

Enclosure in No. 10.

PRELIMINARY REPORT on the Coal Deposits of the Ashburton District, Province of Canterbury,
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DURING the course of last summer, I was instructed to examine the Ashburton District, in continuation of my researches into the existence and extent of coal fields in this Province, and in the following pages I beg to offer a *résumé* of the main results of that examination, leaving its scientific portion to my more extended geological report.

Although the geological features of the country resemble in many respects those of the Malvern Hills, this resemblance is principally confined to the existence of older rocks, palæozoic sedimentary beds, and melaphyres and quartzitic porphyries,—the absence of the whole series beginning with the porphyry conglomerates and including the seams of brown coal, saurian and other fossiliferous beds, up to the greensands, being very striking.

This non-occurrence of beds so well developed at no great distance is very important in more than one respect, notwithstanding that their place is being taken by younger beds of a somewhat similar nature, with seams of brown coal at their base. This difference would not be so remarkable if a greater distance were to separate both localities from each other, or if a mountain chain of great height between them would have offered an opportunity for the formation of different beds in character or age on both sides; however, both series of beds are situated along the eastern side of the great longitudinal chain, and there are at least at first sight no sufficient reasons to account for this dissimilarity.

Beginning with the oldest beds in the district, the palæozoic sedimentary strata, of which the higher ranges are exclusively composed, we observe also here, that their lowest visible portion consists principally of conglomerates, shales and coarse sandstones, and of which, in my Report on the Geology of the Malvern Hills, I have given the principal features. These beds are in some localities replete with the impressions of ferns, of which some are identical with those accompanying the numerous seams of coal opened up in the Colony of New South Wales.

I have been able to follow these beds all the way from the Malvern Hills to the banks of the Rangitata, but unfortunately found them devoid of regular coal seams; the existence in many localities of small seams of black carbonaceous shales, or the bark of trees converted into a fine glance coal, making this search after workable coal still more tantalizing.

We therefore are compelled to assume, that during the formation of these very extensive strata, covering the greatest portion of this part of New Zealand, and which have been folded up and denuded in a remarkable manner, the necessary conditions favourable for the formation of seams of coal did not exist.

In another locality, in Mount Potts, on the banks of the Upper Rangitata, these lower beds also appear well exposed in deep gorges, cut by mountain torrents, overlaid by the same sequence of rocks as the fern beds of the Clent Hills; but they contain numerous marine exuvæ, identical or closely allied to Australian forms of older Carboniferous or younger Devonian age, thus offering additional evidence of the age of the Clent Hill series, as both beds, the fern and shell beds, alternate with each other in New South Wales.

This whole series of older sedimentary strata is, as in the Malvern Hills, overlaid in the district under review by igneous rocks, having been deposited in a semicircular form stretching from the south-eastern corner of Mount Winterslow, across the valley of the Stour, and after forming the very summit of the Clent Hills across the valleys of the Southern or main Ashburton and of the Northern Hinds to the isolated little range between the latter and the Southern Hinds, called the Gawlor Downs.

The relations of these melaphyres, the oldest basic rocks, as well as those of the next series, the acitic or quartzitic porphyries, which in many localities, principally in the north-eastern corner, overlie them, are well exposed in a considerable number of sections. In several localities, however, the latter repose directly upon the older sedimentary rocks, and offer us at the same time sufficient evidence from which we can judge of their age and mode of deposition. One of these localities is on the flanks of Mount Somers, which is principally composed of quartzitic porphyries, and the pitch stones associated with them, and where a small range called Cox Hills runs from its south-eastern end in a southerly direction towards the Southern Ashburton. In the deep gullies of these hills, and principally in Petrefying Gully, splendid sections are opened to our examination; here, above green sands and quartzose sands which overlie directly the sedimentary palæozoic rocks, follow shales with dicotyledonous leaves, and a seam of coal about 3 feet thick with a dip of 46°, and consisting at the outcrop of an inferior brown coal showing woody structure.

The overlying shales and clays gradually change into porcelain jasper, and are covered by a great thickness of pitchstone-agglomerates, containing pieces from 1 inch to 10 feet in diameter, and which in its turn is again overlaid by pitchstones and quartzitic porphyries, which latter form the great mass of Mount Somers, rising about 3,000 feet above the brown-coal series below them.

A similar seam of inferior brown coal exists in Woolshed Creek, which latter has cut a deep and magnificent gorge on the western slopes of Mount Somers, exposing the porphyritic streams for a thickness of more than 1,000 feet, the whole confirming the observations made in the gorge of the Rakaia as to the character of the beds underlying the quartzitic porphyries. (See Malvern Hills Report, page 79, Geological Report, 1871.)

I pointed out already that the porphyry conglomerates, the brown-coal bearing and saurian beds of the Malvern Hills, were missing; their place being taken by a younger formation and of the age of the Curiosity-shop beds, and with which, as far as I could observe, no seams of brown coal of any consequence are associated.

There are however several other localities where we meet with workable seams, being associated with shales, ironstones, and quartzose sands, but in which I failed to obtain any fossils from which their age might be ascertained. This series might possibly be of the age of some of the coal seams of the Malvern Hills. Several of these seams are situated in such positions that it would be difficult to work them at present with advantage, whilst others are easily accessible and are already worked.

The fact that there is a great deal of timber in the district under review has hitherto prevented the