

# The Norwood Junction Derailment

By H. M. MADGWICK

ON May 1, 1891, there occurred on the London, Brighton & South Coast Railway an alarming incident which, while fortunately not attended by any loss of life or serious injury to passengers, had a wide and far-reaching effect on the policy of construction and maintenance of railway bridges throughout the country. It involved the 8.45 a.m. express from Brighton to London Bridge, which left the rails while travelling at considerable speed over the Portland Road bridge at Norwood Junction. The derailment was caused by the collapse of a girder, allowing part of the bridge to give way under the weight of the train.

Major-General Hutchinson, investigating the accident on behalf of the Board of Trade, reported that the cast-iron girder which failed had been in its place for about 31 years and during the whole of this time had concealed in the interior of the web and in the outer part of the lower flange a very serious flaw, abstracting at least one fourth from the strength of the girder. This flaw was invisible to even careful inspection after the girder was placed in position; nor was it visible when the girder was cast, because of the practice of using sheet iron in the foundry

operations at special parts of the castings, such as gussets. Independent of the flaw, however, the girder did not possess a sufficient theoretical margin of safety for the passage of the engines then in use on the line.

Considerable criticism was levelled at the L.B.S.C.R. in the report for not ensuring the safety of its bridge structures, which at that time were very largely of cast-iron, and General Hutchinson expressed the opinion that all such cast-iron girder work should be replaced by wrought iron. As can be well imagined, there was a considerable stir in the Brighton Company's boardroom when the Inspecting Officer's report was presented, and, as a result, Sir John Fowler, the company's Consulting Engineer, was instructed to examine all the bridges and viaducts on the line. This he did, producing a report as follows in June of the same year:

"Mr. Bannister [the L.B.S.C.R. Engineer] has supplied me with full information respecting the cast iron bridges on the Brighton Railway and its branches. The total number is 171 of very varied size and character. I have personally inspected the Victoria Bridge over the Thames, the Ouse Viaduct, the Shoreham Viaduct and several typical bridges. The Victoria

Bridge is a strong and good bridge in every respect, and will be so for very many years. The timber of the permanent way now requires renewal and this is being done. Being an arch bridge, passing trains cause a movement which may be termed 'vibration' as distinguished from the movement or deflection of an ordinary girder bridge, which has less vibration, although probably more movement. No anxiety whatever need be felt about the Victoria Bridge.

"I walked over the ground of the site of the Ouse Viaduct and examined every pier and arch. I found this fine structure, which is exceptionally strong, in excellent condition. The Shoreham Viaduct consists of thirty six spans of thirty feet each, with cast iron girders resting on timber piers. The time has arrived when this viaduct would require renewal in a few years by substituting iron cylinders for timber piers and wrought iron girders for cast iron. I recommend, however, that this renewal be carried out as soon as arrangements can be made, and whilst the viaduct is in a perfectly safe state. Besides the Shoreham Viaduct, there are about twenty bridges which, in my opinion, should be reconstructed by the substitution of wrought iron, or preferably steel, for cast iron during the next twelve months, or sooner if possible, and about sixty others should then be reconstructed.

"The advice given in this report for the gradual reconstruction of the bridges is based upon considerations affecting the vast majority of railways in the kingdom—namely the great increase in the weight of modern locomotives, and the superior endurance of wrought iron or steel as compared to cast iron when high speeds, heavier engines, and consequently a greater vibratory action have to be provided for. The result of my investigation does not indicate any unusual weakness in the Brighton bridges, which are neither better nor worse in that respect than those on similar lines of railway at home and abroad."

Needless to say, other railways throughout the country took heed of the ensuing rumpus, finding it necessary to issue reassuring statements for the peace of mind of their passengers. Even the mighty London & North Western was moved to issue a statement through Lord Stalbridge, its Chairman, that neither the shareholders nor the public need be perturbed as to the state of the permanent way, for their engineers would see to it that the line was kept, with regard to

bridges and everything else, up to the requirements of the present day.

The Chairman of the North Eastern, Mr. John Dent, pointed out that there need be no alarm as to the condition of the bridges on that system—important bridge works over the Yorkshire rivers such as the Wharfe and the Swale had already received attention. Mr. George Paget, Chairman of the Midland Railway, issued a statement to the effect that there was a large margin of safety in the majority of its bridges. Following the Tay Bridge disaster in 1879, his company had spent, during the past ten years, £1,000 a week on the maintenance and renewal of bridges. He had, however, asked the shareholders to allocate a further £85,000 for the purpose of reconstructing 181 bridges wherein the use of cast-iron was involved. At half-yearly company meetings throughout the country, chairmen spoke of the matter in reassuring vein, and bridge rebuilding and repair was quickly entered into with zeal on many an English railway. On the L.B.S.C.R., the improvements, which had been completed by 1895, are understood to have cost about £100,000.

Apart from the engineering works, as far as the L.B.S.C.R. was concerned the failure of the girder at the Portland Road bridge was found to be an expensive mishap for, while no loss of life was sustained, a considerable number of claims in respect of injury, and so on, were lodged by the influential class of passengers using this business express, and heavy compensation (amounting to about £20,000) was involved. The locomotive was No. 175, *Hayling*, one of Stroudley's celebrated "B1" class, and the train was composed of nine first class coaches, a Pullman car, and two brake vans.

Thus it will be seen that an incident, while in itself by no means of the nature of a major railway disaster, had repercussions which were to make themselves felt far beyond the confines of the company immediately concerned and, as so many railway accidents have done in the past, contributed through the process of trial and error to the high standard of safety and security enjoyed on our railway system today.