

the Poverty Bay flats is almost certainly derived from the carbonaceous material contained in the surface beds, and not from the oil-bearing rocks of the Gisborne district.

Inflammable gas in small quantities is known to occur in the unconsolidated gravels, sands, and silts of the alluvial flats near Napier,* at Hanmer (?), and in the Canterbury Plains. It probably occurs in many other similar localities.

To determine the commercial value of the gas issuing from the bores in the Hauraki Plains it is necessary to find out its chemical composition, how much can be got from the strata, and the cost of production. The natural gas of America is obtained from strata connected with the oil-pools, and in no country are beds so recent as these here considered known to yield gas in commercial quantity. But there is no geological reason why the strata should not contain much gas. Indeed, deltaic beds of porous sand separated by impervious silts all containing more or less carbonaceous matter are favourable for gas-accumulation. Conditions of this kind occur at the mouth of the Mississippi, where more or less inflammable gas is emitted in connection with the well-known "mud-lumps." The collection of data, including the number of bores, their position and depth, the strata they penetrate, and the gas they yield, is desirable. If the gas is found in commercial quantity anywhere in the Hauraki Plains the area over which it may reasonably be searched for is considerable, including all the low-lying country extending from the Hauraki Gulf to Otorohanga.

9. MINERAL RESOURCES OF THE WHANGAREI-BAY OF ISLANDS SUBDIVISION.

(By H. T. FERRAR and W. H. CROPP.)

The mineral resources of the Whangarei-Bay of Islands Subdivision were briefly outlined in the last annual report. Of the many minerals occurring in the subdivision those forming the most valuable deposits are coal, cinnabar, and limestone. Other minerals occur, but under present conditions they are not of commercial importance.

COAL.

The following notes, based on a study of the geological relations of the coal of North Auckland, summarize the known and potential coal-bearing areas of the subdivision. For convenience they are arranged according to survey districts.

Whakarara, Bay of Islands, Kerikeri, Russell, Whangaruru, Opuawhanga, Taranga, and Taiharuru Survey Districts.—The prospects of workable coal being found in these districts are nil.

Kawakawa Survey District.—The coal-outcrops in the Waitangi Valley are of no importance. Workable coal probably exists only in the extreme south-east corner of this district—that is, in the old Kawakawa coalfield. Of this field, that portion lying immediately south-west of the township is worked out; between this area and the point of emergence of the Waiomio Stream from its limestone basin the coal-seams are too thin to be of use; beneath the limestone, however, an area of workable and relatively shallow coal may exist.

Hukerenui Survey District.—Future prospects in this district are confined to the Hikurangi coalfield, the limits of which are now approximately known. In that part of the field east of the railway little coal now remains. The Waro section, between the railway and the ridge joining Carter's Hill to Hikurangi Mountain, is rapidly being exhausted. A small reserve of workable coal probably exists between the head of Perrett's Creek and the present limit of the New Zealand Portland Cement Company's mine-workings. According to bore records, the ridge above mentioned is composed of crystalline limestone overlying workable coal-seams. In the field, however, the writers thought it to be part of the claystone which underlies the North Auckland coalfields. This forms Carter's Hill and continues under Hikurangi Mountain. West of this ridge, and between these two prominences, is a small area of downfaulted coal-measures, now being developed. This area may continue under the Hikurangi Swamp and fringe the base of Carter's Hill. Boring alone can prove this, but it is improbable that coal-bearing strata underlie the main portions of the Hikurangi Swamp. Computation of the coal reserves of this field leads to the belief that at most only three-quarters of a million tons remain.

Purua Survey District.—A triangular downfaulted area of some 1,200 acres adjacent to Kamo offers considerable prospects—perhaps the best in the subdivision. Of the three faults that enclose this area one follows Waitaua Creek, the second the line joining the mouth of Whau Valley to the junction of the Hatea and Waitaua streams, and the third extends from the mouth of Whau Valley to the Kamo thermal springs. The downthrow increases as the Hatea Stream is approached, so that the active Whangarei (Harrison's) Colliery and the abandoned Kamo workings both lie in the western or least-depressed portion of the area. From a study of old bore-logs and from geological data gathered in the field, the writers believe that the portion of the field between Harrison's workings and the Waitaua-Hatea junction would well repay the cost of further boring.

The basalt sheet which stretches from the Whauwhau Coalmine westwards to Maruarua Creek probably covers at least small patches of Miocene strata, but the chances of boring being successful in finding them are problematical. Not until other coal areas in the subdivision have been exhausted will this area be worth attention.

Whangarei Survey District.—Of the two known coal-bearing areas of Whangarei Survey District that of the Kiripaka-Ngunguru area has just been exhausted. That at Whareora contains merely the remnant of a small seam. Observations at the outcrop show it to be limited along both strike and dip by a ridge of greywacke, a rock much older than the coal. A few tons might be extracted to meet the requirements of the neighbourhood.

* R. W. Holmes: "Notes on an Artesian Trial Bore, Westshore, Napier." Trans. N.Z. Inst., vol. 49, pp. 509-12, 1917.