members of the steel girders. In the openings between the rails at the end of each bridge, short hammered steel "compensation rails" are placed close by the rails.

Most of the wrought iron for these three works was manufactured in Belgium, at several ironworks in the neighbourhood of Charleroi. The works at Hверлe supplied all the steel for the three bridges, except a small portion of the steel for the Knielembrug Viaduct, which was made at Sheffield.

The metal was submitted to several experiments before it was accepted for use on the works. In the specifications the principal conditions relating to its resistance were:—"That the wrought iron should resist without yielding a tensile strain of 36 kilogrammes per square millimetre of the transverse section, during not less than fifteen minutes." "That the rolled steel plates and angles should bear without breaking a tensile strain of 60 kilogrammes per square millimetre." "That the iron and steel plates and angle irons, when supported at the ends and loaded till the most affected fibers are undergoing a tension or compression of 14 and 26 kilogrammes per square millimetre, should bear this weight during twenty minutes without showing any alteration in form after its being taken away."

The materials fulfilled these conditions in a very satisfactory way. The plates vary in thickness from $\frac{3}{4}$ to $\frac{5}{8}$ in.; the largest and smallest angle irons are of the ordinary sections. No single piece of iron exceeds a weight of 770 lb. Only the hammered steel forgings are of a much greater weight, the largest pieces being 6710 lb. Without entering into further particulars about the construction, it may be observed that all the holes for riveting were bored or drilled, no punching being allowed on the work.

The whole of the iron and steel work received six coats of good lead oil paint, after having been cleaned in a bath of muriatic acid. Before the bridges were to be opened for the public traffic, every line of rail was to be submitted to the load of a test train, composed of five locomotives with tenders and so many loaded wagons as were necessary to cover the bridges over their whole length. The dimensions of the several parts of superstructure are calculated according to the strains produced by their own weight and by the heavy load of these test trains. In no part of the iron or steel work greater tensile or compressive strains are allowed than of 4.5 and 6.5 tons per square inch of the transverse section respectively.

The Knielembrug Bridge and Viaduct consists of seven land openings each of 187 ft.; one opening of 262 ft. 5 in., and one main span of 492 ft. The seven bridges of 187 ft. are built on the northern shore of the Lek.

The bridge of 262 ft. 5 in. opening spans a part of the bed of the river, separated from the opening of 492 ft. by low dams, which overflow as soon as the water rises above the middle water level. The length of the structure between the fronts of the northern and southern abutments measures 2181 ft. 2 in. The total length of the nine openings is 2063 ft. 6 in. The piers and abutments