A HISTORY

OF

CLEVELAND

OHIO

By SAMUEL P. ORTH

OF THE CLEVELAND BAR

WITH NUMEROUS CHAPTERS BY
SPECIAL CONTRIBUTORS

ILLUSTRATED

VOLUME I.

CHICAGO-CLEVELAND
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council. They were to serve three years without pay. and appointed a health officer. In 1882, the health officer appointed a district physician in each ward.

April 30, 1886, the legislature authorized the board to appoint sanitary policemen, one for every fifteen thousand inhabitants. When the federal plan was adopted, in 1891, all these officers were appointed by the mayor and later by the mayor and council. During the fluctuations of the appointing power, the authority of the board has been gradually increased, until its arbitrary power is very great.

In 1893, an important revision of the sanitary laws[13] increased its power to abate nuisances, amplified its powers of inspection, extending it to dairies, slaughter houses, meat shops, food stuffs, food and water supply for animals, and included a quarterly inspection of the sanitary condition of schoolhouses. The board's power of quarantine was made absolute and its regulations intended for the general public were given the same force as city ordinances. The board was given control of all registrations of births, deaths and marriages, the granting of burial permits, and later, in 1896, the board was given the power to appoint a board of examiners to examine plumbers, and with the sanction of the city council, to appoint an inspector of plumbing.[14]

A substantial increase was made in the number of district physicians, in 1905, and there are now a number in each ward, and there are thirty-three sanitary policemen.

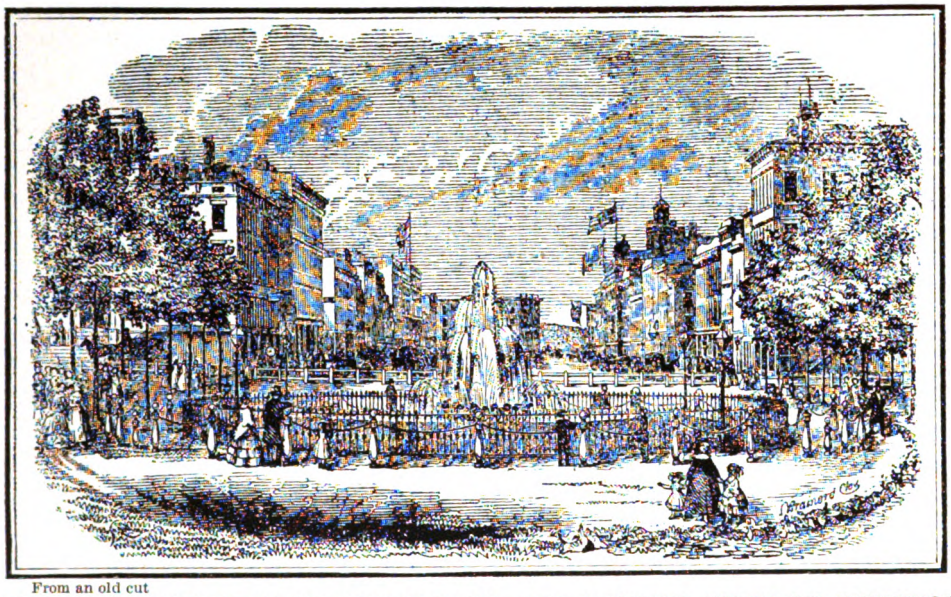
CHAPTER XIII.

THE WATER SUPPLY.

With an inexhaustible lake, multitudes of springs and a gravel subsoil for good wells, our city has never had a water famine, although, in spite of these natural favors, there have been two periods where man's short-sighted economy interfered with nature, and the water from the lake was polluted by the refuse from the city.

