tertiary marls and sandstones at 900 ft., but as the present company sunk its No. 3 bore to 1,975 ft., and for between 1,600 ft. and 1,700 ft. through papa, the total thickness of this formation probably exceeds considerably the total depth of the bore-hole. There is therefore little or no hope of a depth being reached sufficient to enter upon the coal-bearing formations of the Mokau Valley should these chance to be present under the tertiary deposits of the district.

The tertiary rocks met with in the deeper parts of the bore-holes, as they consist of arenaceous sands and sandy marls, and are not highly fossiliferous, are regarded as unlikely to be the actual source of the oil found any more than the volcanic breccias that overlie, and hence the assumption that the Mokau coal-formation underlies these, and that the carbonaceous beds of this, acted upon by volcanic heat and kindred causes, have in the first instance yielded the gas and oil that, rising into superincumbent strata, have had storage in the looser sandy beds of the Miocene formation, or risen into yet higher beds, or escaped at the surface. Nothing can be said against the reasonableness of this assumption, but it is without proof, and is likely to so remain: and the simple fact remains that gas and oil appear at the surface, and have been traced downwards through superficial deposits and volcanic breccia some 300 ft., and after that found at 900 ft. and nearly 2,000 ft. from the surface.

The lignite formations of the superficial Pleistocene formation, described by Sir James Hector, and certain marsh deposits seen in connection with the volcanic breccias, might be held accountable for some of the oil at and near the surface, and some years ago I thought the oil at shallow depth near the Breakwater might be accounted for in this way.

At the northern base of the Sugar Loaf south of the Breakwater a section is exposed, which shows clays full of plant-impressions covered by volcanic agglomerate. Every trace of plant-substance has been removed from these clays. They dip northward towards the Breakwater, in which direction the volcanic breccia, or agglomerate, is overlain by loose, or more or less compacted, sands. These sands and the volcanic breccias underlying the latter, or both, interstratified with peaty deposits, changed to lignite, altered or wholly removed, might reasonably be regarded as the primary source of the oil found in the same strata, or as oil or gas escaping to the surface.

Knowing the nature of the older Pliocene and Miocene strata that underlies, and the very considerable thickness of these formations, the likelihood did not seem great that the oil and gas at the surface were derived from an inferior underlying formation; the more so as all the oil and gas might be accounted for as proceeding from the the upper lignite-bearing formations.

The operations of the New Plymouth Petroleum Company have shown that there is a deeper-seated source of oil than the volcanic breccias and Pleistocene formations overlying the Miocene sands and marly clays, and it may be well, therefore, to try to determine the probable source of this oil. The sections that may be studied—first, from Stratford to the Tangarakau River; second, along the coast from New Plymouth to the Waitara River; and third, of the coal-bearing strata in the Mokau Valley, show that, unless the higher part of the coal-formation has been denuded away, some 5,000 ft. of beds overlie the coal in the vicinity of New Plymouth. In the District of Taranaki and the west coast of Wellington, south of a line east from the mouth of the Waitara River, there is no evidence of the presence of Cretaceo-tertiary coal-measures underlying the tertiary sands and marls of that region, the lignites of the Pohangina and the western slopes of the Ruahine Range, according to Park, of newer Pliocene date, north of which to the southern end of the Kaimanawa Range only tertiary rocks are met with along the junction between the Palæozoic rocks and the younger formations to the west and south. Over great part of the district south and west of the boundaries indicated it is probable the coal-formation was once present, but presumably they have been removed prior to the deposition of any tertiary strata.

In 1878 Sir James Hector made a further examination of the coast-line north of New Plymouth, and continued his explorations into and along the valley of the Mokau, and the following extract from the report descriptive of this work, as it supplements that of 1866, may be here given: "A few miles north of the Waitara the volcanic rocks of the Mount Egmont system, and superficial rocks derived therefrom, disappear, and from beneath them a great formation of clay marls of Lower Miocene age (Pareora series) rise to the surface and form a very broken range of hills that terminate on the sea-coast in the White Cliffs. The change to the next formation is marked by a band of shell breccia, beneath which the strata are formed of soft argillaceous sandstones, which form the northern portion of the White Cliffs. . . . In ascending the Mokau River . . . the base of this formation is found in the nummulitic limestone (Middle Eocene) which again rests unconformably upon the grey marls and the chalk marls which belong to the Cretaceo-tertiary formation. These in turn rest on greensands, passing downwards into the brown concretionary sandstones of the coal formation."*

From this I gather that there are two unconformities in the section described, and that the Miocene-tertiary deposit is of great thickness, beneath which the upper part of the coal-bearing formation is of great thickness. The carbonaceous part of the Cretaceo-tertiary formation must lie at great depth below the town of New Plymouth—that is, if it has not been removed by denudation—and to reach this by boring would be utterly impossible. The true source of the oil, therefore, if not the Miocene beds, can never be known, and it is useless to speculate thereon.

The plan herewith shows the position of the different bore-holes that subsequent to 1866 have been put down by the present or former company since 1888. The natural-gas springs between Moturoa and Inglewood are also shown, the map in so far being a copy of a plan accompanying a report on the various bores put down by the New Plymouth Petroleum Company, by Mr. Strauchon, Commissioner of Crown Lands and Chief Surveyor, Taranaki. The sections are compiled from the descriptions given by myself or others in this or former reports.

10th April, 1899. ALEX. MCKAY.

* "Geological Reports," 1878–79, p. 21.