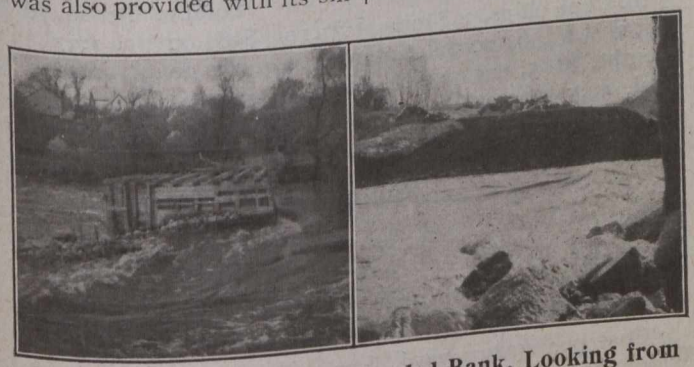
DAM OF "HOME-MADE" DESIGN FAILS IN NOVA SCOTIA

By K. H. Smith, A.M.Can.Soc.C.E.
Resident Engineer, Dominion Water Power Branch, Halifax, N.S.

ON Monday, October 22nd, a freshet occurred in the Annapolis Valley which is said to have been the largest for many years. Higher water has been experienced at certain places along the Annapolis River, due to ice blockades in the spring time, but such high water throughout the whole course of the river due to rainfall entirely was certainly very unusual, particularly at this season of the year. As a general rule, the highest stages of streams in Nova Scotia occur during the month of April and arise from a combination of melting snow and ice and rainfall.

In the present instance, the freshet was due to excessively heavy rains over Friday, Saturday and Sunday preceding the high water of Monday. Detailed information as to the actual amount and duration of the rainfall in various parts of the valley is not yet to hand, although a heavy rainfall was general at that time over most parts of the province. It seems that the crest of the flood was soon passed and the excessively high water was of short duration. However, during this short period, parts of the Dominion Atlantic Railway were washed out, some live stock was lost and several hundred barrels of apples are said to have gone down the river.

Probably the most extensive damage was in connection with a small dam and power development in course of construction for the village of Lawrencetown. This small development is situated on the Annapolis River in the centre of the village. The dam itself was practically completed, the flume built and the wheels installed. The small power-house was not completed nor the electrical machinery installed. As built, it was a rock-filled crib structure about 200 feet in total length, including the flume and power-house which was integral with the dam, and having a maximum height above the stream bed of about 14 feet. A rollway 86 feet long was provided of which 34 feet was 7.5 feet above the stream bed and the remainder 8 feet above the stream bed. A sluice gate was also provided with its sill 4 feet above the stream bed.

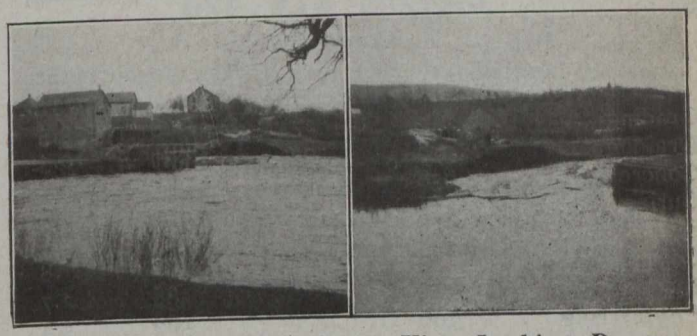


View from Top of Eroded Bank to Flume and Dam

Eroded Bank, Looking from Existing Timber Flume

On the left bank of the stream, the dam abutted against a high bank of reddish sand and clay soil. The large flume in which the wheels were installed was built practically at the foot of this bank while a small section of crib-work and planking connected the top of the flume with the slope of the bank. Behind this part of the dam, a certain amount of excavation had been carried out to provide foundations for the power house. This was to be built immediately adjoining the flume so that the shaft from the pair of horizontal wheels installed would project through the side of the flume and into the lower section of the power house, enabling a belt connection to be made to the generator placed on the main floor of the power-house.

At the period of highest water, the whole structure was submerged at least two feet, so that the water going over that section of the dam just mentioned washed out the bank, probably beginning where it had already been disturbed and continued to cut into the bank until a channel from 60 to 75 feet had been formed which carried almost the entire flow of the river. The bank at the other end seems to have been saved by the mass of willow roots which it contained. The present condition of the dam is



Looking Upstream, Showing Existing Condition of Dam and Break in Bank

View Looking Downstream, Showing Break in Bank

shown in the accompanying illustrations. The greater portion of it remains intact and in good condition, while the stream is flowing in a new channel cut around the end of the dam. In brief, the dam failed due to water going over the top of a bulkhead section caused by the fact that sufficient discharging capacity was not provided by the existing rollway and sluice gate.

Now, the failure in connection with this comparatively small structure would hardly warrant the attention given to it herein, did it not present the opportunity of pointing out the danger of building structures of this kind without competent engineering advice. The whole situation was further complicated by the fact that no adequate surveys had been made to determine the lands likely to be flooded; in fact, no proper computations seem to have been made as to floods likely to occur, the discharging capacity of the dam or backwater from the dam. It is roughly estimated that the maximum discharge at the dam was about 7,000 sec.-ft., and while no gaugings have been made of the river in this immediate vicinity, records available in various parts of the province for the past two years would indicate that such a discharge or considerably larger might be expected from the drainage area involved, about 415 square miles

The party who designed and built the structure appears to have been a good workman so far as his knowledge went, and it seems reasonable to suppose that if he had built a structure properly designed to pass the floods which might reasonably have been expected from information readily available, no trouble would have occurred.

It is unfortunate that the necessity for competent engineering advice in matters of this kind is not yet fully recognized in certain localities and that conditions are such that a structure such as described above can be built in the heart of a village on one of the largest rivers of the province without engineering supervision. It is hoped that such conditions will soon be remedied. In this case the failure is to be attributed not to bad engineering practice but to a lack of engineering practice at all.