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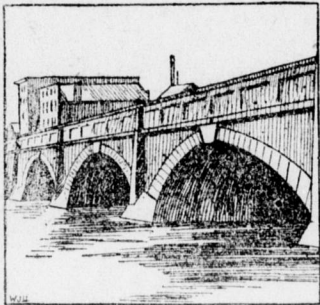
HIGHWAY BRIDGES.

POINTS TO BE CONSIDERED IN THEIR CONSTRUCTION.

Steel-Concrete the Best Material to Use, Says Professor Mason—Bridges Should Be Built For the Future as Well as the Present.

Today, when a community is looked upon as decidedly behind the times and blind to its own interests if it does not have the best roads that it can afford, and when it looks beyond the first cost in deciding this question it should make an effort to have the most prominent features in harmony. It should consider the beauty of its highway bridges as an important adjunct to its "good roads movement," writes Professor Mason, consulting engineer, in Good Roads Magazine.

Most of us have unfortunately come to consider beauty as a luxury, and generally an expensive one. Hence,



STEEL-CONCRETE BRIDGE, PLAINWELL, MICH.

when a beautiful bridge is suggested we take alarm at the cost and are apt to decide offhand that the older type without its good appearance is well enough.

This is a phase of the subject that is very pertinent, whether it should be deplored or not. It is only by reason of this careful consideration of cost that our country is able to compete with European countries in the construction of bridges in foreign dependencies. It has been said that any fool could build a bridge if he had money enough, but it takes an engineer to do it economically.

This matter of cost has compelled us to limit the construction of stone arch bridges to a very small number and to put in their place a metal truss of straight lines and sharp angles. It is not that we have failed to appreciate the beauty of the curved arches, but rather that we could not afford the luxury when we needed so many of them.

Thirty years ago our bridge builders were crying the need of reform as to aesthetic design, but had to offer us in place of sham decorations only the simplicity and harmonious construction of a well built truss suitably painted, and there can be no doubt that great improvement has been made. The sheet iron abominations which covered up the outlines of the truss and which were what Ruskin would have called "constructed decorations" have been abandoned, and the bridge is left to depend for its beauty on the noble lines of strength and the general symmetry of its construction.

As progress has been made in the building of our roads so have we moved forward in the design of our bridges. For many centuries cement and broken stone have been used to replace the expensive cut stone in arch construction, but only recently have we succeeded in surmounting a difficulty long recognized. Concrete is a building material generally accepted when it is to be subjected only to a compressive force. It lacks sufficient strength if any pull or tension is applied. This fact has so limited us in the use of concrete that only in rare instances has it been economical to use it in bridge construction.

A feature that requires careful consideration in the design of any engineering structure is the effect of the changes in temperature upon the material used. The fact that steel and concrete are affected in the same way and to the same extent by heat first suggested their use in combination. This idea has been developed now to such an extent that we are able to use the steel to resist the tension in our structure and the concrete to take care of the compression and to so design the whole that there will be a sufficient amount of each material and yet no expensive waste. We have found the stone arch too expensive and the steel truss lacking in beauty. Combine the two, and the result is the steel-concrete arch having the requisites as to beauty and comparing very favorably as to cost.

When one is considering the construction of a bridge several points should be considered:

First.—That it shall answer the utilitarian purpose for which it is wanted.

Second.—It should be a monument to the progressive ideas of the community and serve as an education and an inspiration to others.

Third.—It should be built for the future as well as the present, and its permanence should be assured.

These can all be met by the use of steel concrete.

One of the difficulties in the design of a steel truss is so to arrange the detail as to afford ready access to all the parts for painting. And with the best this is impossible where two pieces come into contact. This trouble does not exist with the steel-concrete bridge. The steel is not painted and hence can be readily inspected. It is entirely imbedded in concrete, which has been proved to be a perfect protection to the steel. Unpainted steel has been found imbedded in concrete after many years as bright and clean as ever.

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