## TIDAL PHENOMENA OF THE ST. JOHN RIVER. 67

only, for there is none such anywhere ; nor can we limit the word tide to cases in which forced vibrations and free vibrations are mixed, for it is probable that in the Bay of Fundy itself we have mostly, if not altogether, a free motion of the water, started no doubt by the forcible motions imparted to adjacent parts of the Atlantic. Tides are in fact those forced motions or free motions which may be traced back ultimately to the attractions of sun and moon. And in this sense it is evident that the rise and fall in a river is a true tide. Thus the tides in the River St. John are a mixture of a "backing-up" and a flow of salt water upwards, but this flow of salt water never extends to anything like the distance at which the "backing up" is perceptible. Along with these motions we have complications produced by wind effects and barometric effects. I am aware that some points in this account may be disputed, but I shall attempt to justify the statements in the course of what follows.

d

0

## III. THE RIVER ST. JOHN.

It will be necessary to state briefly a few of the physical features of the river which seem of most importance in the pre-We shall only be concerned with the last sent connection. ninety miles of its length. Just above Springhill (ninety miles from mouth) rapids occur. From Springhill to the mouth of the Belleisle, the general course of the river is between east and south-east, and the river is comparatively shallow and sluggish. Below this comes the Long Reach, a straight clear part of the river, the general direction of which is south-west. This ends at Westfield and the river again takes a southerly direction, enlarging greatly to form Grand Bay and receiving on the east the waters of the Kennebecasis, a large, wide tributary. Below Grand Bay, the river greatly contracts at the Narrows, expands again at Indiantown, then contracts again and meets with short "rapids" and then rushes through a short and very narrow gorge (only one hundred yards wide) into St. John harbour. The term "Falls," often applied to this outlet, more properly belongs to rapids above the outlet. The occurrence of islands is of impor-