

believed to be Carbonic. Lithologically, it is very similar to the Lower Cache Creek series, described by Dawson.\* His description of such rocks on the Thompson river is perfectly applicable to the Mount Roberts formation at Rossland. He recognized the shallow water or continental character of the sediments in southern British Columbia. He says:—

"In the southern part of British Columbia the Cache Creek group shows some evidence of littoral conditions toward the west slope of the Gold ranges, probably indicating the existence of land areas there."

Umpleby† also describes a similar series in Washington and assigns it provisionally to the Carboniferous. This late Palaeozoic series apparently covers a large area in southern British Columbia and Washington, but how extensive the original area of deposition was is unknown. The present outcrop of strata referable to this period forms a broad north-and-south belt extending north of the Thompson river and south of Republic, Washington. Eastward it thins out against the Archean of the Selkirk, and westward it disappears under the Columbia lava plains.

#### TRIASSIC.

The rocks referred to the Triassic are volcanic fragmentals, with associated flows and intrusive masses of augite porphyrite with accompanying dykes. No fossils occur in the elastic rocks and the correlation is purely lithological.

#### *The Clastics.*

It is believed that in the highly inclined beds forming the slopes of Mount Roberts the beds rise in the time-scale going westward. The lower slopes consist of the slates with interbedded tuffs assigned to the Mount Roberts formation. Higher up the mountain, and presumably younger in age, the volcanic fragmentals become the dominant rocks and finally entirely replace the slates of the typical Mount Roberts formation. These latter beds are placed as Triassic. They are made up of fragments of volcanic material of all sizes; some of the beds are agglomeratic, but most of the series consist of finer material, in some places so fine that the rock is very dense with a conchoidal fracture. The material is usually rather perfectly sorted, producing a well-marked banding often with very thin laminae. The colour varies from light to dark grey. The beds are nearly vertical at times, but ordinarily the dip is steep to the west. So far as can be seen, the upper beds are absolutely conformable on the lower Mount Roberts beds up to a point about 100 feet below the summit of Mount Roberts. The effusive rocks capping the peak are horizontal, and for this reason have been assigned to a later period. Associated with the elastic beds are thin dykes and possibly interbedded flows of rocks with about the composition of andesites.

#### *Augite Porphyrite.*

The parent rock of these small intrusives and flows forms one of the important rock-masses of the district. This is the augite porphyrite which is the surface rock on Columbia and Kootenay mountain, on Red mountain, and at several other points.

In appearance there is some variation in these different localities, but in general the rock is fairly constant in its characteristics. On Red Mountain it is deep green in colour, with stout greenish-black prisms of pyroxene usually visible to the naked eye. Hornblende needles and laths of feldspar are sometimes present. The size of the individuals varies greatly, and often in short distances the rock will change from a type crowded with large well-formed phenocrysts to a dense, deep green variety with no phenocrysts visible. This may be due to the agglomeratic structure that can often be seen on weathered surfaces, oval patches then showing with a lighter colour than the surrounding rock. These seem to be of the same composition as the rock between them, and probably represent fragments produced by a slight movement after the first crystallization, the fragments being recemented by the same magma, but the new crystallization having a finer texture.

In all types of the porphyrite a platy jointing is at times rather pronounced, but the direction of these master-joints is not constant. In the north-east drift of the fourteenth level of the *Centre Star* the strike is N. 14° E., dip 65° E. East of the shaft on the same level the strike

\* Annual Report, Geological Survey of Canada, Vol VII., page 110.

† Geological Survey of Washington, Bulletin No. 1, page 17.