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## CITY WATER SUPPLY FROM DRIVEN WELLS.

The city of Brooklyn, N. Y., requires a daily water supply of from forty-five to fifty-five million gallons. There are no natural reservoirs or streams available for furnishing this great quantity and recourse has been had to wells, in a comparatively level stretch of country extending some fifteen or eighteen miles down by Jamaica Bay, toward the ocean, on the south shore of Long Island. From these wells the water is pumped into a brick conduit, by which it is conducted to a large reservoir on high ground on the outskirts of the city, into which it is lifted by pumping engines.

Previous to 1882 the supply of water was all obtained from large open wells, but in that year a contract was made with Messrs. William D. Andrews & Bro., of New York, for furnishing an additional supply of five millions of gallons of water daily, by their system of tube, driven and gang wells. One of the illustrations herewith shows a pumping station—there being four now in operation—whereby water is supplied from these driven wells, and in another view is a diagram illustrating the underground strata and watercourses through which the tubes are driven to reach sources most likely to be permanent, and furnishing water of a satisfactory character. This Forest Stream pumping station was established under a contract with the city of Brooklyn to furnish therefrom five millions of gallons of water daily, but it has furnished as high as nine million gallons in twenty-four hours, and regularly supplies six to seven million gallons daily. From the four driven well stations the agreed upon supply was eighteen and a half million gallons daily, but as high as twenty-seven million gallons have been furnished, the average being about twenty-two million gallons a day. At all of these stations Knowles pumps are used (a full description of the

plant was published in the SCIENTIFIC AMERICAN of April 10, 1886); but at the open well stations from which the remainder of the Brooklyn water supply is furnished, both Worthington and Davidson pumps are employed.

The manner of driving tube wells is so well understood that a bare reference thereto is all that is necessary. They are simply two inch tubes (this size being generally found best in practice), with a galvanized steel point, above which comes a perforated brass strainer. These tubes are driven into the ground by means of a simple portable pile driver, worked by hand, a new section of tubing being

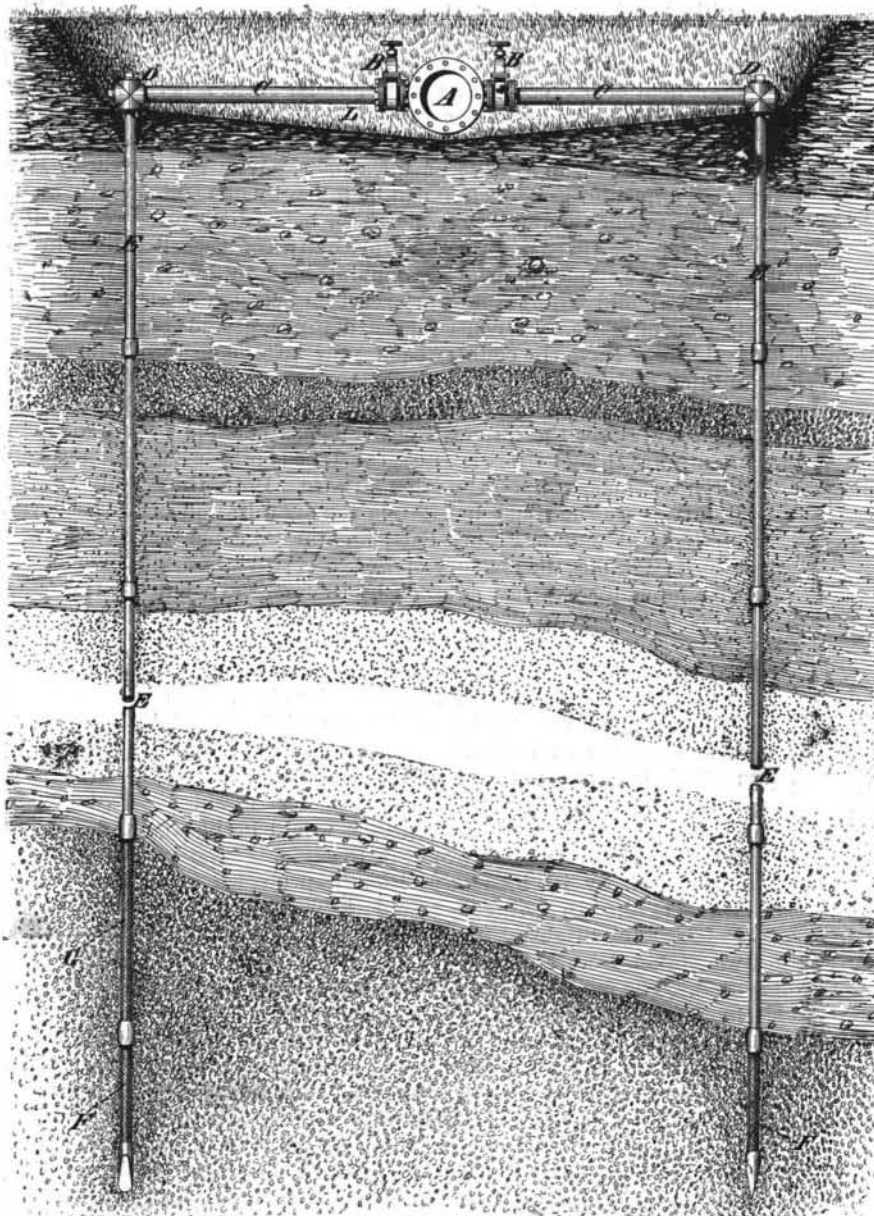
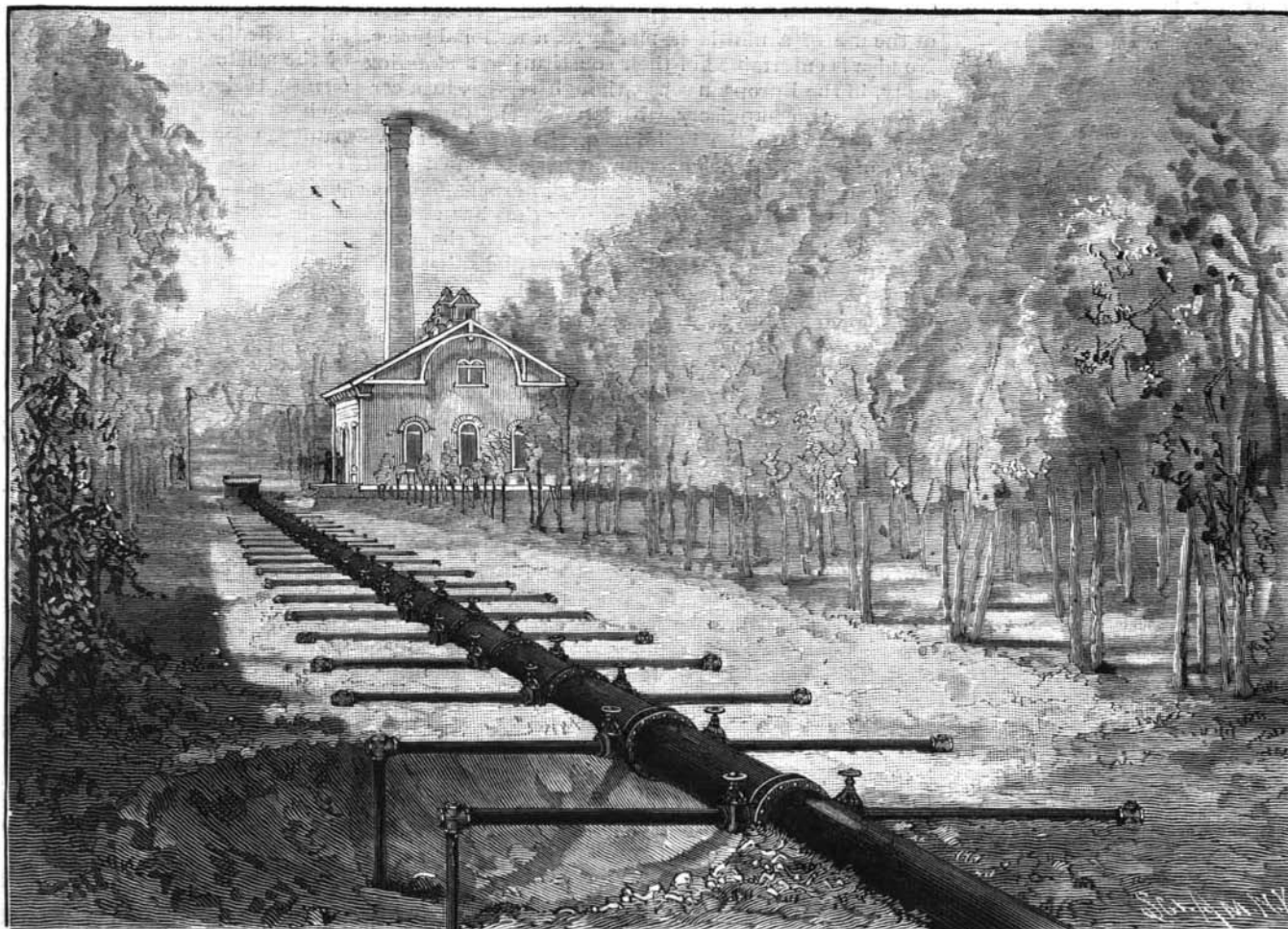