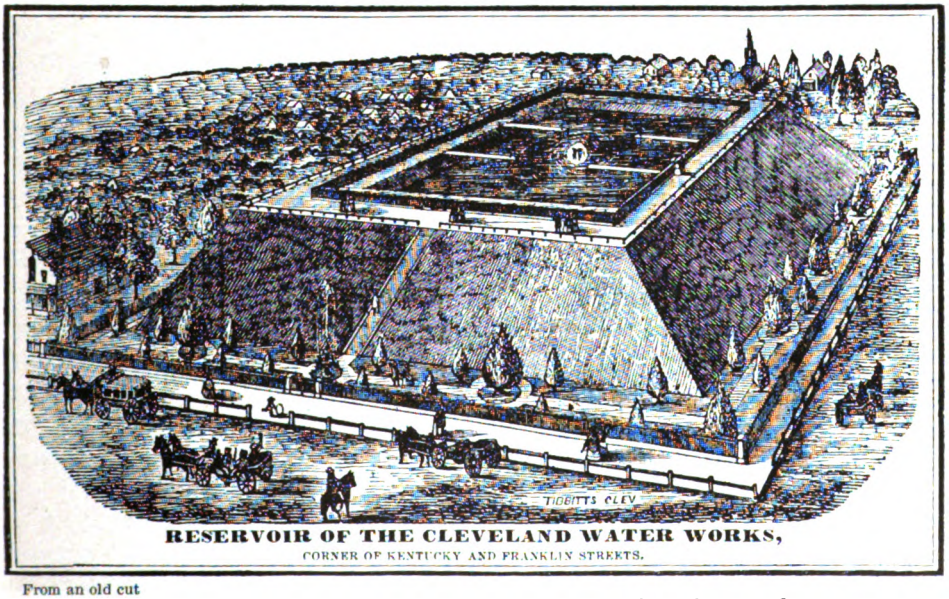
The village was supplied with water from springs and wells. There was a fine spring on the hillside near Superior lane, where Lorenzo Carter first built his cabin in 1797, and another near the foot of Maiden lane, where Bryant's distillery was built a few years later. It was easy to dig wells through the sandy loam into the gravel, and the town folks had no trouble in finding an abundance of water. A town pump was put up on the corner of Superior and Water streets and one on the Square, and deep cisterns were placed at numerous intervals for storing water to put out fires. A favorite drinking well was the spring near the barn of the Cleveland House, on the northwest corner of the Square. On the corner of Prospect street and Ontario, was a pump and a drinking tank or reservoir for horses. "On the south side of Superior street nearly opposite the City Hall, I should think, there was a spring of soft water, and near it a shelter was built of

[13] 90 Ohio Laws, p. 87.
[14] 92 Ohio Laws, p. 342.



From an old cut

THE FIRST FOUNTAIN ON THE SQUARE, 1856, LOOKING WEST ON SUPERIOR STREET



From an old cut

The Kentucky Street Reservoir in 1856, when first used

boughs of trees in summer, and here many of the women used to congregate for washing, hanging their clothes on the surrounding bushes. The wells, what few there were, contained only hard water. The only water carrier for a long time was Benhu Johnson, who, with his sister, a Mrs. White, lived on Euclid street, about where the Vienna Coffee House is now. [1880.] Benhu, with his wooden leg, little wagon and old horse, was in great demand on Mondays, when he drew two barrels of water at a time, covered with blankets, up the long steep hill from the river, now known as Vineyard street, to parties requiring the element. In fancy I see him now, with his unpainted vehicle, old white horse, himself stumping along, keeping time to the tune of 'Roving Sailor,' which he was fond of singing, occasionally starting 'Old Whity' with a kick from the always ready leg, especially if he had been imbibing freely."[1]

In 1849, M. H. Fox and Brothers offered to carry water from the spring on the hillside, near the foot of Huron street, to the square, through a one-half inch pipe. They would thus supply fifty barrels a day, and provide for a fountain of three jets, for the small sum of one hundred and sixty-five dollars the year. "The jets would be small and throw a stream twelve to fifteen feet, but they would be ornamented. * * * The jets would diffuse a cooling spray, and fill a big tub with water, for the consolation of thirsty horses."[2] The city spurned these jets, but later a drinking trough was placed on the Square for horses.

