

# **LONG-SPAN RAILWAY BRIDGES AND SHORT- SPAN RAILWAY BRIDGES**

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Long-Span Railway Bridges and Short-Span Railway Bridges by Benjamin Baker

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**BENJAMIN BAKER**

**LONG-SPAN RAILWAY  
BRIDGES AND SHORT-  
SPAN RAILWAY BRIDGES**



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LONG-SPAN RAILWAY BRIDGES

(REVISED EDITION);

AND

SHORT-SPAN RAILWAY BRIDGES.

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*In hoc genere, duo vitia vitanda sunt: unum, ne incognita pro cognitis habeamus, hisque temerè assentiamur. Alterum est vitium, quòdquidam nimis magnum studium multamque operam in res obscuras atque difficiles conferunt, eàdemque non necessariis.—CIC. DE ORV., lib. i., cap. 6.*

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## PREFACE.

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THE portion of the following work treating on Long-span Railway Bridges, was first published some seven years ago, so but little introduction will now be required. As stated in the Preface to the First Edition, on proceeding with the investigation, it was at once seen that a strictly mathematical treatment of the subject would entail lengthy and involved formulæ, and absorb far greater space than was available for the purpose. Accordingly, the various hypotheses, which it is absolutely necessary to make in an inquiry of this nature, are framed as comprehensively as possible; and in many instances the result of a careful balancing of probabilities is given without exhibiting the process by which it has been evolved. In short, elimination, and not elaboration, has been the aim throughout.

The succeeding portion of the work, referring to Short-span Railway Bridges, is now published for the first time. The aim of the Author has been to maintain unity of design, so far as possible, in the treatment of the two branches of his subject, but the altered con-

ditions have to some extent suggested different modes of procedure. Thus, formulæ, numerous and indispensable in the former division of railway bridges, will be conspicuous by their absence in the present division. Nor could they be advantageously introduced, for the data necessary to obtain the constants in any general formula for the weight of iron in Short-span Railway Bridges, will suffice for the immediate compilation of tables of weights, without the intervention of a formula.

The prominent position assumed by formulæ in the investigations referring to the first group of railway bridges, is, in the second, usurped by considerations bearing upon the special action of a rolling load. In a long-span bridge, but little speciality attaches to a rolling load; in a short-span bridge it is the point above all others demanding the most anxious consideration from the engineer. The Author's experience for some years past, as to the effects of heavy rolling loads upon the most severely worked line in the world,—where the bridge girders are bent by passing wheels as many times in a few hours as upon an ordinary line they would be in a year,—has enforced upon him the conclusion, that the destructive action of a frequently recurring rolling load is habitually under-rated; and that, as a consequence, in many instances heavy works for maintenance will have to be incurred in the future.

The ordinary practice of lumping together dead and rolling loads, and adopting an uniform working strain



of 5 tons per square inch, whatever the respective proportions of the said loads may be, is totally indefensible, and implies an unconscious exhibition, on the part of the designer, of timidity in some instances, of temerity in others.

If the following pages contribute at all to the development of a more rational practice in the above respect, and to the adoption of a more uniform standard for the strength and weight of railway bridges than at present obtains, the purpose of the Author will have been achieved.

B. B.

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