portion at least of Frying-pan Flat was blown up, and a "blast," presumably of air, but carrying with it much watery vapour (or "steam") and fine debris swept up the neighbouring valley, and in its course wrecked the accommodation-house. Parts of the building were carried a distance of a mile. Some hours later the violence of the eruption had lessened, but much steam was escaping from Frying-pan Flat. During the next few days several paroxysmal eruptions took place. One on the evening of the 3rd April lasted for three hours. The next day, following several small outbursts, there was a violent eruption from ten minutes past 12 to 1 o'clock. On the 3rd April five "blowholes" were visible on Frying-pan Flat. At least two of these had been violently active on the preceding Sunday, and had thrown boulders of all sizes to a height of possibly half a mile or more. All the vents were active at intervals during the 3rd April, and some of the "shots" reached a height of 800 ft. or 1,000 ft. Much of the material thrown out on that day was described as dry. During the eruptions the pool to the south of Frying-pan Flat, the site of the old Waimangu Geyser, was, it is stated, quiescent.

At the entrance to Frying-pan Flat debris was piled to a depth estimated at 100 ft. One observer stated that the country to the south for a distance of three miles was covered by a deposit of dirty-whitish mud, varying in thickness from many yards to an inch or two. Another observer estimated the debris-covered area as four miles long by two miles wide.

Outbursts on a small scale appear to have continued at least into the month of June, when a fiercely boiling pool was observed at the south end of Frying-pan Flat. Round this lake were several vents, from which at intervals mud was thrown in geyser-like fashion to a height of 60 ft. or 70 ft., and occasionally to much greater heights. It is worth noting that during several days in May White Island is said to have been "most active," a statement which presumably means that a cloud of steam was rising continually from the crater. One night "vivid flashes of blue flames" were observed from Whakatane.

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15. PETROLEUM.

During the past few months the Blenheim bore of the Taranaki Oil Lands Acquisition and Development Company (New Plymouth), according to information obtained from the company, passed from bluish claystones and sandstones into dark carbonaceous shale, alternating with highly calcareous claystone or marl. At the time of writing (July, 1917), the bore was reported as 5,021 ft. deep. It is thus evident that the geological estimates of at least 5,000 ft. of sedimentary rocks being present at New Plymouth below the surface deposits of volcanic debris are not under the mark.

The Huiroa bore, drilled fifteen miles north-east of Stratford by the Consolidated Oilfields of Taranaki, on the 2nd May, 1917, had reached a depth of 4,921 ft. The strata penetrated consisted almost entirely of bluish mudstone.

At Kotuku, in North Westland, a prospecting-bore was drilled during the year somewhat to the west of previous bores. The indications of petroleum obtained were somewhat favourable. It may here be pointed out that the Kotuku district is by no means unpromising as an oilfield, and deserves further prospecting. Here are the largest oil-seepages in New Zealand, while bores have shown the presence of abundant salt water and carbon dioxide. Recent investigations have shown that under certain conditions carbon dioxide may be regarded as an indication of the occurrence of petroleum.*

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16. POTASH.

During the past two years various inquiries for information concerning potash were received by the Geological Survey. Much information concerning this substance has been given in the *Journal of Agriculture*, and a few months ago the Director of the Geological Survey wrote an article for that journal, which was published in the April number under the title of "Potash in New Zealand and Other Countries."

In that article it was pointed out that potassium oxide, according to F. W. Clarke, forms 3 per cent. of the earth's solid crust, so that if chemists can indicate practical methods of making the potash-contents of rocks and soils "available" for plant-growth a real potash famine is not possible. That this can be done need not be doubted. The average potassium-oxide content of seventy-five New Zealand igneous rocks, analyses of which are published in Geological Survey bulletins, is 2·26 per cent., and fifty analyses of sedimentary rocks, selected from the same publications, show an average potash-content of 2·76 per cent. The combined average is 2·46 per cent., which is decidedly below Clarke's estimate for the earth's crust; but it is fairly safe to say that a properly weighted average would show at least 2·8 per cent. of potassium oxide in New Zealand rocks.

There is no ground for expecting that large deposits of soluble potash salts such as those of Stassfurt, Germany, will ever be found in New Zealand. Therefore, if potash is to be produced in New Zealand, it must be obtained from the suint of greasy wool, from wood-ashes, burnt seaweed, insoluble potash minerals, or potash-bearing rocks. Another source, theoretically as available to New Zealand as to any other part of the world, is sea-water. The investigation of the potash in organic materials such as suint, wood-ashes, or burnt seaweed (kelp) is, of course, a work outside the province of the Geological Survey, and must be left to others.

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*Rogers, G. Sherburne: "Chemical Relations of the Oilfield Waters in San Joaquin Valley, California." U.S. Geol. Survey Bull. 653, recently published. No copy of this bulletin has yet reached the New Zealand Geological Survey Office, and the title is quoted from the *Mining and Scientific Press*, 28th April, 1917, p. 588.