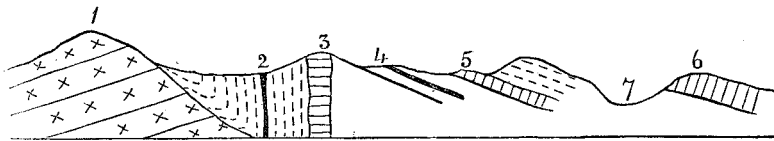


dipping towards the flat, and the analyses of these coals, as seen in the accompanying table, show them to be of very good quality. They are overlaid by a dolerite floc, as shown in the following section:—



1. Quartz porphyries: Pullwool Peak; 2. Brockley Coal-mine; 3. Dyke; 4. Ayers's (Lee's) Coal-mine; 5. Dolerite floc; 6. Harper Hills; 7. Wairiri Valley, which may either belong to the contemporaneous volcanic series of the coal measures (metaphyses), or to the more recent doleritic one of the Harper Hills, but most probably is of the former age.

This rock appears to have altered the constitution of the coal where exposed, and it is quite probable that coal of the same character may extend some distance to the dip, but the nature of the country will make it necessary to work this by shafts or very long tunnels, since it dips towards the Wairiri Flats, a series of hills, however, intervening between the outcrop and the flat, the rocks of which overlie the coal measures. It is evident that no estimate can be formed of the extent of altered coal in this direction, beyond this: that it may occur for 120 chains along the strike, and extend to the dip indefinitely, but how far actual work can alone show.

In Washpen Creek, on the north-western side of Pullwool Peak previously referred to, altered coals again occur striking north and south and standing vertical, but at a short distance from the creek the measures are dipping to the west at gradually decreasing angles, although they are very shortly overlaid by the terrace gravels of the Hororata and Rakaia Rivers, which are continuous in the flat country until the Rakaia Gorge is reached.

Dr. Hector, in reporting on this district (Geological Report 1870-71, page 47), says of Washpen Creek: "Under the sandstone ironstone beds appear, and in that part of the stream opposite Redwood (Rochwood) Station the same ironstone strata are seen to form the floor of the valley, interbedded with coarse quartzose grits, finely laminated shales, and ten well defined, but thin seams of coal, the thickest being only 2 feet 9 inches."

At the Rakaia Gorge, Dr. Von Haast reports the occurrence of two thin seams of anthracite 2 feet 2 inches, and 2 feet 4 inches thick respectively, besides which there two thick seams of an altered brown coal of good quality, as may be seen by the accompanying analyses by Mr. Skey of samples, which I collected. They have, however, a high percentage of water, notwithstanding the fact that the proportion of fixed carbon to hydro-carbon is large, and the coal does not stand the weather as well as that from Brockley, although it is superior to the average coals of the Malvern Hills. These seams, which are about 10 feet thick each, are arranged at a rather steep syncline, the axis of which strikes about north-east, in the direction of the Brockley and Rochwood seams, and it is quite possible that the coals may be continuous below the flat in this direction, flanking the Four Peak Range to the south-east, but this can only be proved by boring.

Mr. Gerard, the proprietor of these Rakaia seams, has, I understand, expressed his intention, in event of a railway being constructed through the Wairiri Valley, of laying down a tramway to connect his coal with it, a work of some magnitude, since twelve to fourteen miles would have to be constructed.

About six miles from this point, in the valley of the Acheron River, a seam of anthracite, owned by Mr. Murchison, occurs. This seam, which is 4 feet thick, is of first rate quality, being the best which has been found in the district. A previous analysis of a sample collected by Dr. Hector in 1869 gave 88.91 per cent. of fixed carbon, or an evaporative power of 11.5; but the sample which I brought has a large percentage of ash, and so does not give as good returns to analysis. This seam, which has previously been reported on both by Dr. Hector and Dr. Von Haast, is striking north and south and dipping west at an angle of about 30°, and is a parallel belt to the Rakaia syncline, the same remarks applying to the country between the two points as I have already made concerning that lying between the Rakaia and Brockley, but here the length along the strike is limited by Mount Hutt on the one side and the High Peak Ranges on the other. Coal is reported to occur for two miles further up the Acheron, but Dr. Hector reports (Geological Report, 1870-71, page 49) that it is of inferior quality.

To summarize the results of my trip, it appears that four classes of coal occur in the district, as follows:—

1. *Anthracites*.—Of these the best seam is undoubtedly that at the Acheron, which is 4 feet thick, and also of the best quality, having an evaporative power of from 8.5 to 11.5. Besides this there are thin seams in the Brockley Mine, and also in Ayers's (Lee's) Mine, as well as at Rakaia, which might be worked in conjunction with other seams of coal.

2. *Altered Brown Coals in which the percentage of water is not high*, amongst which the thick seam in Ayers's (Lee's) Mine and Brockley 6 feet seam may be classed.—They are of good quality, burning freely and not being affected by the weather, but the sample from Mr. Ayers's mine is the best. These correspond with the better class of pitch coals.

3. *Altered Brown Coals with high percentage of water*, including the large seams of coal at the Rakaia Gorge.—These coals have a lower evaporative power than the foregoing, and do not stand the weather so well. They are, however, of better quality than the ordinary brown coals.

4. *Brown Coals*, which are largely represented in the Malvern Hills, but are not found amongst the seams which I have examined.—They have a high percentage of water and hydro-carbons, and a far lower evaporative power than any of these.

The extent of these altered coals is not assured, as I have previously pointed out, and without the knowledge which can be obtained by means of boring no estimate of quantity can be made. The estimate given of the quantity of coal in the Brockley Mine is, however, only a small proportion of what probably occurs in the district, and the coal in Mr. Ayers's seam, adjoining it, is of yet better quality.