Topography.

In the north and east the subdivision consists of two asymmetrical tilted fault-blocks trending 30° east of north with long gentle eastward slopes and steep westward-facing scarps, and in the west a third long eastward slope rising to a dissected plateau. The fault-angle depressions are occupied by tidal lagoons and low alluvial plains. The block in the east rises gently from the east coast near Quoin Point to a ridge 550 ft. high two miles inland, and drops abruptly to a depression that contains the tidal flats at Akatore. From the depression a long gentle slope rises five miles westward to 1,500 ft. in the watershed between the streams that flow seaward and those that flow inland to the long depression occupied by Lake Tuakitoto, Lovell's Flat, the Tokomairiro Plain, Lake Waihola, Lake Waipori, and, farther north, the Taieri Plain. West of the summit the ridge is faulted, and extends a mile westward as a lower step 1,000 ft. high, rising again to 1,500 ft. at Gorge Hill. From the hill the country falls steeply to the tidal lakes and Tokomairiro Plain, which, as already mentioned, occupy the fault-angle. From the depression the country rises again westward, interrupted in places by volcanic peaks, for some seven miles to Mount Stuart (1,418 ft.) and the surrounding plateau. From this the country slopes away gently south-westward to the 300 ft. downs along the foot of the scarp that, trending south of east to Nugget Point, forms the front of the 1,500 ft. plateau to the south.

General Geology.

An immense thickness of unfossiliferous greywacke grading downward into schist, corresponding with Marshall's "Tuapeka Series," covers 274 square miles; greywacke, argillite, and conglomerate not less than 20,000 ft. thick, containing in places Ladino-Carnic fossils, occupy 51 square miles; unfossiliferous coarse greywacke conglomerate at least 300 ft. thick, corresponding with Marshall's "auriferous conglomerate," occupies 35 square miles, including the Kaitangata Coalfield; quartz conglomerate grading up into sandstone, containing the Wangaloa Eocene fossils, 1,000 ft. thick, corresponding with Marshall's "quartz grits," covers 68 square miles, including the Taratu, Waronui, Benhar, and other coalfields; green-sandstone, limestone with phosphate rock, and brown sandstone occupy 2 square miles, and contain Ototaran fossils; post-Ototaran basalt covers 4 square miles; and alluvium covers 110 square miles. These different formations have been mapped to show their location and boundaries. The lowest two are not of general interest and need not here be further described; the upper ones, containing coal, gold, phosphate, limestone, &c., will be more fully described under the next heading.

Economic Geology.

The Kaitangata conglomerate consists of 2–6 in. well-rounded pebbles, most of greywacke, some of schist, and a few of quartz, set in a sandy matrix of finer pieces of the same rocks. In places the matrix is red and loose, but in others it is dark and compact. Generally it is not visibly bedded, but in places it has in it some bands of sandstone. Between Kaitangata and Clutha mouth it is not less than 300 ft. thick, and, as no underlying rock is exposed to mark its base, its thickness cannot be estimated. The same rock in the Tuapeka district, called by Marshall the "auriferous conglomerate or cement," was estimated as 565 ft. thick. This conglomerate, which is worked for gold in Tuapeka, is important in the Kaitangata area for its coal-seams. The coal has been worked since 1864, and, as little prospecting has been required to enable the output to meet the demand, the resources of the field are not even approximately known. Moreover, little information can be got by examining the surface, for on the west the coal is prevented from outcropping by many strike faults, and on the east the beds dip parallel with the surface and disappear under overlying rock. Further, as the seams are broken by numerous faults, the prospecting-bores hitherto drilled have given information concerning small blocks of country only, and in this respect have been unsatisfactory. Extensive prospecting is warranted, but probably will not be undertaken as long as enough coal to supply the market can be easily found. The evidence available indicates that a great quantity of coal remains, and is as follows: The coal-measures are anticlinal. The western limb, broken by at least eight faults which turn the coal up more steeply farther west, in the early days of settlement showed an outcrop of a 3–4 ft. seam, which was the first mined. In working that seam others were discovered, and thick coal is known near the mines for about a mile along the strike and through about 120 ft. of beds containing 30 ft., 18 ft., and 8 ft. seams. As yet, on account of its greater accessibility, only this western broken area has been worked; but in the mines and in the outcrops it is evident that the coal-measures turn over and dip gently to the east, showing that they extend eastward toward the coast at shallow depth. From Clutha mouth for a mile north they can be seen in the lower part of the sea-cliff, and in them carbonaceous shale bands 10 ft. thick, and coal-seams 3 ft. thick, were seen. Hence workable seams probably extend over this distance. Although the Kaitangata seams were followed into poor coal to the north and into poor coal and to a fault to the south, the coal-measures continue, and probably other payable areas will be found to the north and south along the strike. The rocks in which the thick seams occur are continuous at the surface over 4 square miles, and, as is shown by the outcrops in Saddle and Two-stone creeks, are also present close below the surface in much of the country occupied by the quartz grits; thick seams will probably be found in patches over this area. In the larger and more remote area, however, where these rocks outcrop from the Taieri River for eighteen miles southward past Mount Misery into the head of Wangaloa Creek, only one thin outcrop has been found.

Above the Kaitangata conglomerate lies the Taratu conglomerate, described by Marshall as the quartz grits. It consists of ½–2 in. worn pieces of quartz derived from schist set in an abundant matrix of white sand, in many places cemented with limonite and in some silicified into hard quartzite. It is 1,000 ft. thick, and extends over 68 square miles. Its upper part contains lenses of sand, and grades into ferruginous lenticular sandstone in which are found the Wangaloa fossils of Eocene age. Near the base occur the coal-seams that are being mined at Castle Hill, Taratu, Waronui, Benhar, and elsewhere. At Castle Hill, seams 25 ft., 8 ft., 11 ft., 12 ft., and 8 ft. thick are mined; the Taratu Coal and Railway Company is mining two seams 30 ft. and 18 ft. thick, and has many