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## 8. The Britannia Rail and Road Bridge in North Wales (United Kingdom)

*Owner: British Railways*

*Designer: Husband & Co.*

*Engineers: Husband & Co., & R. J. Coon, Esq., Chief Civil Engineer, London Midland Region, B. R.*

*Contractors: The Cleveland Bridge & Eng. Co. (Main substructure and rail deck) Sept. 1970-June 1974  
The Fairclough-Fairfield-Mabey Consortium (Rail Deck) Oct. 1977-July 1980*

The opening of the Road Deck by H. R. H. The Prince of Wales on July 11th, 1980 marked the completion of a ten year programme to reconstruct Robert Stephenson's famous tubular bridge of 1850 (Fig. 1).

Stephenson's bridge was irreparably damaged by fire in May 1970 (Fig. 2). The spandrel braced arches and plate girder approach spans provided a design solution that enabled the new structure to be constructed below the 120 year old wrought-iron tubes and be subsequently used as a support for the ironwork during its demolition (Fig. 3).

The excess capacity designed into the new steelwork to support the iron tubes equated closely to the weight of the road deck thus providing an extremely economical dual-purpose bridge. The railway was re-opened in 1973 (Fig. 4).

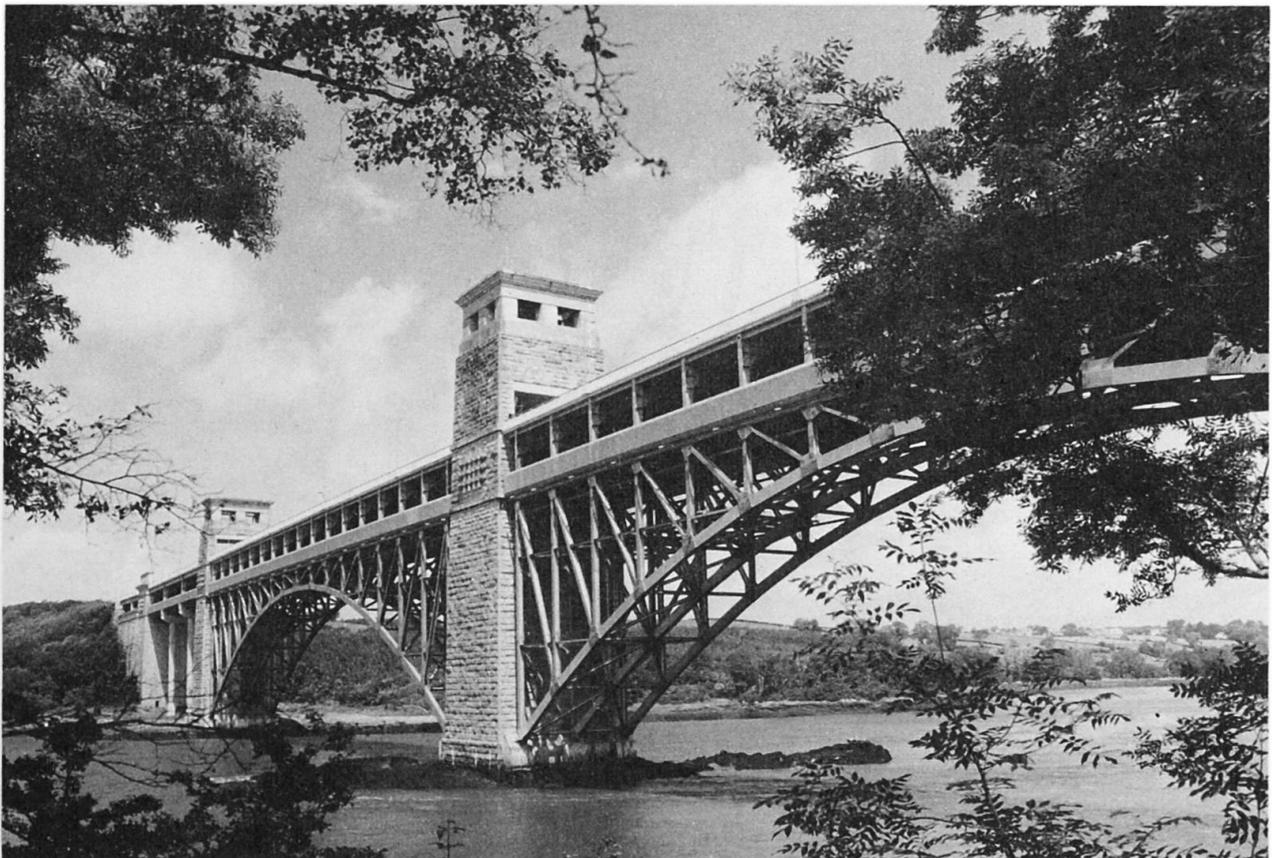


Fig. 1

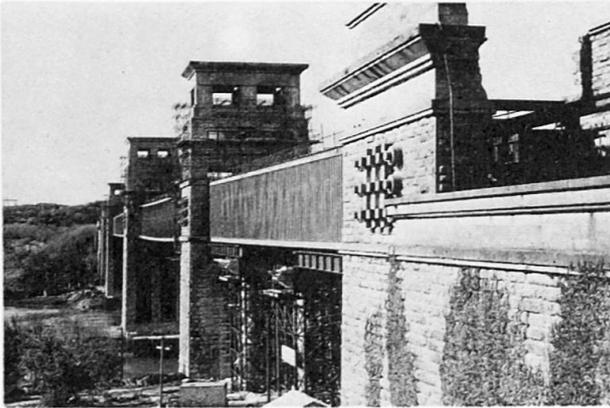


Fig. 2



Fig. 3

The recently completed road-deck contract commenced in late 1977 and included two additional road-approach spans making the road deck 826 m in length between abutments. The rail deck is 456 m in length.

