

confined in the deposits at the time they were being laid down on the bottom of the sea. These deep-seated waters do not circulate, due to conditions the attempted explanation of which will be given later, but have remained practically at a standstill since the time of their inclusion.

PRINCIPLES AND CONDITIONS CONTROLLING THE STORAGE AND CIRCULATION OF UNDERGROUND WATERS OF THE NORTH CAROLINA COASTAL PLAIN.¹

The materials of the Coastal Plain of North Carolina consist of a great series of sedimentary deposits, for the most part unconsolidated, which rest upon a gently sloping surface of ancient rocks. In the Piedmont Plateau region the latter form the surface materials and along its eastern border have elevations of from 400 to 500 feet. Their surface here dips to the eastward beneath the sediments of the Coastal Plain, forming a gentle slope which passes gradually to greater and greater depths in the coastward direction. Along the immediate coast this surface lies at depths of 1,000 feet and more below sea level. A contour map of the buried surface of the basement rocks, with contour intervals of 500 feet, has been prepared by B. L. Johnson. (See map, Plate XXIX.) Little is known of its extension out beneath the ocean, but it probably reaches at least as far as the edge of the Continental shelf. By referring to the geologic section (Plate XXX, opposite p. 343), it will be observed that the sediments of the Coastal Plain resting upon this rock surface consist of a succession of clay, sand, and in part of limestone beds which dip at a slight angle to the surface. The landward edges of the lower beds come almost to the surface immediately to the east of the Piedmont border, and the overlying beds likewise come close to the surface at points successively farther from the Piedmont and nearer to the coast in the ascending order of their stratigraphic positions. Their upper edges appear to have been planed or beveled off, and the plain thus formed to have been subsequently covered by nearly horizontal surficial beds of loam, sand, gravel, and clay.

Water which falls upon the surface as rain is absorbed by the loams and sands, passes through them by gravity, and either enters the underlying inclined beds or moves off laterally and escapes as springs along the valley slopes. If these inclined beds led to a place of escape at their lower ends the water would continue to gravitate downward, fol-

¹The reader is referred to the following papers treating of general artesian conditions and principles:

Chamberlin, T. C., *The Requisite and Qualifying Conditions of Artesian Wells*. Fifth Ann. Rept. U. S. Geol. Survey, 1885, pp. 125-173.

Fuller, M. L., *Summary of the Controlling Factors of Artesian Flows*. U. S. Geol. Survey, Bull. No. 319, 1908, 42 pp.