

ARTESIAN WELLS AS A WATER SUPPLY FOR  
PHILADELPHIA.

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BY OSCAR C. S. CARTER,  
Prof. Geology and Mineralogy, Central High School, Philadelphia.

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The long-continued drought of the summer of 1892 was unusually severe, the rise of even a couple of inches was eagerly noted in the city reservoirs and frequent warnings were given to use no more water than was absolutely necessary. The frequent low-water mark of the Schuylkill and its well-known impure condition in dry seasons are strong reasons for causing us to seek a new supply of pure and wholesome water. Even if artesian wells will not entirely take the place of the Schuylkill they will at least prove a powerful aid, both in quality and quantity. After keeping a complete record of more than twenty wells that have been drilled recently in Montgomery, Philadelphia, Chester and Delaware Counties I would strongly urge a trial of artesian water. The two main points to consider are the purity and the quantity. First, as regards purity, it is a well-known fact that water which has filtered through from 200 to 500 feet of rocky strata is practically free from organic and all deleterious matter. It is never muddy or dirty but always clear and free from sediment. The wells are cased or lined with iron pipe sometimes to a depth of 100 feet. This effectually shuts off any surface drainage, so that it would be impossible for disease germs which are common in river water to reach these deep wells. As a rule artesian water is pure, sparkling and wholesome. It sometimes happens when a well is newly drilled that the water may have a slight mineral taste, due to the salts of lime, magnesia, potash and iron dissolved by being in contact with the rocks for a long time, or it may be a trifle hard. This, however, from experience, we know, is rarely the case, and it soon disappears when the water has been pumped for a certain

time because new water filters in and takes its place. One instance in particular may be given in this city where the water was used for boilers and became quite soft on continuous pumping. The water of nearly all the wells drilled in this vicinity is in constant use for drinking water and has proved satisfactory.

It will be urged by many, no doubt, that the supply derived from artesian wells is insignificant and, as a rule, that it is difficult to find water-bearing strata in this vicinity. Such, however, is not the case. Nearly all the rocky strata within an area of twenty miles of Philadelphia will yield water whether the rocks be mica schist, syenite sandstone or limestone. Occasionally you may find a locality that is barren, but this is rarely the case.

A comparison of the wells drilled in Europe and in this vicinity may be of interest. The wells drilled abroad have furnished an abundance of water for the supply of cities. At Grenelle, near Paris, a well was drilled to a depth of 1,798 feet, when the water stratum was reached a column of water rose in the well that furnished 36,000 gallons per hour, the entire water supply of a suburb of Paris. The well drilled at Passy has a diameter of 2 feet 4 inches and is 1,900 feet deep. From this a column of water rose to the height of fifty-four feet and furnished 5,582,000 gallons per day. Many artesian wells have been drilled in the chalk strata around London. One well alone, at Chadwell near Ware, yielded London over 4,500,000 gallons per day toward its water supply.

The Kentish Town Water Works have a well nearly 1,000 feet deep. It is said there were two wells drilled at Chicago each five inches in diameter, one 1,000 feet and the other 700 feet deep, which furnished 800,000 gallons daily to the water supply. A well of three-inch bore and 2,000 feet deep was drilled at Louisville, Ky., and furnished nearly as much water as the deep well near Paris.

It may truthfully be urged that the geological formation of Philadelphia and vicinity is different from that of Paris and London, but the records of a few wells drilled in this locality will show that we have prolific water-bearing strata

in Southeastern Pennsylvania. A well was drilled by the Oriental Bath Company, at 1104 Walnut Street, Philadelphia, through sixty-six feet of clay and 200 feet of mica schist and gneiss rock. It yields 6,000 gallons per hour and rises to within twenty-eight feet of the surface. The Pennsylvania Railroad drilled ten shallow wells near Radnor within a space of an acre to supply the water tanks and a pumping station. These wells when connected and tested by continuous pumping yielded 288,000 gallons per day. Deep wells at Radnor do not give much water. At Lansdale, along the North Pennsylvania Railroad, a few miles north of Philadelphia, there is no water supply except that derived from an artesian well. This well was drilled to a depth of 611 feet, and is cased or lined with iron pipe to a depth of 259 feet; with an improved pump, it could give 200 gallons per minute or 288,000 gallons per day. The supply is said to be practically inexhaustible. Lansdale is not a particularly good locality for water except at a great depth, because the clay slate, shale and sandstone are tightly packed and the water soaks slowly between the bed planes. The borough of Jenkintown is supplied with artesian water and is in the same belt of mica schist rock as Philadelphia wells. One well is 324 feet deep, the other is 349 feet deep. They will each yield 9,000 gallons per hour, and not only supply Jenkintown with water, but also the surrounding twenty villages for a distance of three miles. The water is soft. Artesian wells drilled in the mesozoic or new red sandstone at Newark, N. J., have yielded an abundance of water. Three wells of six-inch bore, and each less than 100 feet in depth, flowed at the rate of 250,000 gallons each per day. Another deeper well in the same city is yielding 800,000 gallons per day. This is a favorable locality, because the water-bearing stratum underlies a thick bed of clay. Wells drilled in the same belt of mesozoic sandstone at Norristown, Pa., yield over 3,000 gallons per hour with small pumps. Many other instances of prolific wells, such as those at Atlantic City and Ocean Grove, can be given; but enough has been said to show that we have water-bearing strata. Of course, it would be impossible to supply a city the size of Philadel-

phia wholly with artesian water, but in seasons of long-continued draught, such as the summer of 1892, when the rise of even a couple of inches in the reservoirs was eagerly noted, artesian wells would be an enormous gain. In a deep well, when a water crevice is struck near the bottom in drilling, it can be widened and the supply of water enormously increased by exploding nitro-glycerine in the wells in precisely the same manner that it is employed in the oil regions. Tin canisters containing the proper amount are lowered and exploded by means of electricity. The explosion widens the bottom water crevices.

The city of Philadelphia is underlaid with an immense deposit of clay which artesian borings have shown is fifty feet in thickness, and in many parts of the city much deeper. Clay is impervious to water, and this great clay bed checks to a great extent, although not wholly, the filtration of surface drainage. It must not be thought for an instant that the clay is a perfect barrier and wholly prevents the surface water from getting to the mica schist rocks beneath, because instances can be given of surface water getting below and showing on analysis. One fact then cannot be too strongly emphasized, artesian wells must be thoroughly cased with iron pipe from the surface, the deeper the better. When they are properly cased for 100 feet or more there is little if any danger from surface contamination. When the well is finished it should be pumped for a couple of hours, and the next day a sample taken for chemical analysis. If any trace of surface contamination is shown, the casing should be driven deeper until analysis proves the water to be perfectly pure. These precautions are only necessary in large cities and towns. Artesian wells drilled in the country will always yield pure water. A series of artesian wells drilled in Fairmount Park, some distance out, would yield an abundance of pure and wholesome water, which would be free from surface contamination of any kind.

A series drilled near the new reservoir at Roxborough would give the purest water. When artesian wells are drilled in solid rock in the country, it is not necessary always to line them with iron pipe, as a hard compact rock will remain open from top to bottom when once drilled.