Ocean Island.

Ocean Island, in the British Protectorate of the Gilbert Group, is in latitude 0·62 S. and longitude 169 E. It is almost oval, and five or six nautical miles round. This is a dreary rock in comparison with Nauru—a little overgrown with pandanus-trees and coconut-palms. For twelve years it was the scene of a great mining scheme whose production was greater than that of Nauru, but will probably become less. The phosphate is rather easier to work than that of Nauru, and the island contains 15,000,000 tons of phosphate of tolerably uniform quality, and corresponding on the dry substance to 85·25 to 86·75 per cent. of tricalcic phosphate. As in the case of Nauru, the greater part goes to Australia and Japan. Nauru and Ocean have gone through similar geological history. While on Nauru 1 to 3 per cent. of the phosphate consists of pieces twice as big as a fist up to big blocks, that on Ocean Island which occurs between the pinnacles is in the form of not only loose gravel and sand but for the greater part of loose coral rock, which can generally be split up with the pickaxe. On Nauru, on the contrary, the pickaxe is seldom made use of. On Ocean Island the greater part of the phosphate may be best put through a breaker. There is a great lack of water on Ocean Island, and before the company provided condensers there was often a crying want of water. There are five hundred inhabitants belonging to the Gilbert Islands, but they are somewhat darker in colour. The winning of the phosphate, although easily broken up with a tomahawk, requires more working than Nauru phosphate. The material has to be shovelled into baskets running on top of wagons on portable rails. It is often difficult to get phosphates from between the rocks forming deep shafts, cañons, and crevasses into the wagons on the surface. Phosphates are won in this way from a depth of 50 ft. The ease of working in the past must have been very much greater than it is now.

The island has a desolate appearance. The fluorine content of Ocean Island is somewhat higher than that of Nauru. This was much discussed some years ago. The author was not able to find bromine or iodine in Ocean Island phosphate. Ocean Island phosphates contain less iron and alumina than those of Nauru—generally less than 0·6 per cent. Ocean Island is gradually rising. The island is subject to rapid erosion by the sea. Power quotes an example: platforms used for the huts of Natives are now so near the waves that—standing directly on steep cliffs—at present no one dare live in the huts, which are being undermined.

The analysis of two samples of the phosphate dried at 100° C. gave 85·9 per cent. and 85·3 per cent. $Ca_3(PO_4)_2$. The banded hard phosphate agates are better developed in Ocean than in Nauru Island.

Angaur Island.

Angaur is supposed to have from 300,000 to 600,000 tons of phosphate, ranging from 81 to 83·6 per cent. In this connection, however, Fritsch ("The Manufacture of Chemical Manures," 1911) states: "Angaur Island phosphate: The deposits of Angaur Island phosphate comprise about 2,500,000 tons, which may be extracted in the open. Four-fifths of the deposit consist of a phosphate with a content of 80 per cent. of tribasic phosphate of lime. Working reserve for thirty-five years to a German company with a capital of 4,500,000 marks (say, £225,000)."

Makatea Island.

Makatea Island, which is 130 miles north-east of Tahiti, is a coral reef, 7½ km. long, 3½ km. broad—approximately the same area as Nauru Island. In comparison with the other islands of the Paumotu Archipelago, Makatea is elevated, and rises from 50 to 76 metres above the sea. It contained formerly one hundred inhabitants, Natives of Polynesia. A French company works the island. The chief deposit contains 80 to 85 per cent. phosphate of lime. There is a phosphatic sand in the neighbourhood of the beach—70 to 72 per cent. In 1910 400,000 tons of high-grade phosphate was shipped. It is only on account of the high quality of the Makatea phosphate that it could be shipped to compete with that of Florida and North Africa. At first at Makatea there was no assessor, and there were troubles with the Natives. At Makatea there is a pier 300 metres long, an elevating-work 200 metres, and extensive rock roading. There are several kilometres of railway. The mooring-buoys are anchored, 400 metres deep. Analysis of the rocks shows 37·88 per cent. phosphoric acid, analysed in Paris, undried 38·68 per cent., dried at 100° C. In both cases there was an excess of lime over that required to form $Ca_3(PO_4)_2$. Fritsch says, "There has been discovered in the Island of Makatea deposits of phosphate containing, according to the analyses made, from 60 to 85 per cent. and even 90 per cent. of pure phosphate of lime. Makatea Island belongs to the Paumotu Archipelago, and lies 120 miles to the north of Tahiti. It is four miles and a half long and one mile and a half wide. Its formation differs from all the other islands of the Paumotu Group in that it has no lagoon, and rises up to 230 ft., whilst the other islands are simply chains of an average of 8 ft. above sea-level. Phosphate has been found in several of these atolls, especially that of Niau. Guano has also been found in Pukapuka, in the extreme north-west of the group. The deposits of Makatea are estimated at 30,000,000 tons, and will be exploited by a French company."

Malden Island.

Malden Island is worked, but is not suitable for making into super, as the Malden phosphate is a very greedy consumer of sulphuric acid. It is a low-grade phosphate, and the price in Australia is high enough to exclude its manufacture into super. The best phosphate was long ago removed from Malden Island, but Elschner believes that it is still worked by Greiss and Co. It is ten miles long, flat, with a lagoon in the interior. Originally the rock was 78·3 per cent.; at present it is 66·1 per cent. There are gypsum deposits on the island.