The arrangement of the road deck is of conventional steel portal frame and stringer construction with in situ reinforced concrete deck and parapets above (Figs. 5 and 6). The road surface is hot rolled asphalt. To allow for differential temperature, wind and rail load movements between the main substructure and the road deck a complex system of bearings, semi-fixed connections and expansion joints has been provided.

The majority of the structure is in notch ductile and high yield steel to BS4360 grades 43C and D and 50C. Areas requiring superior low temperature notch ductile qualities to conform with Merrison rules are in grade 50E.

All the steelwork for the road deck was erected either in short railway possessions or between trains as no disruption to railway traffic was allowable. The major-

ity of the 4415 t of steelwork was erected in this manner in a period of 45 weeks.

The in situ concrete deck was cast on permanent soffit forms of steel and glass reinforced polyester-resin panels.

The protection of the steelwork is provided by, initially, a sprayed aluminium coating followed by zinc chromate and two coats of micaceous iron oxide. The whole of the structure is connected by high strength friction-grip bolts utilising load indicating washers to achieve the correct tension.

(R. W. Husband)

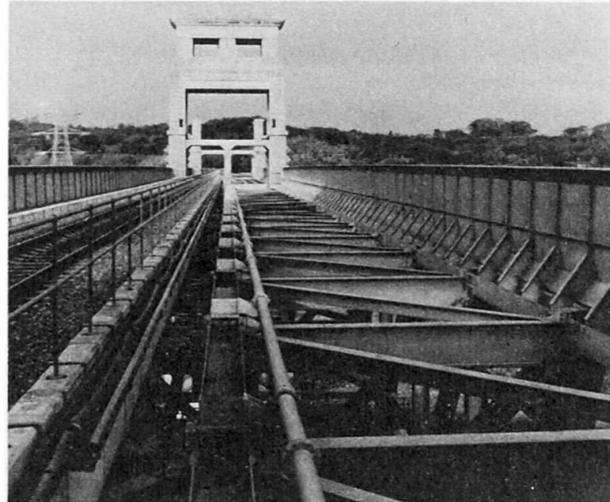


Fig. 4

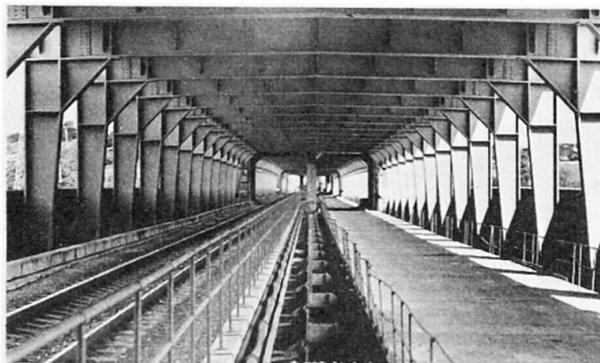


Fig. 5



Fig. 6

(Photographs by courtesy of British Railways & Winter & Kidson)