entirely of firm, tough, clayey till with an abundant admixture of stones and boulders. Between Factoryville and Ackermanville, where the moraine lies in the valley of Waltz Creek, there is considerable sand and gravel, but further north it is again almost entirely of till, closely set with stones of all sizes up to boulders, occasionally twenty feet in diameter. A considerable proportion of the boulders are striated and a very large proportion are distinctly glaciated and worn. Probably 55-60 per cent of them are from the Shawangunk formation. Slates, sandstones, shales, greywacke and limestones are more or less abundant and of various kinds. The Martinsburg formation has contributed quite largely, and some large boulders of Caudill Gallt grits were identified by the fossils. The bulk of the sandstones, shales and greywacke probably come from the Shawangunk, Hamilton and overlying formations and were transported across the Kittatinny Mountain. Limestones from the Lower Heldersberg and from the Onondaga rocks north of the mountain also occur, and a few Oriskany sandstones were noted. A few small specimens of an igneous rock closely resembling the New Jersey Beemerville Plutolite Syenite were found. As would be supposed from the scarcity of limestone boulders in the moraine, the till is not strongly calcareous, and rarely could any calcareous content be detected even far below the depth to which oxidation and weathering had penetrated. Locally the till of the moraine is highly calcareous. This coloration resulting from oxidation has in general penetrated only four to six feet; below this depth and not uncommonly at a less depth, the till is buff or light gray in color and fresh in appearance. The boulders upon the surface are in general fresh in appearance and not deeply weathered. The weathered zone varies in thickness from 1/32 of an inch to an inch or in rare cases more, according to the character of the rock. Some of the small limestone boulders were merely honeycomb masses of chert or flint, the limestone proper having been dissolved. In spite, however, of a few cases of great disintegration, such as these, the general aspect both of the till and of the boulders on the surface, is of youth and freshness. Some of the boulders and cobbles are more deeply weathered on one face than on the others, or the weathering may be uniform in depth on all sides but one, where it is much less. In many respects these have the appearance of cobbles deeply weathered in pre-morainic time and freshened by later glaciation. These freshened cores were more abundant among the Shawangunk boulders than any others.

The Till. With the exception of the low ground along a few of the larger streams, the area north of the moraine is quite generally covered by a sheet of till of varying thickness.

In its larger features the topography of the slate belt north of the moraine is not unlike that of the extra-morainic shale hills. The till sheet is not thick enough to greatly change the topography. This statement is less applicable to the northwestern side of the valley than to the southeastern, but in both regions it is in general true. On the other hand the peculiar undulatory shale-knoll topography so marked in Sussex County, New Jersey, is not in general developed here. In general the till is so evenly distributed as to cover the rock, even though locally the covering is very thin. On some of the steepest slopes of the hills near the Delaware and its tributaries, the soil is chiefly residuary, but these areas are small and unimportant. The till by no means forms a sheet of equal thickness. In many cases it varies greatly within comparatively short distances, particularly on the hillsides. The chief effect, therefore, of the till in changing the topography is in changing the steepness of the slopes—usually in the direction of a more gentle gradient. In many cases the preglaflacial valleys have been partially filled—never completely save toward their heads where they were very shallow. The amount of vertical relief is not, therefore, on the whole quite so great as in preglaflacial times and as in the corresponding extra-morainic regions, although the general features of the topography are not markedly changed.

The thickness. The greatest known thickness is sixty to seventy feet, where it is exposed over an abandoned quarry west of Slateford. This thickness of drift is not all till, as layers of sand and gravel of considerable