

along the front. But in some large submerged valleys, like that of the Connecticut, in which the bottom ice had a movement of flow in the direction of the valley, there were sometimes obstructing conditions which produced a forced deposition of bowlders and till, and thus made an accumulation somewhat moraine-like, which might be called an *obstruction moraine*.

A good example exists along the *west* side of the south end of the Connecticut valley, in the vicinity of New Haven. This declivity is rather abrupt, and has a nearly north-and-south direction, while the course of the valley ice-stream, as described on page 956, was S. 15° W. The ice-stream, in meeting the obstructing ridge or declivity, dropped along it a large amount of till and many great bowlders of trap and sandstone. The top of the ridge, five miles from the Sound, is about 300' above the lower land to the east, and 400' above the sea level. One great bowlder of 1200 tons, and several others of large size near by, were a little too low in the ice to pass the top of the ridge, and consequently became stranded against its slopes, or combed out by its summit ledges. Half a mile north is another trap bowlder of 500 tons, and several exceeding 100 tons lie to the south. A mile and a half to the *east*, but separated by an open valley 300' deep, stands the West Rock trap ridge, of equal height; and on this ridge, and almost in an east and west line with the 1200-ton bowlder just mentioned, at a like height, there is a 1000-ton bowlder, which was similarly stranded. For a distance of 10 miles from Long Island Sound the great bowlders are common, and the till against the slopes has unusual thickness. The upper part of the glacier above the level of the ridges kept on its southeastward course (S. 30°-40° E.), carrying bowlders of gneiss from the northwest. But some, if not all, of these gneiss bowlders, while on their way over the valley, dropped down so as to come within the lower or valley ice-movement; and they are now, as a consequence, part of the obstruction moraine along the *eastern* base of the West Rock Ridge, and other north-and-south trap ridges of the valley.

Among the formations produced by the melting, besides moraines and deposits of till, clay, and other ordinary materials, there were glacial accumulations of loose materials called *drumlins*, and *eskers* or *kames*, — formations that were much less common in connection with the early partial retreat than with the final. *Kettle-holes*, also, were a feature of many moraines, from the Coteau des Prairies to Cape Cod.

*Kettle-holes* are bowl-shaped depressions, usually 30 to 50 feet deep and 100 to 500 feet in larger diameter. Each depression, according to the accepted explanation, was the resting-place, and often the burial-place, of a huge mass of ice that became detached during the melting; and the final melting away of the ice left a hole where the ice lay. The great Wisconsin moraine about Green Bay is called by Chamberlin the "Kettle Range," from the great numbers of its kettle-holes. Near Wood's Hole, in southeastern Massachusetts, opposite Martha's Vineyard, 1000 kettle-holes occur, according to B. F. Koons, in a distance of about 12 miles. Kettle-holes occur sparingly over Long Island; but it is possible, since there is clay beneath the drift, that the weight of the overlying drift, with the addition of the resting glacier in some cases, forced aside the clay, flexing its layers in the process, and thus made the bowl-like depressions.

*Drumlins* are hills or ridges of till, 30 to 200 feet high, made ordinarily by deposition from the glacier, or in the course of its dissolution; and