deeper, many average over 200 feet in depth. These deeper ones are apt to secure water under artesian pressure that will rise far above the place encountered and in some instances will flow.

About four miles north of Nazareth a 600-foot well drilled in the slate obtained a strong flow of water that rose to the surface. The drill probably broke into an open fissure caused by some displacement of the rocks, through which the water flowed in large volume. Other wells sunk to equal depths in the same vicinity might obtain only small amounts of water that would not rise to the surface.

**LIMESTONE REGIONS**

In those portions of Northampton County underlain by the Cambrian and Ordovician limestones the water problem is serious in many cases.

Ground water in limestone regions flows mainly in well-defined open channels formed by solution along ordinary joints or bedding planes, and the surface water passes into these underground channels. With the exception of Hokendauqua, Catasauqua, Monocacy and Bushkill creeks, which head in the slate region, surface streams are practically absent in the limestone belt north of the Lehigh River. Count Zinzendorf in a letter dated March 15, 1743, described the region between Bethlehem and Nazareth as "absolutely a desert without wood or water, and of such a nature that it never can be sold." Another writer in 1799 said that "part of the road (between Bethlehem and Nazareth) runs through a tract of land, which is exclusively called the Dry Land, on account of its want of any creeks, rivulets, or springs above ground. It is, however, well settled; the inhabitants bring water for common use from the nearest spring or brook. This is often at the distance of one, and even two and three miles. Of late, however, prudent and able settlers have begun to dig wells, whereby the value of their lands is considerably enhanced."

As the water in the limestones is concentrated in definite channels, one of these channels must be struck to obtain water in quantity, and the uncertainty of finding one of them has favored "water witching," which is still practiced in many regions, although repeatedly shown to have no scientific basis and to be entirely unreliable.

Some water is usually obtained at the contact between the loose residual and glacial loamy clay and the underlying compact limestone. Many wells fifteen to thirty feet deep draw their supply from this horizon and obtain sufficient water for domestic use except in times of drought. The water in such wells is, however, easily polluted

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Ogden, J. C., Excursion into Bethlehem and Nazareth in 1799, pp. 41-42, Philadelphia, 1805.