During the nearly rainless months early in this year (1928) unusually large amounts of fibrous white and yellow salts encrusted the thermally altered ground. Aluminium, ferric and ferrous, and sodium sulphates are the predominating salts in them, though traces of chlorides are also present. Those occurring at Sulphur Gully and Frying-pan Flat contain ammonium salts, the nitrogen of which is generally believed to be derived from the magma.

The temperatures of the springs near Rotorua vary considerably. Over a period of nine and a half months—from 15th September, 1927, to the end of May, 1928—the lowest average temperature of fourteen springs was 173·7° F., and the highest 194° F. On the 6th October, the 10th November, and in the middle of December the temperatures were high. During the whole of January and February they were low, and in March rose slightly, the highest being on the 17th. Temperatures continued to rise during April, reaching, on the 26th, a maximum just a little below the highest for December. They were also high in May, the maximum being on the 15th.

The record from January onward shows the effect of rainfall. The temperatures were low during the dry period and became high after heavy rains. Probably the increase is caused by additional water descending and accelerating the circulation of the ground-waters.

Some of the springs, more particularly the mud-pots, are affected by rainfall in the reverse way. In summer the amounts of water in them decreases and the temperatures increase, whereas during wet weather they are flooded and the temperatures fall. No doubt these springs are shallow, receiving surface waters from small surrounding basins.

Economic.

Sulphur.—The principal sulphur deposits of the subdivision are at Tikitere and Te Tarata (south of Rotoiti), on the eastern side of Rotorua Township, and at Rotokaua. In the few sections that were seen the ore is usually not more than 2 ft. 6 in. thick. Most of it is high-grade, the sulphur content ranging from 60 to 94 per cent. The larger areas in the Rotorua district have been worked for the high-grade material. From the Tikitere–Te Tarata area about 5,000 tons of crude sulphur was obtained between 1900 and 1902, and at Rotorua 6,460 tons has been obtained. Using the scanty data at present available, the writer estimates that between 5,000 and 6,000 tons of sulphur (reckoned on a 100-per-cent. basis) occurs in the Tikitere – Te Tarata area, between 7,000 and 8,000 tons at Rotorua, and about 3,000 tons at Rotokaua.

Gold and Silver.—A visit was made to a quartz vein discovered in 1924 by a Maori in a rill of the Waiaute, a branch of the Tarawera River. An excavation about 15 ft. long by 8 ft. wide in the bed of the rill exposes a light-slate-coloured mineralized rock in which common opal and small crystals of pyrite can be recognized. Thin sections show opal, quartz, and pyrite. Less than a chain up the rill the enclosing rock, a fresh augite hypersthene andesite, outcrops. Still higher up, mineralized rock, pug, and andesite are found for about 3 chains. The extent of the mineralized rock cannot be stated owing to the thick covering of rhyolite tuff. Small outcrops were located in a creek about one mile and a half to the south-east. The highest values per ton in the samples collected by Mr. M. Paul, Inspector of Mines, were gold, 3 dwt. 4 gr., and silver, 9 dwt. 19 gr. The andesite appears to have been altered by hot springs at the surface, and consequently it is not thought that values will be better at a greater depth.

Diatomaceous Earth.—As mentioned above, thick beds of diatomaceous earth occur in the Whirinaki and Waikato valleys. In the Whirinaki Valley it outcrops at intervals over a distance of 90 chains, the thickness being from 15 ft. to 18 ft. In this locality more than a million tons is present. The diatomite in the Waikato Valley is up to 15 ft. thick. A sample from the Whirinaki Valley contained 73·16 per cent. of silica and 12·61 per cent. of water. The impurities are most likely mainly very fine glass-particles.

Clays.—Highly plastic clays—white, grey, and red—formed by the thermal alteration of the rhyolite tuffs and flows occur in many parts. The Dominion Analyst reports that a sample from a large deposit on the western side of Paeroa Range, north-west of Maungaongaonga, consists of finely divided clayey material with about 8·7 per cent. of quartz-particles. If the analysis of the sample, the free quartz being omitted, is recalculated, it agrees fairly well with the theoretical composition of kaolin and very closely with those of kaolins given by Dana.

Roadmaking-material.—Most of the roads of the subdivision are formed of the pumice of the late showers. If graded and repaired often, a good surface can be kept on it. The best road-metal is the basic andesite; the nearest deposit to a road forms the hill west of Taupo on which Trig. K is placed.

5. MURCHISON SUBDIVISION.

(By H. E. Fyfe.)

Introduction.

Field-work was recommenced in the Murchison Subdivision for the second season early in October, 1927, and continued till late in May, 1928. Some 400 square miles in the survey districts of Lyell, Maruia, Tutaki, Matiri, Maunga, and Rotoroa were examined in detail, thus completing, with the exception of a small area in the Maruia Survey District, the survey of this subdivision. The area described adjoins on the west the Buller–Mokihinui and the Reefton subdivisions (Bulletins Nos. 17 and 18), and on the north the Motueka subdivision.

Structure and Physiography.

North-north-east-striking faults divide the area examined into a series of earth-blocks, some elevated, some depressed, and tilted in different directions, east and west dips predominating. Occasionally the covering Tertiary strata are horizontal or gently warped, and in the vicinity of faults