

below, which very likely—but not certainly—contain the other product of distillation of carbonaceous material—namely, petroleum.

As mineral waters nearly always accompany petroleum, mineral springs and the evidence of former mineral springs are to a limited extent favourable indications. Travertine, a deposit of a former mineral spring, occurs at several places in the area, notably at German Hill.

A loose porous stratum, such as a sandstone, a conglomerate, or a limestone, is ordinarily considered the most favourable situation for the occurrence of a large reservoir of petroleum, when this is capped by an impervious stratum such as a shale or a claystone. Interstratified claystones and sandstones have been pierced by the various drill-holes so far sunk; but it may be said that the sandstones, being generally fine-grained and argillaceous, are usually not sufficiently porous to contain much oil. It is thought that most of the small pools so far encountered are either in fissures in both sandstones and claystones, or are very minor impregnations in the more porous of the sandstone beds, and that the oil has arisen through fault-planes (which are widespread in this locality) from reservoirs more deep-seated than those so far pierced by the various bores.

A complete examination of the Tertiary strata so well exposed eastward and northward from Moturoa to the Mokau gives the observer a very fair idea of what may be expected in the drill-holes. Overlying the extensive Mokau coal-beds, the south-westerly extension of which, by coming in contact with volcanic heat or mere increase of heat towards the earth's interior, have been the source of the petroleum, are thick beds of porous green sandstones. It is thought that until these are cut by drilling no very extensive pool of oil will be struck, unless perchance a large fissure rising from great depths is reached above. Consequently it follows that, in the writer's opinion, the drill-holes so far put down at Moturoa are not sufficiently deep, and he would suggest that one hole be chosen, preferably No. 3 (as being the most westerly and consequently apparently the nearest to the source of oil), and pushed down until the porous stratum seen on the Mokau is encountered. It would be quite hypothetical in the present state of the geological survey of the oilfield to say at what depth this stratum will be reached, but it is hoped to obtain more definite knowledge on this point before our work in the locality is complete. Meanwhile the exploratory bore should be proceeding.

In the present state of our knowledge it seems to the writer that hopeful petroliferous country, in which boring might later be carried out with success, lies between the present No. 3 bore and the foot of the breakwater. Any bores, however, sunk in this locality should await the results of the deep trial bore—the continuation of No. 3—and when put down should be located at a sufficient distance from the foreshore to be uninfluenced by the sea.

Away from Moturoa all indications must be closely examined and carefully studied before sites for boreholes are chosen. Ordinarily the crest or near the crest of a faulted anticlinal fold is considered the most hopeful site for boring. To such a natural apex the oil would readily ascend through the faults till a porous stratum was reached, from which stratum further migration upward was prevented by an impervious roof.

It is thought that the geological survey will be able to reveal, especially towards the east of the field, these anticlinal crests, near which gas now issuing—evidently through fissures—suggests petroleum-pools beneath. However, the work has not yet advanced sufficiently to speak definitely on this point. In the eastern part of the area drilling would probably not necessarily have to be prosecuted to such depths as near Moturoa, since there is a general rise of the strata towards the eastward and northward.

It may be remarked in closing that, even with the greatest attention given to all geological details before selecting a borehole-site, there is danger that the lower part of the petroliferous strata encountered “may contain water instead of gas and oil; or may be calcified or silicified instead of being bitumenized; or that water has entered the outcrop of the strata at higher altitudes [than the borehole-site] and ascended through the formation, floating the oil to the surface and carrying the same to the other dip of the anticline”<sup>\*</sup> than that on which the drill-hole is proceeding.

It is unfortunately true that theory and observations cannot be perfect, but they are immeasurably better than the mere guessing which alone can be said to have accounted for the choice of the sites of many of the Taranaki boreholes.

In the writer's opinion the chances for oil in Taranaki may in general be said to be as good as in any imperfectly tried field, and it is hoped that after the observations of the Survey are complete the industry will be pushed as vigorously as surface indications certainly seem to warrant.

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<sup>\*</sup> See “The Genesis of Petroleum and Asphaltum in California,” by A. S. Cooper. Bulletin No. 16, Calif. State Mining Bureau.