

cations of the youth of a stream. As the latter begins to carve its way it meets with different degrees of resistance in the rock material over which it flows, and the more resisting beds, less rapidly removed than others, naturally play the part of dams, holding the waters back only to descend at a much steeper angle when the barrier is overcome. Such rocks as granite, trap, freestone, slate and limestone are quite unlike in their hardness and resisting power, and where there is a passage from the one to the other, and especially from slate to granite, or from limestone or slate to trap, falls are very apt to result. Thus at the Grand Falls of the St. John bands or "dykes" of black volcanic rock are seen at many points traversing the much lighter and softer calcareous slates, and have had much to do in determining the features if not the existence of the gorge and cataract; and similar conditions are repeated at the falls of the Aroostook, near Aroostook Junction, while the so-called Meductic Falls on the St. John, now artificially reduced to a rapid, the falls of the Miramichi and those known as the Pabineau falls on the Nepisiquit, and the Rough Waters near Bathurst, are the result of the existence at these points of hard granitic bands. In Nova Scotia a good illustration of a similar relation is to be seen in the falls of Bear River, three miles above the village of that name. But other factors may contribute to the result. Some rocks, like granite, are "massive"; others, like conglomerates, sandstones, slates and limestones, are stratified, *i. e.*, arranged in layers or beds. These latter, moreover, may have their strata either horizontal, inclined or folded, often in a most complex way. Finally, all rocks, whether stratified or not, are marked by the occurrence of divisional planes, known as "joints" and "cleavage planes," which, by affording access for the eroding waters, hasten the process of removal as well as determine in large measure the character of the result.

Perhaps the simplest type of fall is that occurring in unaltered horizontal beds. Good illustrations are furnished in the falls of the Nashwaaksis and in Skoodewapkoosis, near Fredericton, both in nearly flat beds of the coal formation. In the Grand Falls of the St. John, on the other hand, and in the tidal falls at the mouth of the same river, the highly tilted, and in the former case greatly contorted character of the rocks, are conspicuous features, readily noticed by all visitors. The influence of joint planes is best seen in connection with granite rocks, as witness the Pabineau Falls on the Nepisiquit and

the Pokiok Falls in York county. In the former instance the rock is divided by two sets of joints into rectangular blocks, suggesting Cyclopean masonry, and from the edges of these one may look vertically downward into the deep channels to see perhaps three or four large salmon resting quietly, but beyond the reach of any but the privileged sportsmen. In the case of the Pokiok a similar structure has led to the production of a deep gorge, of which the

sides, though arranged in zigzag fashion, are still accurately parallel. This parallelism led our first geologist, Dr. Gesner, to suppose that the two sides of the chasm had been violently rent asunder, but in this, and all similar cases, the continuity of the rock across the bottom of the gorge and the fact that the



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sides show no downward convergence, as they would were the chasm due to an earthquake rent, show clearly that the result is due solely to the wearing action of water guided by the natural fissure planes in the rocks.

The effects produced by the varying nature and attitude of the rocks is well shown in the case of the Gordon Falls on the Pollet River in Albert county; just above the falls, named after a former governor of the province, the rocks are slates in a nearly vertical position, and here the stream occupies a deep gash so narrow as to be easily spanned by a highway bridge, while at and below the falls proper the rock is a coarse conglomerate, the wear of which, made more easy by the grinding action of loosened pebbles, at once leads to a considerable widening as also to another result characteristic of many waterfalls, the formation of "pot holes." These are quite conspicuous at the Gordon Falls, and may be seen in the accompanying cut, but are even more striking at the Pabineau Falls of the Nepisiquit and in the gorge of the Grand Falls of the St. John. Here every stage of their production may be witnessed from slight circular depressions containing one or more pebbles, the movement of which by the whirling