

Coarser, better-graded sand could probably be obtained by searching the bed of Grande Rivière, or also from gravel pits at other places on the North Plain. Coarser sand was noted particularly near Le Trou. The deposits are extensive, and by proper screening, washing, and mixing could supply large quantities of good building sand.

Black sand derived from the disintegration of dark basaltic rock occurs in small amounts along some of the streams and more rarely on the beaches of the Southern Peninsula. A sample was obtained on the beach near the mouth of the Grande Rivière de Jérémie, where this sand is particularly abundant. It consists principally of fragments of dark basalt, augite, and magnetite, with a little calcareous sand. The magnetite constitutes perhaps 10 per cent of the sand. The screen analysis of this sand is as follows:

Mechanical analysis showing fineness of black sand from beach near Jérémie.

Percentage of material passing	$\frac{1}{4}$ -inch screen, retained on	20-mesh..	6
Percentage of material passing	20-mesh screen, retained on	28-mesh..	4
Percentage of material passing	28-mesh screen, retained on	35-mesh..	9
Percentage of material passing	35-mesh screen, retained on	48-mesh..	24
Percentage of material passing	48-mesh screen, retained on	100-mesh..	55
Percentage of material passing	100-mesh screen, retained on	200-mesh..	2

100

This sand has been used in concrete at Jérémie, but the results are not known. It can not be very good for the purpose, as it is more poorly graded and much finer than either of the samples for which tests are given on page 508. If coarser, better-graded sand of this kind could be obtained it should be better than calcareous sand, although somewhat inferior to the siliceous sand.

Deposits of sand suitable for special uses demanding high purity or refractoriness, such as for glass making, molding, or the filtration of water supplies, probably do not exist in commercial quantities in the Republic of Haiti.

SALT.

Almost all the salt used in the Republic is obtained by evaporating sea water with the natural heat of the sun. This salt is highly esteemed, is cheap, and is consumed in large quantities.

Salt works are easily constructed at almost any place where there is at least a narrow strip of low land near the shore. Large works near Gonaïves, Baie de Henne, and Grande-Saline were hastily examined. At all these places the salt water is evaporated in large square or rectangular pits, generally from 30 to 50 meters long and broad and 1 to 2 meters deep. The earth excavated from the pits is thrown up around them as an embankment to protect them from surface drainage or from tidal

overflow. Many pits are constructed close together over a considerable area.

At Gonaïves, where the shore is low and flat and the soil is rather impervious, the sea water is admitted directly through open ditches, which are closed while the water is evaporating. Near Baie de Henne, however, where the pits are in a salty lagoon that is separated from the sea by an emerged beach of calcareous sand or in places by reefs of cavernous, coralliferous limestone, seepage from the sea is so effective that ditches are unnecessary. However, as the salt is deposited it tends to seal out the salt water, and after each harvest many stakes are driven into the bottoms of the pits to permit the salt water to fill them again. As more salt is deposited these holes are again sealed, and so on. A similar method is used at Grande-Saline.

When evaporation is sufficiently advanced workmen enter the pits and harvest the salt by hand, placing it in baskets. Usually it is dumped temporarily beside the pits (see Pl. XXXVIII, *C*), but if it must be stored for some time it is placed under shelter. Harvests are most frequent in the dry season, as at that time evaporation is most rapid. It is said that at Gonaïves the salt is sometimes harvested at intervals of only 18 days. As a rule, the interval is longer and may be as much as three or four months.

The salt obtained in this way is coarsely crystalline, and some of it is stained brown by impurities, but no further purification is attempted.

GUANO.

The Republic of Haiti contains numerous deposits of cave guano similar in many respects to those of other countries.¹ In 1909 the Government granted to Mr. O. P. Tommins, of New York City, a concession for the exploitation of these deposits in the arrondissements of Fort-Liberté, Grande-Rivière du Nord, Vallière, and Cerca-la-Source, notably at Cerca-la-Source.² The State was to receive a royalty of one-third of the product, and the valuation for purposes of taxation was placed at \$1.50 per ton at the custom house, Cap-Haïtien.

The deposits occur in ordinary caves in the limestone of the mountain sides. They seem to be most common in the limestone areas of the Massif du Nord, though they doubtless occur in other parts of the Republic. The caves in the Massif du Nord are well above the level of the present streams and are now dry. The guano is formed chiefly of the excrement of bats, which inhabit certain caves in great numbers. A considerable deposit has accumulated even very recently in the abandoned workings of the old mines at Las Lomas, where bats are especially numerous.

¹ For general discussion and references see "Nitrates" and "Phosphate rock" by Clarke, F. W., *The data of geochemistry*, 4th ed.: U. S. Geol. Survey Bull. 695, pp. 248-253, 515-526, 1920.

² *Le Moniteur*, No. 46, p. 314, 1909.