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For THE CANADIAN ENGINEER.

RAILWAY ENGINEERING.*

BY CECIL B. SMITH, MA. E., MEM. CAN. SOC. C.E., ASSISTANT PROF. OF CIVIL ENGINEERING IN M GILL UNIVERSITY.

CHAP. V.

ROADBED CONSTRUCTION.

ARTICLE 18. LARGER WATERWAYS WITH HEAVY EMBANKMENTS.

When a single box culvert 4 by 5 feet in cross section or, with very long covers and corbels, possibly 5 by 5 feet, will not carry the maximum flow of a stream, we must either use double or treble box culverts or an arch culvert. The intermediate walls of double box culverts may be made pointed to divide the flow of water, and a screen or paling may be erected some distance up stream to catch driftwood, but, even at best, their use is doubtful for the same reasons as for double lines of culvert pipes, *i.e*, the danger of logs, etc., choking up the entrance, whether an arch culvert of equivalent area will be cheaper than such a structure will depend on the availability of brick, cement or cheaply cut stone for arch sheeting on the one hand, or of large-sized stones for covers on the other.

*This series of papers will be issued in book form as soon as they have appeared in THE CANADIAN ENGINEER.

ARTICLE 19.—ARCH CULVERTS.

The selection of materials for the construction of arch culverts will depend on circumstances; where good weathering stone can be easily quarried and cut in the vicinity it will be usually used, but if stone is scarce or costly, and well-burnt brick plentiful, then brick may be found cheaper; of course brick so soft as to be unable to stand erosion or frost should never be used on exterior faces or for the arch sheeting. The use of concrete for arch culverts is yet a very occasional one in America, but is likely to steadily increase as we have more skilled civil

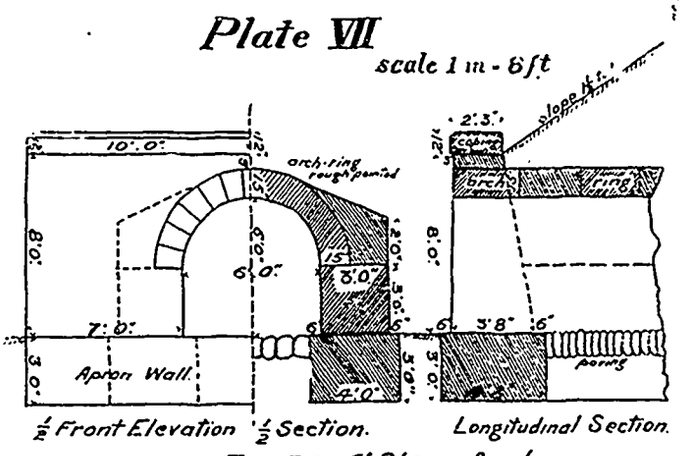

Fig. 33. 6' Stone Arch.

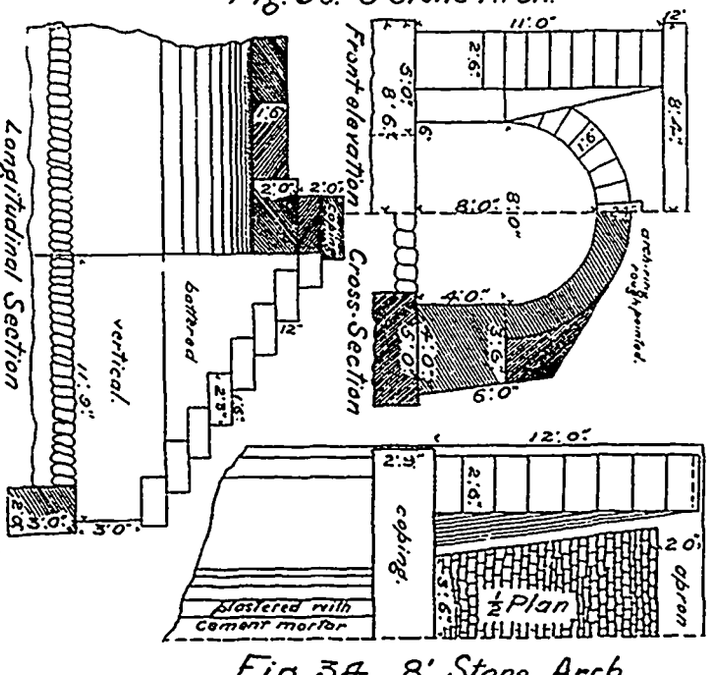

Fig. 34. 8' Stone Arch.

engineers who are familiar with the production of a cheap concrete with superior exterior finish, capable of standing frost and erosion and certain to remain sound for an indefinite number of years, which necessitates using absolutely sound, high-grade cements, and until an engineer has the opportunity of making certain of his cement by systematic testing, he is advised to avoid the use of any but the very smallest monolithic arch culverts, although, of course,