

compound mass may cause it to sink, it may still be very buoyant, and easily borne along by a feeble current. The ice, moreover, melts very slowly at the bottom of running streams in winter, as the water there is often nearly at the freezing point, as will be seen from what will be said in the sequel of ground-ice.

As we traverse Europe in the latitudes of Great Britain, we find the winters more severe, and the rivers more regularly frozen over. M. Lariviere relates that, being at Memel on the Baltic in 1821, when the ice of the river Niemen broke up, he saw a mass of ice thirty feet long which had descended the stream, and had been thrown ashore. In the middle of it was a triangular piece of granite, about a yard in diameter, resembling in composition the red granite of Finland.\*

When rivers in the northern hemisphere flow from south to north, the ice first breaks up in the higher part of their course, and the flooded waters, bearing along large icy fragments, often arrive at parts of the stream which are still firmly frozen over. Great inundations are thus frequently occasioned by the obstructions thrown in the way of the descending waters, as was before noticed when I spoke of the Mackenzie in North America, and the Irtysh, Obi, Yenesei, Lena, and other rivers of Siberia. (See p. 81.) A partial stoppage of this kind lately occurred (Jan. 31. 1840) in the Vistula, about a mile and a half above the city of Dantzic, where the river, choked up by packed ice, was made to take a new course over its right bank, so that it hollowed out in a few days a deep and broad channel, many leagues in length through a tract of sand-hills which were from 40 to 60 feet high.

In Canada, where the winter's cold is intense, in a latitude corresponding to that of central France, several tributaries of the St. Lawrence begin to thaw in their upper course, while they remain frozen over lower down, and thus large slabs of ice are set free and thrown upon the unbroken sheet of ice below. Then begins what is called the packing of the drifted fragments; that is to say, one slab is made to slide over another, until a vast pile is built up, and the whole being frozen together, is urged onwards by the force of the dammed up waters and drift-ice. Thus propelled, it not only forces along boulders, but breaks off from cliffs, which border the rivers, huge pieces of projecting rock. By this means several buttresses of solid masonry, which, up to the year 1836, supported a wooden bridge on the St. Maurice, which falls into the St. Lawrence, near the town of Trois Rivières, lat.  $46^{\circ} 20'$ , were thrown down, and conveyed by the ice into the main river; and instances have occurred at Montreal of wharfs and stone-buildings, from 30 to 50 feet square, having been removed in a similar manner. We learn from Captain Bayfield that anchors laid down within high-water mark, to secure vessels hauled on shore for the winter, must be cut out of the ice on the approach of spring, or they would be carried away. In 1834, the Gulnare's bower-anchor, weighing half a ton, was transported some yards by

\* Consid. sur les Blocs Errat. 1829.