

southwest line at Piermont, through which cut a small stream now drains the marshes back of the Palisades into the Hudson. The morainal deposits stand above this swamp in the form of two northeast and southwest ridges of mounded drift rising from 100 to over 120 feet above the sea level. They are both cut off by a small stream on the west of Tappan village.

The northern of the two ridges is nearly straight in its course, its southern slope being more uniform in direction and steeper than its northern.

The southern ridge trends southwestward from near Sparkill railroad station for 1 mile when it turns abruptly northwestward into the village of Tappan, having thus a convex southward curvature as seen from the north though its southern front is decidedly angular.

Both of the ridges are composed largely of red gravelly drift. An excavation just south of the Sparkill railroad station showed gravels and sands with occasional small boulders, the upper part of which deposit is without stratification. The surface of both ridges is comparatively free from kettles but carries many boulders, now particularly noticeable about the houses.

A nearly smooth water-laid drift plain lying between 60 and 80 feet above sea level separates the ridges, and drains to the westward; but more significant is a small frontal apron of washed gravel and sand which extends beneath the swamp at the southwestern end of the outer or southern ridge, sloping from about 60 feet at the edge of the moraine to 40 feet where it disappears southward beneath the recent swamp accumulation, fixing the upper limit of the water body or lake into which it was built as lower than 40 feet at the time of this stage, but giving no closer index of sea level.

The position of these frontal moraines, just north of the Piermont gap, plainly indicates that at this time the gap was free from ice, presumably allowing the escape of the drainage as now into the Hudson gorge; nor does the Hudson river appear to have flowed through this gap since the ice last disappeared from its valley. Just east of the Sparkill station glacial striae on the trap rock read $n. 24^{\circ} w.$ a direction about at right angles to the moraine showing that, though the striae may have been made