

DESCRIPTION OF THE CROTON AQUEDUCT

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Description of the Croton Aqueduct by John B. Jervis

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JOHN B. JERVIS

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THE CROTON
AQUEDUCT**

Eng 1078.42

1851 Dec 19

to the Hon. Mr. Longfellow
Prof. of Harvard University

ENTERED according to Act of Congress, in the year 1842, by
SLAMM & GUION,
in the Clerk's Office of the Southern District of New-York.

P R E F A C E .

It is seventy years ago since the subject of procuring a supply of pure and wholesome water for this city was first agitated in our Common Council. The population of the city was then only twenty-two thousand, and notwithstanding it was at that time considered a matter of the highest importance, yet it was reserved for this late day to plan and execute the Croton aqueduct.

Comparatively few of the inhabitants of this city are aware of the magnitude of the works erected, or the character of the obstacles overcome, in bringing a river forty miles, over mountains, streams and valleys, to pour its blessings in the midst of a populous city. It has occurred to the publishers that they could not perform a more gratifying or acceptable service to the public than to present them a full and complete description of the aqueduct from the pen of John B. Jervis, Esq. To the eminent ability and devotion of this distinguished engineer are the public mainly indebted for the successful accomplishment of this great enterprise. Although he has been connected with almost all the great public works of this state, it will be the Croton Aqueduct that will transmit his name to all future generations with enviable distinction.

This pamphlet contains a minute, full and accurate description of the whole work, from the Croton river to the distributing reservoir, from Mr. Jervis's pen, and the publishers do not hesitate in making the assurance, that while it cannot fail to satisfy the popular curiosity, it will be everywhere regarded as an acquisition in hydraulic science.

THE PUBLISHERS.

October 14, 1842.

GENERAL DESCRIPTION OF THE LINE.

THE Croton Aqueduct was designed to supply the city of New-York with an abundance of pure and wholesome water. It commences about six miles above the mouth of the Croton river, where a dam has been constructed to elevate the water of the river 40 feet, to the level of the head of the aqueduct, or 166 feet above mean tide. The course of the aqueduct passes along the valley of the Croton to near its mouth, and thence passes into the valley of the Hudson. At 8 miles from the Croton dam it reaches the village of Sing Sing, and continues south through the villages of Tarrytown, Dobbs' Ferry, Hastings, and Yonkers.

At the latter place it leaves the bank of the Hudson, crosses the valleys of Saw-mill river and Tibbits' brook, thence along the side of the ridge that bounds the southerly side of Tibbits' brook valley, to within $3\frac{1}{2}$ miles of the Harlem river, where the high grounds of the Hudson fall away so much as to require the aqueduct to occupy the summit of the country lying between the Hudson and East rivers.

This formation of country continues to, and is terminated by the Harlem river, at the point where the aqueduct intersects it; which is one mile northwesterly from McCombs' dam.

The length of the aqueduct from the Croton dam to Harlem river, is 32.88 miles, for which distance it is an uninterrupted conduit of hydraulic stone and brick masonry. The high ground that bounds the northerly side of the Harlem river valley, is very near the level of the aqueduct at that place; and the width of the valley at the aqueduct level is about 1450 feet,

or a little over one quarter of a mile; over which a bridge is designed to be constructed (and is now in progress) at an elevation of 114 feet above the level of high tide in the Harlem river, on which iron pipes are to be laid to convey the water across the valley.

The shore on the southerly side of the river is a bold, precipitous rock, rising at an angle of about 30 degrees, to a height of 220 feet, or about 100 feet above the level of the bottom of the aqueduct.

After crossing this valley, the aqueduct of masonry is resumed, and continued 2.015 miles, to the termination of the high ground on the north side of Manhattan valley.

This valley is 0.792 mile wide at the level of the aqueduct; below which it descends 102 feet. The conduit of masonry here gives place to iron pipes, which descend into the bottom of the valley, and rise again to the proper level on the opposite side; from which point the masonry conduit is again resumed, and crossing the Asylum ridge, and Clendinning valley, is continued 2.173 miles, to the receiving reservoir at York hill.

This reservoir is bounded by 86th street on the north, 79th street on the south, 7th Avenue on the west, and 6th Avenue on the east. It is 1826 feet long and 836 feet wide on the outside angle of the embankment; containing an area of 35 acres, divided into two divisions, and is (a little over) 5 miles from the City Hall. From the receiving reservoir, a double line of iron pipes three feet in diameter, are laid down in 80th street and 5th Avenue, to convey the water 2.176 miles to the distributing reservoir at Murray hill. The location of this reservoir is on the 5th Avenue, between 40th and 42d streets, and is three miles from the City Hall; it is 420 feet square on the cornice of the exterior wall, and contains an area of 4.05 acres, divided into two equal divisions, and has an average elevation of 44.5 feet above the level of the streets around it.

The length of aqueduct from the Croton dam to the distributing reservoir is 40.562 miles—to wit :

Masonry conduit in Westchester county	32.880
Do. do. on New-York Island	4.187
	Total length 37.067
Receiving reservoir from end of aqueduct to south-eastern effluent gate house	0.172
Distributing reservoir	0.080
Iron pipes on bridge over Harlem valley	0.275
Do. do. across Manhattan valley	0.792
Do. do. between reservoirs	2.176
	40.562

It is proper to add to the above, the length of the Croton reservoir, which has been formed by the erection of the Croton dam and other work necessary to obtain the water, at a suitable level on the Croton river, as without this dam and reservoir, the aqueduct would have required an extension of five miles to reach the proper level on the river ; which is now attained by means of the dam. The entire length, therefore, from the point on the Croton which has the requisite elevation, to the distributing reservoir, is 45.562 miles. The large mains running from the distributing reservoir through the central part of the city, would add about four miles, making the total length of the main conduit nearly fifty miles.

DESCRIPTION OF THE COUNTRY THROUGH WHICH THE AQUEDUCT IS LOCATED.

The soil, earth and rock, of the country from the banks of the Croton to the city of New-York, is of one general character. The line cuts a small section of marble of inferior quality,

about two miles below the Croton dam. In running through the State farm at Sing Sing, it passes a few hundred feet (mostly by a tunnel) in a marble of pretty fair quality for building; and again at Dobbs' Ferry and at Hastings it lightly cuts a similar rock; at the latter place marble has been got out to some extent for market. No more marble was discovered by constructing the aqueduct until it reached Harlem river, where in excavating two of the coffer dams to obtain foundation for the piers, marble rock was found in the bed of the river. This is supposed to be a continuation of the stratum that appears in Harlem valley at the Kingsbridge road, near the Hudson river. With these limited exceptions, the prevailing rock of this district is gneiss, of great variety in quality. In many places it affords excellent building stone for ordinary purposes, and to some extent good blocks of hewn stone have been obtained. A very large proportion, however, of this rock is totally unfit for building purposes.

The surface soil is generally a sandy loam, containing a very small proportion of argillaceous earth. Below the surface soil, gravel, sand, boulders, or detached rock, have in most cases been found, and also hard pan to a considerable extent.

A large proportion of the open cutting, and nearly the whole tunnel cutting, has been through rock. More than 400,000 cubic yards of rock have been excavated.

The general formation of the country is extremely irregular, and unfavorable for the economical construction of such a work.

Commencing at the Croton dam, on a level 40 feet above the river, which descends from this point to tide-water, at the average rate of 25 feet to the mile, the grade of the aqueduct was compelled to encounter great irregularities of surface. Very little regular table-land could be found for its location. While the main ridge of high land, that lay on the left of the line in Westchester county, controlled the general location, numerous spurs of ridges, of various forms and extent, bounded