The presence of ground water that is probably under some pressure is attested by springy and marshy areas, such as give rise to the Rivière des Mapoux and the Petite Rivière du Quartier Morin, which originate far out on the plain. Flowing wells may possibly be obtained near the shore around the mouth of the Grande Rivière, but the flows will probably not be large. The only well that affords any evidence on this subject is that drilled at the Cap-Haïtien Railroad station at the mouth of Rivière Haut du Cap, which is more fully described elsewhere (p. 588). It is a small well, 25 meters deep, but at first yielded a slight flow. Better results might be had from deeper wells of large diameter, but they would have to be drilled farther from the sea, for the sea water affects somewhat the water of the well just mentioned, and the water probably would be worse if the well were drilled deeper.

In the eastern part of the plain, between Fort-Liberté and Ouanaminthe, the rainfall is less, the relief is greater, and the depth to water is probably greater, so that shallow wells would perhaps be less successful. But the shore of the plain here is longer and the beds are better sorted, so that the possibility of obtaining artesian water in areas not much above sea level appears better.

MOUNTAINS AND HIGHLANDS.

Most of the mountain regions of the Republic of Haiti receive more rain than the lowland plains and valleys. Where their surface features and soil are favorable they are more likely than the plains to produce crops without irrigation; indeed, irrigation would be quite impossible at most places in the highlands on account of their rugged surface. Water is needed mainly for domestic use and for stock and generally is obtained from streams or springs. Some of the mountain regions receive but little rain and are semi-arid; and large areas in the regions underlain by limestone have subterranean drainage, so that the scarcity of water causes the land to be almost uninhabited. Examples of these conditions can be found in the region of Grands-Bois; in Section Plymouth, southeast of Jérémie; on the Bombardopolis Plateau; and on Gonave and Tortue islands.

Not much of value can be recorded about the streams of the mountain areas, and the geology is at most places so complicated that only a few generalizations regarding ground water can be based on the hasty observations made. The springs, which are common and at many places valuable, are described on pages 550-566.

Many of the mountain ranges are composed of hard limestone, which is generally considerably folded and disturbed and overlies igneous rocks that are exposed at many places, chiefly in the center of the ranges and in valley bottoms. Water circulates freely in the limestone through joints and along bedding planes, many of which have been greatly enlarged by solution, which has at some places formed large caverns. A large part

of the rainfall on the limestone areas is absorbed and sinks rapidly downward along these channels until its flow is checked, either by striking some less pervious material, such as igneous rock, or by reaching a permanent water table controlled by the sea or by a lake or large stream. At some places beds of chalk or of clayey partings in the limestone act as impervious beds. The water tends to move laterally down the slope of the water table or along the surface of the impervious bed until it reaches an outlet into a stream or into the sea, generally through springs.

In most limestone areas the surface is greatly dissected and the rocks are porous so that the water table undoubtedly lies very deep. Moreover, much of the ground water is concentrated in subterranean streams along solution channels. At many places in the highlands, therefore, wells would not reach water except at great depth, unless they accidentally penetrated channels of circulation. Some of these channels are indicated by sinkhole valleys, especially where surface streams disappear into sunken valleys or springs issue from them. Wells drilled in these sunken areas in regions where water is greatly needed might tap large supplies at no great depth. A suggestion for exploration of this kind at the town of Pestel is given on page 592. In regions where the cover of limestone is thin water might be obtained by wells drilled to the impervious rocks below and tapping the water that circulates along the contact of the limestone with the impervious bed. Considerable supplies of water have been obtained from such wells on the island of Barbados,[1] where conditions, however, are rather less complicated than those in most parts of the Republic of Haiti. A part of the Bombardopolis Plateau might possibly offer opportunity for work of this kind, as the porous limestone that lies above the impervious beds appears to be rather thin at some places.

Water circulates much less freely in the igneous and metamorphic rocks than in limestone because these rocks are denser and the principal open spaces in them are small joints, which are enlarged only very slowly, if at all, by solution. Moreover, these joints generally become closed at depths of a few hundred meters. The residual soil and the upper part of these rocks, however, usually absorb considerable water, which seeps down the hillsides and concentrates beneath the valleys. Shallow dug wells in valleys or ravines, or even on flat uplands in areas of igneous rock, would generally yield plenty of water for domestic use and for stock, and deeper drilled wells would be equally or even more successful, although they probably would not yield so much water as is obtained from many similar wells in the alluvial plains.

GONAVE ISLAND.

With the exception of small patches of alluvium, the only surface rock on Gonave Island is limestone. The limestone is not strongly folded, as it

[1] Harrison, J. B., and Jukes-Browne, A. J., Geology of Barbados, pp. 60-62, published by Barbadian Legislature, 1890.