

melting ice-sheet and sometimes flowed along channels among the ice-masses or in its opened chasms. They were formed also by the gushing streams from the end of glaciers while the ice was rapidly disappearing, and sometimes beneath the ice. They often accompany moraines as an attendant effect. Stone refers those of Maine chiefly to superglacial streams; and J. B. Woodworth, those of southern New England mainly to subglacial waters, the ice giving them their limits. Deposition seems to have sometimes taken place in Maine over frozen soil and lakes, so that when the ice of the lake melted (as in the case of the Rangely Lakes) the kame over it dropped to the bottom. Some of the so-called kames are ordinary fluvial deposits. Kames were so named in Scotland. The *Eskers* of Ireland and *Osars* of Sweden are of like nature.

The till along seacoasts sometimes contains marine shells that had been gathered and transported by the glacier. Examples occur in the vicinity of Boston Harbor, especially to the southeast of it, and have been described by Upham (1888), and by W. O. Crosby and Miss Ballard, who enumerate 55 species collected chiefly from drumlins (1894). Similar localities, described by R. Chalmers (1893), exist on the coast of the Bay of Fundy.

The till over Ohio has a mean depth, according to measurements in borings made over 53 counties, collated by Orton, exceeding 93 feet, and four borings in Butler County, in the southeast corner of the state, gave 116 feet for the mean depth. The deeper places were along valleys. Excluding valley deposits, the depth is probably nearer 56 feet, as measured by Claypole. In Indiana and Illinois, the mean depth, according to Claypole, is 62 feet; for Central Minnesota, according to Upham, between 100 and 200 feet. Near Darrrtown, Butler County, Ohio, there are cedar logs in the till, which, Wright says, point to short times of advance and recession of the ice-front.

The *Erie clays*, so named by Logan because forming extensive deposits along Lake Erie, are one of the results of deposition. According to an analysis by T. G. Wormley, the clay contains 3.40 per cent of alkalies, which indicates a mixture of clay with over 20 per cent of ground feldspar. They overlie the till, are unstratified for the most part, and often contain small scattered striated boulders. The deposit was probably made by subglacial streams after their escape from the ice, and by discharged waters during the general melting. Over the Erie clays, near Cleveland, Ohio, there is a stratum of sand, gravel, and clay, and between the two occurs a bed of vegetable debris, one to two feet thick, which Newberry called a forest-bed. It contains portions of tree trunks of Conifers and other vegetable materials. It may belong to the Champlain period.

In the Rocky Mountain region of British America and over the Interior Plateau to the west, as G. M. Dawson states, the later till is covered by a deposit called by him the "White silts," a well-stratified formation which is, at times, in terraces 100' to 200' high. Sometimes it passes gradually into sand-beds. It is supposed by him to have been formed in the valleys of those high regions before the ice had fully disappeared from them.

The obstruction of river valleys at points by the discharged till was of common occurrence during the Final Retreat. A noted case is that of Niagara River, where the river channel, then shallow, was thus filled and the stream forced to begin again the work of excavation.