Laboratory Work.

Soil and water samples collected systematically are being analysed in the Dominion Laboratory in order to determine their "potential plant-food" content and the presence or absence of substances that may be harmful to plant-growth. These determinations will be continued periodically, and will yield data of permanent value in connection with the complicated subject of irrigation and its consequences.

In most countries where land is brought under irrigation certain deleterious effects sooner or later become manifest. Central Otago is no exception, though naturally the harmful effects of irrigation water are not so great as in countries where evaporation is greater and rainfall less. In portions of some irrigated areas in Central Otago soluble sulphates inhibit the growth of pasture grasses, whilst in other places excess or deficiency of water itself has a deleterious effect upon the soil. The degree to which these harmful factors operate depends upon the quantity and manner of application of irrigation water, upon the quantity of soluble salts naturally present in the soil and subsoil, and upon the general porosity of the land. The work now being done portrays the present state of the land, and any chemical changes that may take place in the future will be easily recognized.

Collateral Work.

Geological advice, as detailed in another report, was given to the Public Works Department with regard to rock-structures.

As opportunities presented themselves, data were collected with regard to the occurrence of gold, lignite, and other mineral products of the district. These will be discussed at some future time, when more observations are available from a wider field than has been covered during the past field season.

5. WAIROA, NAPIER, AND RAUKAWA WEST, HAWKE'S BAY.

(By P. G. Morgan.)

From the 19th to the 25th August, 1925, I was in the Hawke's Bay Land District, and during this time made visits from Napier to Wairoa and Raukawa West.

While at Wairoa (formerly called Clyde) I examined a small part of the coast-line south-west of the mouth of the Wairoa River, and also a small area north-east of Wairoa, on the east side of the river. The rocks in these localities, other than Recent deposits, are mainly rather poorly fossiliferous claystones, either nearly horizontal or dipping to the south-east or south-south-east at angles varying from 1° or 2° to 10° or more. On the Napier Road, between Wairoa and the Waikare River, the rocks are mainly claystones, and in various places show dips to the south-east similar to those seen near Wairoa. The fossils found in the Wairoa claystones, according to Dr. J. Marwick, indicate an Upper Miocene age. Hitherto the oldest rocks near Wairoa and along the coast south-westward have usually been regarded as of Pliocene age.

Several reports and papers on the geology of the Napier district have been written, but as yet exact agreement regarding the stratigraphical position of the limestones and other calcareous rocks forming Bluff Hill (Scinde Island) has not been reached. Lately, near Napier Breakwater, on the advice of a water-diviner (or dowser), a bore was drilled in search of oil to a depth of 360 ft. This, I understand, penetrated blue claystone and similar rocks. No oil was found. On the western side of Bluff Hill the strata dip westward at angles which may reach 15°; on the eastern side near the bore they are nearly flat. Hence there is a structure not unfavourable to the accumulation of oil, if it is present in the strata.

On the 24th August Raukawa West, some miles south of Maraekakaho, and about twelve miles south-west of Hastings, was visited. Here, on the property of Mr. W. Macfarlane, is a bore which, on the advice of the dowser referred to above, was drilled to a depth of 691 ft. in search of natural gas. Only a little gas—not enough to be of any use—was encountered. When the cap on the casing was removed the accumulated gas, on being lit, burned for a few seconds. The lower part of the bore had probably collapsed, otherwise the flow of gas might have been a little greater. The bore is said to have been drilled through blue papa (claystone), sandy in the lower part. A small flow of water with a slight taste of mineral salts and a faint smell of sulphuretted hydrogen escapes from it.

About a quarter of a mile to the north, on the west side of Waikerenui Creek, there is a strong emanation of inflammable gas. The gas escapes with a considerable flow of salty water. Both gas and water have been previously analysed. A sample of the gas taken by me on the 24th August last contained 91·9 per cent. of methane and 2·6 per cent. of ethane (Dominion Laboratory No. Q 2366).

Near the gas spring, in a rill draining to the Waikerenui, fine-grained fossiliferous calcareous sandstone is exposed. The overlying and underlying beds are probably claystones. About 300 ft. above, near the top of the higher ridges on both sides of the Waikerenui Valley, a band of shelly limestone outcrops. This lies nearly horizontal, and is at almost the same level on either side of the valley. Thus probably no fault traverses the strata of the Waikerenui Valley, as has been supposed. North of the gas-emanation described above there are, as I was informed, other gas springs.

Oil and Gas Prospects, Hawke's Bay.

East of the Ruahine Mountains nearly the whole of Hawke's Bay is covered by Upper Tertiary strata. In some parts Upper Cretaceous beds appear on the surface. These Tertiary and Cretaceous rocks are of marine origin, and not unreasonably may be expected to contain petroleum in places where the structure is favourable. Detailed geological survey is necessary in order to locate possible oil-bearing structures and to estimate the chance of success if drilling is undertaken.

Gas-emanations are not uncommon in Hawke's Bay—for instance, in the Nuhaka-Morere district; at Raukawa West, as described above; near Weber, &c. Probably, therefore, considerable supplies of natural gas could be obtained in these and other districts by drilling in the right places.