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PLATE GIRDER BRIDGES IN RAILWAY CONSTRUCTION

PART I.

PREVALENCE DUE TO ADVANTAGES OVER OTHER DESIGNS —TYPES OF PLATE GIRDER SPANS IN USE—DIMENSIONING AND STRESS CALCULATION—VARIETY OF LOADS

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THE builders of iron and steel bridges for more than sixty years have maintained that steel bridges properly designed, with good material, efficiently maintained, and used according to the intention of their designers, have in every case proved entirely satisfactory and capable of indefinite endurance and that any cases of disaster have been due to some defect in the construction, to derailment, or other accidental occurrences which bring upon certain members unforeseen strains which they were not intended to carry.

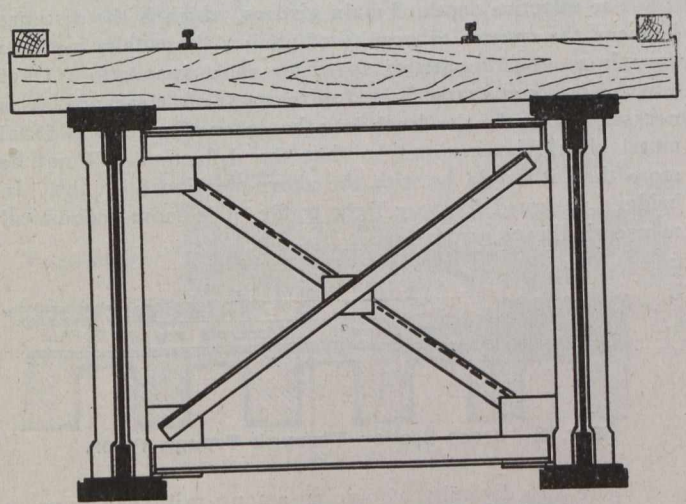

Fig. 1.—Type of Deck Plate Girder.

Of all types of steel railway bridges the plate girder span is the most common, as 75% of the extensive mileage of bridges built, is in the form of plate girder spans, and it is this great commercial demand which has suggested to the writer the importance of this subject.

Canada is still in her infancy in railroad construction, and in the future it will be necessary for a great many of our young engineers to have charge of the design and fabrication of plate girder bridges. Shop methods and erection facilities have so changed that text books do not give the young engineers all the information they require. It is not the object of this series of articles to explain the fundamental theories of plate girders, but to treat the subject from the standpoint of an engineer in actual practice, and to give an intelligible explanation of various snags which are not covered in text books, and which are either omitted in different specifications, or upon which they do not agree.

The advantages of plate girder construction over other forms of bridges are so evident that it is used wherever conditions will permit. One of these advantages is its solidity, by reason of which it is better fitted to resist injury from derailed trains, to prevent corrosion from sulphur gases, and to withstand the severe conditions of exposure which pertain to railway bridges. Another reason for the superiority of this form of bridge is its simplicity and uniformity of construction, there being a minimum likelihood for error in design. Moreover, the drawing-office expense and shop costs are reduced, as it is usually possible to standardize spans. The erection is completed in a shorter time than in the case of any other form of construction. There is usually more weight of material required in plate girder bridges than in lattice or truss spans, but this objection is more than counterbalanced by its cheaper pound price, the greater speed in the completion of the work and the longer durability in actual service.

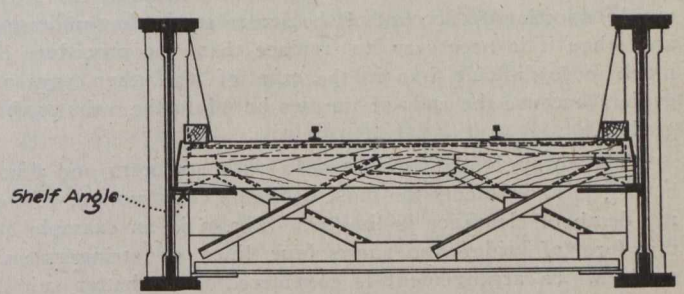

Fig. 2.—Half Deck Plate Girder.

The design of a bridge may be divided into two branches; first, the determination of the type of bridge most suitable and its dimensions, and second, the calculation of stresses and sections of material. After the site of the proposed bridge has been surveyed and the engineer has determined the grade alignment of the track, the allowable depth of clearance line below the base of rail and the most suitable lengths of spans required, the design of the bridge can be attained.