

masses of specular and magnetic oxide of iron. As we shall devote a special chapter to the character of these masses and their relations to the associated rocks, a more minute description is here deemed unnecessary. We would merely observe that in this region the iron masses are invariably found in this association—never occurring in the granite.

These alternations of trappean and schistose rocks continue, to near the southern boundary of township 47, and are characterized in many places by the ores above described.

SECTION FROM LAKE SUPERIOR TO LAKE MICHIGAN.

The coast near the head of Keweenaw Bay (L'Anse) affords an admirable section of the slates and the overlying sandstone. (Vide Plate XXI., Figure 1.)*

The following is the descending order of succession :

- 1 and 2. Fissile sandstone—the equivalent of the Potsdam—dipping slightly to the west-north-west, of a reddish color, and coarse-grained, passing into a conglomerate composed of pebbles of milk-white quartz, and occasionally trappean pebbles—13 feet, resting *unconformably* on the azoic rocks, consisting of
3. Chlorite slate and novaculite, or silicious slate, variously colored, and much contorted—in places folded over
4. A dark hornblende and feldspar rock evidently trappean in its origin. Formations 3, and 4, are traversed by veins of quartz which in no case penetrate the overlying sandstone. The slates are also occasionally intersected by dykes of trap. (5)

This section is exceedingly instructive, inasmuch as it enables us to draw a line of demarcation between two formations different in age and external characters. While the newer formation—the Potsdam sandstone—is but slightly if at all disturbed and little changed by metamorphism, the older, or azoic slates, are contorted and folded into numerous arches, and in several places, invaded by igneous rocks. Their structure has been changed from granular to sub-crystalline, and the whole mass is intersected by numerous planes of lamination.

These slates are displayed for three miles along the south-eastern coast of Keweenaw Bay, and, within that distance, exhibit several distinct convolutions, alternately convex and concave. This structure is probably characteristic of the whole of the azoic series, but it is nowhere so beautifully shown as along this coast, for the reason that it is impossible to meet with equally extended sections inland. Even where, at the surface, the strata are apparently vertical, if we could trace them downward, they would probably be found to form parts of flexures more or less abrupt. The upper portions of these flexures are, for the most part, imperfectly traced, for the reason that they have been removed by denudation.

The section displays in a very remarkable degree those planes designated as planes of lamination, represented by the highly inclined lines. (Plate XXI., Figure 1-6.) However great the foldings of the strata, which may

* The geology and topography on a southerly line between Lake Superior and Lake Michigan is illustrated on the General Section. It is but justice to add that in the exploration of this region, as well as in the preparation of the section, we were assisted by Mr. S. W. HILL.