

1892.

## NEW ZEALAND.

## LITHOGRAPHIC LIMESTONE IN MONGONUI COUNTY

(REPORT ON THE OCCURRENCE OF, BY ALEXANDER McKAY, F.G.S.).

*Presented to both Houses of the General Assembly by Command of His Excellency.*

## REPORT ON THE OCCURRENCE OF LITHOGRAPHIC LIMESTONE IN MONGONUI COUNTY, AUCKLAND.

Geological Survey Department, Wellington, 20th June, 1892.

LIMESTONES more or less suitable for lithographic purposes have been discovered at various times during the progress of the geological survey of New Zealand. As early as 1863 lithographic limestone is noted (Hector, Geological Reports on Otago, and Juror's Reports, Exhibition, 1865, pp. 33 and 392) as coming from Hutchinson's Quarry and the neighbourhood of Oamaru. This, however, occurred only as small thin bands of altered limestone associated with volcanic tufa, or as kernels in the rubbly calcareous sands of Hutchinson's Quarry itself; and from the limited quantity and small size of the samples to be obtained it proved of no commercial value.

At a later date Mr. H. H. Travers visited the Chatham Islands, where, although chiefly engaged in making zoological and botanical collections, he also made a collection of the rocks and fossils representing the different formations present in these islands. With the latter was a small slab of lithographic limestone of a cream or light-buff colour. This was flattened and grained and some crayon work printed from it, which seemed to prove it of good quality, but for some reason or other no further notice was taken of the occurrence of this rock at the Chatham Islands.

In 1875 Messrs. Docherty and McArthur opened out the Abbey Rock Quarries, which were situated on the west coast of the South Island, five miles to the south of the Paringa River, Westland.

This stone occurred as massive beds, and of such extent that want of material was no cause of its not coming into general use. But the stone was not uniform in colour even in the same slab; and, besides, contained imperfections in the shape of numerous small shells of foraminifera and small crystals of iron-pyrites, so that after some expense had been gone to in opening out quarries the works were abandoned.

During 1876 I visited and made an examination of the Amuri Bluff, Kaikoura County, where the fine-grained chalky limestone, known as the Amuri limestone, has its typical development. Some beds of this, I concluded, were suitable as a lithographic stone, and I brought with me to Wellington a small slab which, on being polished, though of a uniform colour, contained too many tests of foraminifera to recommend it as a suitable stone, and it was never printed from.

In 1885, and again in 1886, during an examination of the north-east district of the South Island a large area of country formed of Amuri limestone came under consideration, and at several places I noted that it in part consisted of flaggy bands, which, if of the proper grain and quality, might render it fit for lithographic purposes. But in most cases much stripping would be required to reach these special bands of the limestone, and there was, besides, the liability and the probability that the stone would not be sufficiently free from foraminifera and other impurities to make it suitable for the purposes of lithography. Also, where apparently most suitable for the purpose designed, it occurred in a mountain region, which, though not distant from the coast-line, is difficult of access. Possibly on the eastern slopes of Benmore Mountain, between the Kekerangu and the Ure Rivers, flaggy, chalky limestones, capable of being utilised as lithographic stone, may be found; but all the earthy limestones of the Marlborough District are liable to the defects which have already been mentioned.

During the course of an examination of the country between the township of Mongonui and the west coast of this part of Auckland Peninsula, I proceeded first to Oruru Valley, and thence from Peria passed into the valley of the Kaikaia River. On entering the latter watershed, I noted a distinctive change in the character of the Cretaceous-tertiary rocks. To the east, within the Oruru watershed, they consisted of firestones, a species of siliceous rock resembling imperfectly consolidated chert, underlain by shales and sandstones, including concretionary boulders, the whole resting on Palaeozoic rocks, a prolongation of one of the many spurs that descend from the northern side of the Maungataniwha Range. Passing the saddle between the two watersheds, the road—Fairburn's line—follows the main stream of the western watershed, and exposes from under the firestones a series of evenly-bedded soft green and brown sandstones, and dark-blue or grey clay marls. These dip at moderate angles at first to the eastward, but further down the valley to the westward, and finally are overlaid, without the intervention of the firestones, by beds of fine-grained earthy limestone, associated or directly underlain by calcareous greensands. These limestones, which constitute the lithographic stone, the main object of this report, cross the road-line and valley