difficulty arose from, 1st, the practical impossibility of perfectly combining the action of the arch and the truss (each system, of itself, being insufficient to carry the whole load); and 2d, the absence of counter braces. These defects, clearly apparent in their use on common roads, were greatly aggravated under the increased and concentrated nature of the weight, and the rapid transit of trains on railroads. It is true, they were obviated in part by adding largely to the amount of material in the structures; but, as the difficulty was inherent in the plan, violent contortions in shape could not be prevented, and these in time caused failure.

These remarks are intended to apply to spans of considerable length, as experience has proved that plans of even an inferior grade may be measurably successful in spans of ordinary length; whereas, nothing short of the most judicious distribution of material will insure permanency, in cases where long spans are indispensable, and any arrangement which can be made permanent in the latter case, must certainly prove so in the former.

It is worthy of remark here, that this particular combination of the arch with the truss, is even now with some, a favorite idea, but it is believed that its warmest advocates will be generally found among those whose opportunities for practical investigation have been limited, and that it is only necessary that the question be properly presented to them, to produce a change of views in respect to it.

This partiality for the combination of the arch and the truss is attributable partly to the fact, that the simple truss has in many instances failed, and as a last resort, the arch has been added, of such dimensions and strength, as to be competent to carry the truss and load, the truss serving only as a stiffener to the arch, while the latter, thrusting