

VI. CRETACEO-TERTIARY AND CRETACEOUS.

(a.) *Upper Beds*.—Usually the upper beds of the Cretaceo-tertiary series have been described as embracing the Grey marls, Weka Pass limestone, and Amuri limestone, including also the marly strata that underlies the horizon of the Amuri limestone, and rest upon the Concretionary Green-sands or the saurian beds. On the West Coast the uppermost member of the series is absent, and the Weka Pass stone also is not characteristically represented, the Cobden limestone showing more of the lithological character of the Amuri limestone, while at the same time its more abundant fossil fauna may indicate more the period of the Weka Pass stone. The dark foraminiferous marly clays that underlie the Cobden limestone must, with the limestone, be regarded as representing on the West Coast the upper part of the series. Limestones of this age and character are said to occur on the left bank of Donnelly's Creek, at Ross. Limestone also is present at Camel-back Hill, on the Kokatahi Plain, and the line of limestone south of Greymouth is continued across the New River below Marsden, almost to the banks of the Teremakau. North of the Grey River the Cobden limestone, underlain by the black marls, extends to Point Elizabeth and the Seven-mile Creek. Beyond this no limestone or underlying marls are present till reaching the north end of the Seventeen-mile Beach, where, in the Hills of Razorback, the limestone begins and is continuous along the coast, with a depth of a few miles inland, to the Fox and Nile Rivers, and the Little Totara River. In the Buller and Inangahua Valleys this limestone is developed to a large extent along the west side of the Inangahua Valley, from one mile and a half below the junction to a point between Fletcher's and Stony Creek, opposite the junction of Boatman's with the Inangahua. On the opposite eastern side of the Inangahua a small area of limestone of the same character and age is met with between Little Boatman's Creek and Italian Gully. Limestone of the same age and character is found in the Upper Buller Valley as deeply involved strata, between the Newton River and Fern Flat, and an extensive area of limestone occupies the higher part of the range between the Maruia and the Matakita Rivers.

(b.) *Middle Beds*.—These consist of green-sands, soft yellow or brown sandstones, limestones, sandstones, &c., grit with shales and coal-seams, and constitute the more important part of the formation. In the southern part of the district there is a small area of these rocks in Camel-back Hill, near the banks of the Hokitika River, and again in the Valley of Coal Creek, a tributary of the Kanieri River. On the southern side of the Lower Grey Valley the axis of the range between the Brunner Gorge and the northern sources of New River has on each side of it a development of coal-bearing rocks, but these as yet have been but imperfectly explored for coal-seams. The coalfield north of the Grey is an important development of these rocks. The higher part and west slopes of the Mount Davy Range is the most important coal-bearing district in the region of the Grey Valley. The workable seams vary from 5ft. to 16ft. in thickness on the Mount Davy Range, and dip west at moderate angles. In the Seven-mile Creek the dips in the more important outcrops is inward toward the mountain range. Towards the sources of the Nine-mile, and of the south branch of the Ten-mile, the coal and beds associated are very much disturbed, and often are seen standing at high angles. Between the northern end of Mount Davy and the conical peak at the sources of the south branch of the Ten-mile, and of the right-hand branch of Ford's Creek, the coal-measures form the mountain range, and are continuous from the coast-line to the Grey Valley, at the mouth of Blackball Creek. In the Grey Valley, above the Brunner Gorge, a narrow strip of coal-bearing rocks runs along the north-west side of the valley and the lower slopes of the Mount Davy Range to the right-hand branch of Ford's Creek. This is separated from the coal rocks on the higher part of Mount Davy Range by a belt of slate, that gradually gets narrower as it is followed to the north-east, till in the watershed of Ford's Creek it wedges out altogether. The Blackball Coalfield embraces in part the watersheds of Ford's Creek, and of Coal Creek, a tributary of the Blackball, and, as stated above, is connected with the coal-bearing area on the coast, through the saddle between Mount Davy and Ford's Peak.

There is in the Moonlight Valley, in Garden Gully, a thick deposit of brown coal, which rests upon auriferous slates, while the section does not show what the overlying rocks are. At the crossing of Moonlight Creek, on the way to the township, the associated rocks are seen, and consist of soft grey sandstones dipping at a considerable angle up-stream, or to the north-east. The same rocks are also well developed further down the Moonlight Valley. They are quite unconformable to the gravels on the high terraces and the "Old-Man bottom," with which these soft sandstones come in contact; but at the same time neither the strata associated nor the coal itself agrees well with the rocks and coal-seams of the other parts of the coal-field. Brown coal is found as thin seams in Slaty Creek, and again in the upper part of the Little Grey Valley, on the lower slopes of the Paparoa Range.

Along the sides of the Inangahua Valley coal-seams are found, and are worked at many places on the east side of the valley from Boatman's to Merrijigs. The coal-measures in the Inangahua Valley are shales and quartz grits, passing upwards into sandstone. In the Upper Buller Valley coal-seams of considerable thickness are worked in the vicinity of Longford and in the Upper Maruia. Above and opposite Station Creek there is a 30ft. seam of brown coal.

South of the Buller River a narrow coal-field runs along the foot of the Paparoa Mountains, from the Nile Valley to Bullock Creek, and on the coast-line in the same district are largely developed the brown coals of Charleston and of Brighton, at the mouth of the Fox River. In the valley of the Fox River, between the limestone range and the foot of the higher mountains, anthracite of most excellent quality is found.

(c.) *Lower Beds*.—These consist mainly of conglomerates, or more angular and larger-sized breccia-conglomerates, which are of interest and importance mainly on account of their being auriferous at many places, and at some places stanniferous or tin-bearing. The tin found at the Ten-Mile, north of Greymouth, probably is derived from waste of the conglomerates at the base of the coal-bearing series. Conglomerates and breccia-conglomerates stretch along the lower slope of Mount Davy, and quartz-conglomerates, present on the higher part of the range more towards the north, have apparently yielded to the watershed of Ford's Creek the greater amount of the gold found in it. The lower of these beds, as developed between Moonlight