

The Kyeburn conglomerate is an indurated schistose conglomerate of a red or green colour covering a belt of country extending eastward from the head of the Hogburn into Kyeburn Survey District. It is a fluvial deposit which dips southward at high angles beneath the Naseby marine beds and is overlapped by them. On the southern slopes of Mount Buster the conglomerate becomes quartzose, and resembles the St. Bathans quartz-grits.

The Naseby beds are marine glauconitic greensands which occur in patches (inliers) in Coalpit Gully, Naseby; near the head of the Hogburn; and at Coalpit Gully, Kyeburn Diggings. Fossils are abundant in the feed-water channel from Mount Ida Water-race to the Government dam, Naseby; in the mouth of Coalpit Gully (near Kyeburn Diggings); and farther to the east on the right bank of the Kyeburn, near the footbridge. Fossils were also collected by Hector in 1890 from the deep prospecting-shaft at Naseby (now covered by tailings).

These marine beds are of Lower Miocene (Awamoan) age, and were deposited on the surface of the palæozoic rocks at Quartz-reef Hill, Naseby, but have not been seen west of this point. In Miocene times, therefore, the sea had access to what is now the eastern half of Maniototo Plain.

The St. Bathans beds (Morgan, N.Z. Jour. Sci. & Tech., vol. 3, p. 29; 1920) are a conformable series of deposits due to a complete cycle of erosion, depression and deposition, elevation and erosion. The lowest beds are quartz-grits or fine conglomerates, with which are associated carbonaceous bands or seams of lignite. They are followed by green shaly clays, the paper-shales, which contain fish-remains and impressions of a fresh-water mussel (*Diplodon* sp.). These clays are therefore truly lacustrine. They pass upward into sands and gravels, which, gradually turning coarser, become the fluvial greywacke conglomerate or Maori bottom.\* Quartz-grits occur at several horizons. In places the St. Bathans quartz-grits contain cobbles of water-worn silicified quartz-grit derived from some older deposit, and in places the greywacke conglomerates become quartzose and resemble the quartz-grits proper.

The St. Bathans beds cover the floors of the intermontane basins, and remnants of silicified quartz-grit (wether stones) litter the surfaces of the fault-block mountains. They thus formerly had a far greater extension than they now have. Their age is Upper Miocene or Lower Pliocene.

*Quaternary Deposits.*—Small quantities of morainic material occur along the east side of the Dunstan Range, but elsewhere signs of glacial action are absent. Gravel terraces are usually arranged in flights and carry the geological history forward to Pleistocene and Recent times. About the year 1861 moa-bones in an excellent state of preservation were found in abundance at Puketoi, on the east side of Rough Ridge, and bones are still occasionally found embedded in the soil there and elsewhere. As the bones disappeared rapidly after the arrival of European settlers, it is reasonable to suppose that the moa survived until two or three centuries ago. (Cf. W. D. Murison, Trans. N.Z. Inst., vol. 4, pp. 120–24; 1872.)

*Igneous Rocks.*—Basalt flows and dykes of Pleistocene and Recent age occur in the neighbourhood of Waipiata and Gimmerburn, and two small dykes were located in the Upper Manuherikia valley.

#### ECONOMIC GEOLOGY.

*Soils.*—The soils of the subdivision will be discussed at some length in the detailed report on the soil survey of Central Otago that will be written next year.

*Limestone and Greensand.*—Except for small quantities of calcareous travertine and a bed or two of marl, agricultural limestone is wanting, but beds of calcareous greensand containing potassium and phosphorus occur at Naseby and at Kyeburn Diggings.

*Gold.*—For a number of years gold-mining was the chief industry in Central Otago, and it still occupies a few men. In the St. Bathans Subdivision reef-mining is being spasmodically prosecuted at the old Great Eastern Mine on Rough Ridge, near Otarehua Railway-station. The work done has been of an exploratory nature along a shatter-belt in the mica schists. When visited, the mine was full of water. Since, in the mining sense, the schists are not mineralized, and there are no definite lodes, it is unlikely that a rich find will be made here.

All the known alluvial goldfields within the subdivision were inspected during the past season. These are described in McKay's report, but most of them, though not worked out, are now moribund.

Alluvial gold is unevenly distributed throughout all the fluvial beds from the Kyeburn conglomerate upwards. The Kyeburn conglomerate or "red bottom" is being sluiced at the head of One-speck Gully, Naseby. The basal white St. Bathans quartz-grits are locally rich in alluvial gold, and are still being worked at Cambrian (Welshman's Gully), St. Bathans, and Linnburn, while at Tinker's and Naseby only the weathered portions seem to have been worth sluicing, and are now neglected. The greywacke conglomerate and younger gravels are being sluiced at Cambrian and Naseby, and a dredge to work them is being built four miles to the north-east of Naseby in a tributary of the Little Kyeburn. At Drybread, Kyeburn Diggings, and Patearoa (Sowburn Diggings) beds of the same age as the greywacke conglomerate are being sluiced.

*Building-materials.*—Unlimited quantities of schist are available for constructional work. This rock readily splits into easily dressed slabs of convenient sizes. The schist is resistant to weathering, and thus forms a valuable stone which is used extensively for building houses and bridge-piers. Thin slabs of schist are sometimes used as roofing-slates. The Waipiata basalt is a durable building-stone, but the Tertiary sandstones disintegrate too readily to be of any value.

\* This is not included in the St. Bathans beds.