12. NOTES ON THE GEOLOGY OF THE WARWICK VALLEY.

(By J. Henderson, Mining Geologist.)

In April, 1914, the writer spent ten days in the Upper Matakitaki–Warwick district, but the weather was so persistently bad that it was found possible to cover only the roads and tracks. Cox and McKay are the only geologists who have published any account of the geology of this district. The former in 1883 made a reconnaissance survey of the region between Tophouse and the Bog Saddle, and his report* still furnishes the best account of the area now considered. McKay in 1894–95 visited this locality to investigate the probable source and value of the gold-deposits, but his remarks on the geology are of a most general nature.†

At Upper Matakitaki acidic igneous rocks form the high spur between the Glenroy and Matakitaki, while hard conglomerate, striking N. 20° E. and dipping 45° to the eastward, outcrops near the river. Along the road to the Maruia Plains, near the Glenroy Bridge, sandstones, grits, and fine conglomerates, quite as well consolidated, outcrop; and interbedded with them is a 2 ft. seam of excellent coal, which dips eastward at 70°. Analyses of this coal show the following results :—

Fixed carbon	61·98‡	56·25§
Hydrocarbons	32·07	35·66
Water	3·96	1·34
Ash	1·99	6·75
	100·00	100·00

The road now crosses to the west side of the Warbeck valley, and accordingly shows no more outcrops. The Warbeck, although very much smaller than the Glenroy, drains a valley fully as wide and decidedly more mature-looking. The road-cuttings along the ascent to the Warbeck–Warwick saddle show at first crushed and shaken conglomerate and sandstone beds, and, farther on, granite in a similar condition. The conglomerates and sandstones here exposed differ markedly in composition and degree of consolidation from those at the Glenroy Bridge and Upper Matakitaki. Crossing the saddle, the road descends to the Warwick along the eastern side of the valley. The rocks exposed are conglomerates, sandstones, and shales, with carbonaceous layers, which strike a little east of north, and dip very steeply to the eastward. In many places the carbonaceous shales and sandstones are crushed, and along such a zone, a little more than a mile from the saddle, petroleum escapes in small quantity. A film of oil may be detected in a trickle which here crosses the road; but better indications may be seen in a small creek which, flowing parallel with the road, and at a distance of 10 chains from it, may be reached by crossing a cleared spur to the southward. From time to time along the road down the the Warwick outcrops of conglomerates, sandstones, and shales, often with fine leaf-impressions, occur. These dip eastward, seldom at an angle less than 60°, and have a general meridional strike. A similar section is exposed along the lower valley of the Rappahannock, while in the lower Warwick massive sandstones predominate. Across the Maruia Plains the road shows occasional outcrops of sandstone dipping nearly vertically. A recently cut water-race, tapping Station Creek, affords an excellent highway for several miles up that river. Close above the point where this race enters the plain a fault makes itself manifest in the crushed sandstone outcropping along the bank of the stream. Farther eastward conglomerates are continuously exposed for more than two miles. They dip to the eastward at about 50°.

On physiographical and geological evidence it is clear that a powerful fault striking nearly north-north-east traverses the valleys of the Warwick and Warbeck, separating the granites and hornfels of mounts Mantell and Rutland from the Tertiary deposits of the valleys. Subsidiary parallel faults occur in the younger rocks, and it is along one of these that the oil above mentioned finds access to the surface. A considerable area of possibly oil-bearing strata lies to the eastward, but the writer's explorations did not extend sufficiently far to show more than that the rocks in that direction were less disturbed and had gentler dips. A detailed survey will determine if conditions for the occurrence of oil-reservoirs in this area are favourable.

The succession of Tertiary beds in the Westport and North Westland divisions has been worked out in detail, and is as follows :—

Pliocene to Miocene	Pliocene conglomerates and sandstones.
	Blue Bottom beds.
	Claystones, limestones, sandstones, and conglomerates.
Eocene or earlier	Kaiata beds.
	Brunner beds.
	Paparoa beds.

In the Upper Buller district there is a full Miocene sequence, and some of the Eocene beds are probably also represented. In the area examined by the writer the hard conglomerates and sandstones near the Glenroy Bridge belong either to the Brunner beds or to the lowest layers of the Miocene. The soft blue sandstones and conglomerates of the Warwick valley resemble in a remarkable degree the Pliocene conglomerates and sandstones of the Inangahua and Grey valleys. Like them, they contain numerous impure lignitic bands and thick seams of brown coal. Again, although this may be a fortuitous circumstance, the oil at Kotuku, in the Grey basin, escapes from the same series of beds.

In a small stream draining from the southern end of Mount Mantell, and joining the Warwick a few chains above the oil-seepage above described, a quartzose vein carrying tungsten outcrops. The occurrence lies about half a mile west of the Warbeck–Warwick saddle, and within the metamorphic aureole of the granite. The vein stands vertically beside a pegmatite dyke, and contains irregularly

* "On the District between the Maruia and Buller Rivers," Rep. Geol. Expl. during 1883–84, No. 16, 1884, pp. 1–10.
† "Geology of the South-west Part of Nelson and the Northern Part of the Westland District," Mines Report, 1895, C.–13, p. 5, &c. ‡ Colonial Museum and Laboratory, 18th Ann. Rep., 1883, p. 42. § Colonial Laboratory, 40th Ann. Rep., 1907, p. 57.