

(5) COINCIDENCE OF STRUCTURAL EFFICIENCY AND AESTHETIC EXCELLENCE.

The principle that the most pleasing outlines or general form for a structure arise when the maximum economy of material is secured, does not require proof if we admit that Nature performs her work along the lines of least resistance. In fashioning a straw, reed, or stalk, Nature seeks only to obtain the greatest strength and rigidity with a minimum of weight, and by her own mathematics has arrived at the annular cross-section as the most efficient. She is not influenced by the objections of the bridge engineer that circular columns or compression members are difficult to splice and involve troublesome connections, for the element of cost does not enter into her calculations.

A type of structure which well illustrates the principle that economy of material and aesthetic quality go hand-in-hand is the simple truss span with curved top chord, which feature is now almost universally adopted for spans over 200 ft. in length, and sometimes even for much shorter ones. With any length of span, curving the top chord results in a saving of material and a great improvement in appearance. Thus, the attractive little highway span of Fig. 18, which is a standard structure of the American Bridge Co., is aesthetically decidedly superior to the familiar parallel-chord Warren truss spans built by hundreds in Canada. The superiority is to a large extent due to the curvature of the top chord of the former structure. For short spans this results in increased cost, the saving of material being more than offset by the additional expense of manufacture of the trusses, due to changing inclination of the chords. It, however, is never large in comparison with the total cost of the bridge or even of the superstructure, for the reason that only the top chords of the trusses are prejudicially affected, the verticals, diagonals, floor system, and bracing being as simple as for a parallel-chord structure. This small additional expenditure for curved chords is justifiable, and should certainly be made for all such bridges in populous districts.

The application of reinforced concrete to truss construction has made it possible to take advantage of the aesthetic properties of trusses with curved top chords at little expense over that involved for those with parallel chords, since shop costs do not enter into the problem and the form work is practically no more expensive. The bridge constructed by the writer's firm a year ago for the counties of York and Peel on the Middle Road crossing of the Etobicoke River (Fig. 19) is an example of this type.

For bridges over 200 ft. in span experience has shown that a net saving is effected by employing the curved top chord in addition to