

flame out for more than a few seconds at a time. Consequently no sample of gas could be obtained in the time then at my disposal. The spring came through a landslip, apparently in Cretaceous rocks. During May of this year I again visited this district, with a view to the inspection of the bird-life, and explored more particularly the Isolated Hill Creek, which rises in a large area of bush between the mountains Benmore, Whernside, and the Isolated Hill, and runs through a narrow limestone gorge between Benmore and the Isolated Hill, to join the Ure River about a mile above Messrs. Boyds' homestead. In this limestone gorge there are several small "sulphur" springs, while in a smaller limestone gorge in the right branch of the creek, about three miles from the Ure River, a seepage of oil occurs right in the bottom of the creek. The amount of oil issuing is apparently not great, but the supply is sufficiently constant to keep the surface of water continually iridescent in a small rapid. A little farther up this valley a pool of standing water covered with oil was discovered a few yards to the side of the creek. A sample of the oil was collected and submitted to the Dominion Analyst, who reported as follows:—

"Mineral oil from surface of standing pool alongside right branch of Isolated Hill Creek, Ure River, Marlborough: The sample is an oil, distilling between 250°-390° C. (thermometer in vapour). The benzene and lighter oils usually associated with petroleum were absent. The distillate may be divided as follows:—

	Per Cent.
" 250°-300° C. Burning-oil	28.5
300°-390° C. Lubricating-oil	66.0
Residue (pitch)	5.5
	100.0

"Paraffin not more than 0.5 per cent.

"J. S. MACLAURIN, Dominion Analyst."

It is probable that the oil originally contained benzene and lighter oils, which have been lost by evaporation.

The oil-seepage of the Isolated Hill Creek lies near the line joining the gas springs of the Kekerangu River and the Ure River, and there can be little doubt that all these occurrences are related in origin. The source must be looked for in some member of the Cretaceous strata which underlie the Amuri limestone of that district. The sequence of beds in this part of Marlborough consists of—

- (1.) An underlying series of greywackes and argillites of great but unknown thickness;
- (2.) Conglomerates, sandstones, and dark mudstones of Cretaceous age;
- (3.) The Amuri limestone and flint series, apparently ranging in age from Cretaceous to Miocene;
- (4.) Light-coloured mudstones (Grey Marls) of Miocene age;
- (5.) The Great Marlborough Conglomerate.

The Cretaceous rocks are about 12,000 ft. thick at Coverham, in the Clarence Valley, to the south-west, and apparently thin very rapidly as the coast is approached; but complete sections are not here accessible. They consist chiefly of black mudstones and hard sandstones at Coverham, but the mudstones are lighter and more micaceous in the Isolated Hill Creek, while bands of soft glauconitic sandstone are found near the saddle of the pack-track between Coverham and Kekerangu. A single boulder of a loose sulphur sandstone was observed in the Isolated Hill Creek, but the outcrop of this rock was not observed. If it occurred in mass it would make an excellent rock to serve as an oil-reservoir.

The Amuri limestone and flint series follows conformably on the Cretaceous mudstones, and is nearly 3,000 ft. thick opposite Coverham, in the Chalk Range, the flint-beds occupying about 1,000 ft. at the base of the series. The flint-beds become much thinner to the north-east, and are little over 400 ft. in the Isolated Hill Creek, and still less on the south side of Benmore; but it is not known whether the total thickness of the series becomes less in this direction, as part of the upper beds is cut off by faults. The succeeding beds—viz., the Grey Marls and the Great Marlborough Conglomerate—do not outcrop in the area in which the oil-indications occur.

The disposition of the beds is fairly regular in the middle Clarence valley, where the Cretaceous rocks and succeeding beds up to the conglomerate dip at fairly steep angles to the north-west, and outcrop in long strips running north-east and south-west. The conglomerates are bounded on the north-west side by the greywacke series, and are separated from it by a great reversed fault. To the north-east of the middle Clarence valley the beds change in strike, and sweep round in a half-circle across the line of the valley, while the great Clarence fault appears to branch, and several subordinate faults also appear. The complex structure thus produced has not yet been thoroughly investigated, and must await the production of a geological map before it can be satisfactorily described. All that need be stated here is that within the half-circle of the Chalk Range, Brian Boru, the Isolated Hill, and Benmore, along which the Amuri limestone outcrops (dipping outwards), there is a down-faulted block, extending from Whernside to near the forks of the Isolated Hill Creek, which has brought down the Amuri limestone to so low a position that it appears in the bed of the right bank of the Isolated Hill Creek at least 1,000 ft. below the base of the flint-beds on the spur of Benmore, less than half a mile to the north-east. It is in the gorge cut through the limestone of this down-faulted block that the oil-seepages above described occur. How great a thickness of limestone in a vertical direction here exists cannot be at present estimated.

It is obvious that the indications of oil-bearing country here described do not warrant the expenditure of any money in boring at present. The district is pre-eminently one in which a geological survey should precede the oil-pro prospector. The country is mountainous and traversed by many gorges, so that geological exposures are very good. There is no present prospect of any other mineral wealth than oil being discovered, but the oil-indications are sufficiently pronounced to warrant at least a reconnaissance geological survey.