DIAGRAM SHOWING UNDERGROUND WATER COURSES PIERCED BY DRIVEN WELLS.

tightly screwed on top as each successive length is thus forced into the ground, until the well has reached the desired depth. Of course it is important, in locating in one place a gang of wells from which so large a supply of water is to be steadily drawn, to have a thorough understanding of the stratigraphical features of a sufficiently large area of the surrounding ground, the natural rainfall on which must furnish the supplies which feed these underground streams by slow percolation. Yet these underground waterways are generally not difficult to find in any considerable extent of comparatively level country, and usually at a surprisingly slight distance below the surface. The manner in which these streams are frequently formed, one above another, at various depths, is clearly indicated in one of our illustrations, and the picture also shows one of the great advantages of the driven well over the ordinary open well, in that the tube may be driven entirely through one or more streams of water to take its supply from a source which may be deemed still more desirable yet lower down. In the pumping station we have illustrated, many of the driven wells are made to take water from two or more of the underground streams, by the interposition of lengths of tubing with openings and strainers at heights corresponding with the channels of the streams.

In the diagram showing how the underground strata are pierced by the well tubes, A represents a 16 inch collecting main, which is several hundred feet long, extending out both sides from the pumping station. A connecting pipe, C, three inches in diameter, leads from each well, E, to the collecting main, a valve, B, serving to cut out any single well from the system, and D representing a valve used at the top of the driven well, by which, also, connection may be made with still other driven wells.

There are, doubtless, a great many towns and cities in the country which may profit by the experience of the city of Brooklyn in this line. There is no other filter for water equal to the agents for such purpose that nature provides, and the localities are almost numberless where underground streams of such filtered water can, with proper skill and intelligent effort, be made to supply the wants of communities at a cost less than that often expended on obtaining supplies from other and less desirable sources.



FOREST STREAM DRIVEN WELL STATION, NEAR BROOKLYN, N. Y.

A CORRESPONDENT of the *Rural New-Yorker* found onion roots a foot long and still going down, though too fine to follow.