considerably colder than now during the period under consideration, owing probably to the greater area and height of arctic lands, and to the quantity of icebergs which such a geographical state of things would generate, it may be well to reflect before we proceed farther on the entire modification which extreme cold would produce in the operation of those causes spoken of in the sixth chapter as most active in the formation of alluvium. A large part of the materials derived from the detritus of rocks, which in warm climates would go to form deltas, or would be regularly stratified by marine currents, would, under arctic influences, assume a superficial and alluvial character. Instead of mud being carried farther from a coast than sand, and sand farther out than pebbles,—instead of dense stratified masses being heaped up in limited areas, along the borders of continents,—nearly the whole materials, whether coarse or fine, would be conveyed by ice to equal distances, and huge fragments, which water alone could never move, would be borne for hundreds of miles without having their edges worn or fractured; and the earthy and stony masses, when melted out of the frozen rafts, would be scattered at random over the submarine bottom, whether on mountain tops or in low plains, with scarcely any relation to the inequalities of the ground, settling on the crests or ridges of hills in tranquil water as readily as in valleys and ravines. Occasionally, in those deep and uninhabited parts of the ocean, never reached by any but the finest sediment in a normal state of things, the bottom would become densely overspread by gravel, mud, and boulders.

In the Western Hemisphere, both in Canada and as far south as the 40th and even 38th parallel of latitude in the United States, we meet with a repetition of all the peculiarities which distinguish the European boulder formation. Fragments of rock have travelled for great distances from north to south; the surface of the subjacent rock is smoothed, striated, and fluted; unstratified mud or *till* containing boulders is associated with strata of loam, sand, and clay, usually devoid of fossils. Where shells are present, they are of species still living in northern seas, and half of them identical with those already enumerated as belonging to European drift 10 degrees of latitude farther north. The fauna also of the glacial epoch in North America is less rich in species than that now inhabiting the adjacent sea, whether in the Gulf of St. Lawrence, or off the shores of Maine, or in the Bay of Massachusetts. At the southern extremity of its course, moreover, it presents an analogy with the drift of the south of Ireland, by blending with a more southern fauna, as for example at Brooklyn near New York, in lat. 41° N., where, according to MM. Redfield and Desor, *Venus mercenaria* and other southern species of shells begin to occur as fossils in the drift.

The extension on the American continent of the range of erratics during the Pleistocene period to lower latitudes than they reached in Europe, agrees well with the present southward deflection of the isothermal lines, or rather the lines of equal winter temperature. It seems that formerly, as now, a more extreme climate and a more abundant supply of floating ice prevailed on the western side of the Atlantic