

from below ascends and freezes. When a subsequent rise in temperature causes an expansion of the superficial crust, the ice once more presses against the shores. When these are steep the ice yields and either breaks up along its margin or assumes an undulating surface over the lake; but where they are sloping it is pushed up the slope, carrying with it earth and boulders. Similar results are repeated during subsequent rises and falls of temperature, the débris being driven further up the shore, until it sometimes accumulates in a mound or wall along the outer edge of the broken ice. When the ice melts this embankment of displaced material is left as a memorial of the severity of the climate. Such "shore-walls" are of common occurrence on the margins of many lakes in Canada and the United States.²¹⁵ Under certain conditions, also, what is called "anchor-ice" forms on the bottoms of the rivers and rises to the surface.²¹⁶ In several ways, geological changes are thus effected. Mud, gravel, and boulders incased in the anchor-ice or pushed along by it on the bottom, are moved from their position. This ice, formed in considerable quantity in the rapids of the Canadian rivers, is carried down stream and accumulates against the bars and banks, or is pushed over upon the surface of the upper ice. By its accumulation a temporary barrier is formed, the bursting of which causes destructive floods. When the ice breaks up in early summer, cakes of it which have been formed along shore, and have inclosed beach-pebbles and boulders,

²¹⁵ C. A. White, *Amer. Naturalist*, ii. 1868, p. 148; G. K. Gilbert, 5th Ann. Rep. U. S. Geol. Survey, 1885, p. 109.

²¹⁶ These conditions, according to Dr. Rae (*Nature*, xxi. p. 538), are: 1st, a rocky or stony bottom; 2d, shallow water as compared with that higher up the stream; 3d, a swifter current and rougher water, in comparison with a smooth and slower motion immediately above. It is a loose, slushy, adhesive kind of ice. See also *Nature*, xxi. p. 612; xxii. 31, 54.