can be obtained by drilling there; but, should the gas be heavy with a fair percentage and a strong odour of hydrocarbons higher in the series than methane, the prospector will be justified in concluding that a body of liquid hydrocarbon is somewhere in the neighbourhood."*

(*d.*) *Outcrops of Bituminous Strata.*—Throughout the district sandstone bands and dark carbonaceous shales smelling of oil occur plentifully in the Tapuwaeroa and Taitai beds. Exceptionally, near the contact with the oil rocks, the basal Tertiary and upper part of the Raukumara Series smell of oil.

(*e.*) *Manjak, Ozokerite, &c.*—Ozokerite, the solid residue from the inspissation of paraffin oil beneath the surface, has been reported to occur at Rotokautuku. Skey† showed that it is not ozokerite, but a grease formed out of some of the constituents of petroleum by oxidation and absorption of water, and gave it the name of "dopplerite."

These oil-indications justify the conclusion that a body of liquid hydrocarbons exists in the district. Whether the oil is concentrated in payable quantities can, of course, be determined only by drilling. Haphazard drilling is, however, too risky and too expensive; and modern oilfield practice is based on geology as the only means in advance of drilling by which anything of the underground conditions can be ascertained.

The work so far done has eliminated the country covered by the lowest (Raukumara) rocks and by the highest (Te Arai and Tawhiti) rocks as unfavourable, and has shown that the middle (Tapuwaeroa and Taitai) rocks, although not folded into broad domes or gentle anticlines or other simple ideal structures, are in places favourably disposed for the accumulation of oil in quantity.

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3. OHURA SUBDIVISION.

(By L. I. Grange.)

Introduction.

During the field season which lasted from October, 1921, to the middle of May, 1922, the following survey districts were examined in detail: Aria, Tangitu, Rangi, Piopiotea West, and parts of Waro and Ohura, containing in all about 400 square miles. This area, together with the adjoining "Tangarakau Subdivision" examined last year by Mr. H. A. Ellis, is now termed the "Ohura Subdivision." This season Mr. Ellis was in the field from October to the middle of November.

Physiography and Structure.

At the close of the Tertiary period the rocks of the subdivision were considerably faulted. Two main faults, each of large throw, divide the area into three north-westerly-dipping blocks and determine in part the boundary of the coal-bearing strata. These are the Ohura fault, which, trending north-eastward, can be traced from immediately west of Ohura Township to Matiere and Waimiha; and the Aria fault, which extends south-south-west from Morgan's Greencastle Mine, in the north-west of the district, to the head of the Panirau Stream. Many faults striking north-east and north-north-east traverse the major earth-blocks. Denudation subsequently destroyed in great part the physiographic evidence of structure. The area consists chiefly of uplands of moderate altitude produced by later elevation and erosion.

General Geology.

The oldest rocks of the Ohura Subdivision are Tertiary mudstones and alternating sandstones and mudstones continuous with the Mahoenui beds of the adjacent Mokau district. They are followed by massive sandstone layers, which are in turn succeeded by argillaceous sandstones. The whole series, which corresponds with the Mokau Series of the Mokau Subdivision, is over 1,000 ft. thick. In the western part of the district the massive sandstones contain coal-seams which, in at least parts of the area, thin to the east. Where the coal-measures are absent there is evidence of an unconformity at the base of the series. Overlying the Mokau Series, in most places conformably, are beds placed in the Mohakatino Series. In Tangitu, Rangi, and Piopiotea West survey districts an erosion interval is indicated at the contact by a band of conglomerate averaging 9 ft. in thickness, made up of sandstone and mudstone boulders and a few greywacke pebbles, as well as by the slightly uneven surface of the underlying beds. Fully 700 ft. of strata, consisting principally of mudstone, in which occur bands, lenses, and nests of andesitic tuff, compose the Mohakatino Series. The Tertiary sequence is closed by argillaceous sandstone, 70 ft. thick, which outcrops in two small areas in the north-west of Aria Survey District. This represents the Tongaporutu Series.

The rhyolitic breccia of the Ongarue Valley, near Waimiha, and of the high ridges farther west, the weathered brown pumice sprinkled over many of the upland slopes, and the white unconsolidated pumice of the terraces of the Ongarue and Wanganui rivers, form the Pleistocene and Recent deposits.

Economic Geology.

Coal.—The outcrop portion of a large coalfield, an extension of the coal-measures of the Mokau and Tangarakau districts, has been mapped in the Waitewhena, Panirau, Paraheka, and Mangaohutu valleys. The field extends almost continuously from the north to the south of the subdivision. Except for small areas capping high ridges, it is bounded on the west by the Aria fault; but to the east, at no greater distance than four miles from this fault, the coal thins out and is not present farther eastward, although what is believed to be the coal-horizon was observed at many points. The coal-measures are about 70 ft. thick, and in places contain several seams, of which the lowest is always the main seam, the upper seams rarely exceeding 5 ft. in thickness.

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* E. H. Cunningham Craig: "Oil-finding," p. 165, 1920.

† Trans. N.Z. Inst., vol. 14, pp. 397–99, 1882.