

practical difficulties in boring in the disturbed Cretaceous rocks, and some wells had to be abandoned before the desired objective was reached. The oil-seepages, gas-emanations, mud volcanoes, salt springs, and other indications are so widespread, while in addition thick promising strata cover so large an area that the undertaking of further drilling is very desirable. The general structure, however, is so complex that no well should be bored without the most careful geological and geophysical exploration.

Geological conditions, though similar, are probably not so favourable in southern Hawke's Bay and eastern Wellington, which form the southern part of the same petroliferous area.

The Murchison basin is an area of Tertiary rocks sixty miles long and up to twelve miles wide, enclosed in the mountains of western Nelson. There are 20,000 ft. of Tertiary sandstones, mudstones, and conglomerates which are thrown into a series of folds. Oil seeps out at several points along faults, but so far only one well has been drilled and this was unsuccessful at a depth of 3,474 ft. The folds are sharp and broken, and no drilling should be carried out without careful detailed mapping.

The strongest oil seepages in New Zealand are at Kotuku on North Westland, about twenty miles east of Greymouth. The surface gravels over an area of several acres are heavily impregnated with petroleum which readily collects in any holes that are dug. The area is in the extensive lowland which stretches southwards as a rather narrow strip to Ross and northwards between the Southern Alps and the Paparoa Mountains towards Reefton. Unfortunately, gravels and moraine largely conceal the Tertiary sandstone, mudstone, and limestone that seems to underlie the whole area. The results of a good many bores at Kotuku are unsatisfactory for the total yield is only a few hundred barrels. Two bores reached the underlying ancient rocks. Here there seems to be a gentle anticline somewhat complicated by faulting. Untested structures in the region some distance from Kotuku are worthy of careful investigation.

Much of the search for oil in New Zealand has been carried out on the fatalistic principle that the success of prospecting is so uncertain that no care or skill is required in the selection of the sites of bores. Some wells have been sunk because a seepage was close at hand, others because the access was good, and others after a most cursory geological examination. Such methods have provided costly failures. Though the uncertainties of drilling are known full well, the success of approved methods of locating bores is so manifest that disregard of geological consideration bespeaks negligence.

CONCLUSION.

It will be seen from the foregoing that the chances of finding "flow" oil in New Zealand, sufficient for her requirements and possibly also for those of Australia are reasonably good. Even if found, however, economic development under present world conditions is largely influenced by the cost of transport presumably by pipe-line, to the nearest port or centre of distribution. Nevertheless, the evidence submitted justifies an extensive geological and geophysical programme, the cost of which is extremely small compared with the interest on the capital cost involved in the production of oil by other methods. The possibilities of finding flow oil must be considered in connection with any proposals for hydrogenation, and it is preferable that these possibilities should first be investigated by an intensive programme during the next few years.

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