THE LINVILLE TRUSS BRIDGE.

PLATE LXII.

The different practice of English and American engineers in working out the detailed designs for parallel girders with brand webs is well illustrated by the bridge in Plate LXII, the type form of construction largely adopted on the Pennsylvania Railroad Company, as a substitute for the perishable wooden trusses originally erected. The skeleton outline of this truss will be familiar to every one conversant with American engineering, but at the same time it will be observed that the structure varies less than usual from the ordinary type adopted on this side of the Atlantic, inasmuch as all the principal members are of wrought iron. We should not be surprised to find cast iron entirely dispensed with in succeeding models, and then the only differences between the English and American types would be those arising from the relative proportions of depths to spans of the several girders.

In the latter respect we must maintain that American bridges, with their deep girders, suggested probably by their timber predecessors, have a great advantage over English lattice bridges, framed upon the model of the original shallow plate girder. It has been shown by Mr. B. Baker, in his excellent treatise on "Long Span Railroad Bridges," that the economic depth of a well-proportioned lattice truss carrying a line of railway, is one-sixth of the span, the proportion adopted in the Linville truss; and that, for a plate girder of similar span, the economic depth would be two-thirds of that amount, or one-ninth of the span. Yet, notwithstanding that this fact is capable of rigid demonstration, it would be difficult to point out any lattice bridge in this country, unless the Chepstow Bridge could be so named, in which the girders have any important increase of depth beyond that given to plate girders of similar span.

Allowing the designers of the Linville truss all credit for the boldness of the proportions adopted, we think, at the same time, there will be little left to speak of with unqualified approval.

Beginning at the top of the truss, we find the boom is of the cellular form, long ago interdicted by English engineers on account of the inaccessibility of the several parts for painting or repairs, provision for which is found by experience to be indispensable in all wrought-iron structures where a reasonable amount of durability is required. Again, the opposing member—the bottom chord—is built up of a number of short links connected together by pins, through each of which the entire strain is transmitted. The detail is so arranged that each pin is subjected to a considerable transverse stress; hence they are necessarily large and heavy. Each end of every link has to be forged and drilled, and the consequent increase in the price per ton over ordinary bridge work should not be lost sight of when comparing weights of material in this and other lattice trusses. The same objection of forging applies to the diagonals, which have one end upset and screwed and the other looped and welded.

The struts, made up of four wrought-iron rolled segments, are of rather a novel section for the purpose to which they are applied in the Linville truss. Similarly formed columns were patented by Mr. Hughes, in this country, some years ago, and have been used by him as the shafts of screw piles, with perfect success, for some bridges in Wales, when the original cast-iron ones had been swept away by floods. Applied as they are in the truss we are criticising, we think the cast-iron ends detract materially from the integrity of what apparently aims at being essentially a wrought-iron structure.

Again, the counter braces—so indispensable in a timber bridge, to prevent injurious rocking under a passing load—are in the iron truss, when no such effect could ensue, merely so much material in the wrong place.

In every railway bridge the platform is a very important element, now that engines with 10 to 15 tons on the driving wheels have to be provided for. Since each cross girder in its turn has to sustain the full load on those wheels, it follows that the distance apart of the girders should not be less than that of the centres of the engine wheels, say about 6 ft., and no lighter section could be used if the girders were spaced at half that interval. In the Linville Truss Bridge the little consideration which has been given to this element is most striking. Apparently, the ends of some primitive timber bearers, or at the best some rolled iron joists, rest on the flat bar ties merely, and of course the consequent increase of strain on those portions must be of very great moment.