On January 25, 1833, the legislature granted to Philo Scoville and others, a charter as "The Cleveland Water Company," organized for "the purpose of supplying the village of Cleveland, in the county of Cuyahoga, within the present corporate limits thereof, with good and wholesome water." The authorized capital stock was twenty-five thousand dollars. The project lay dormant until 1850, when an extension of the charter rights was secured from the legislature, and a little stock was sold. But nothing more came of the scheme, for about this time the growing city was impelled both by sanitary reasons and for the protection against fire, to do something.

Public meetings were held to urge the city to action. There was considerable doubt whether the city or private parties should build the water works. In 1850, George A. Benedict and others petitioned the city council, urging upon them the employment of a hydraulic engineer for studying the various water sources and the cost of a city water works. In January, 1851, the council passed a resolution, introduced by William Bingham, appointing the mayor and three others he should name as a committee to report to the council on the question of a municipal water supply, and empowering them to employ an engineer. The mayor, William Case, appointed as his associates, William J. Warner, Dr. J. P. Kirtland and Colonel Charles Whittlesey. An abler committee could not have been named. After nearly two years of painstaking work, this committee, on October 29, 1852, made a report to the council. As to the sources of supply, the committee investigated Shaker run, Mill creek, Tinker's creek and Chagrin river. They believed any one of these various streams might be adequate, but concluded that "Lake Erie is the only source to which we can resort for an

[1] Mrs. George B. Merwin, "Annals Early Settlers Association," No. 1, p. 72.
[2] "Herald," Vol. 32, No. 27.

unfailing supply of pure, soft water." * As to control, they agreed that "All experience shows that such undertakings can be carried on more economically by individuals or companies than by municipal corporations, and also better managed after construction," but that private construction would be impractical in Cleveland, because not enough capital was at hand. "One thing is clear to us," they said, "the city should by no means allow the power to pass from them of keeping the control, or assuming it at such times as they might think proper, upon certain stipulated terms." In the light of present day discussion of municipal ownership. these words are of interest. As to methods, they recommended pumping the water from the lake with "powerful engines, to afford a supply of three million gallons by daylight," an amount ample for seventy-five thousand people; that the water should be stored in a reservoir at least a hundred and fifty feet above the lake and thence distributed over the city. As to the location, they recommended that the intake should be "at least as far as one mile east from the foot of Water street, and to extend the suction pipe some one thousand, five hundred feet into the lake to avoid the impurities of the shore." As to the cost, the committee estimated that the two Cornish engines, the aqueduct, reservoir, distributing pipes, real estate and labor would cost three hundred and fifty-three thousand, three hundred and thirty-five dollars and ninety-five cents. Finally, the committee urged the immediate employment of a competent hydraulic engineer, and said "Mr. Scowden, of the Cincinnati water works, to whom we have alluded, is a gentlemen whose science and experience entitle him to great confidence in the planning and execution of such works, and we feel no hesitancy in suggesting his name to the council."

Accompanying this report was an analysis of water in the vicinity of Cleveland, made for the committee by Professor W. W. Mather, of Columbus. Some of its items are highly interesting. From a well "about fifty yards west of the theatre, between Superior and Center streets, from the oldest part of the city. * * * The water is used for many purposes, but is not much used for drink. Its taste is unpleasant, and color yellowish. The water is bad and contains much organic matter." Water from a well on Professor Cassel's place, "on the ridge on Euclid street, two miles from the city," was found "colorless, and very pure and soft." "Water from the Cuyahoga river, taken at a time of low water, in August, at a depth of ten feet, at the railroad bridge, so as to avoid the impurities of the surface and the slime of the bottom," was found "clear and soft and almost limpid, and by standing some days, became entirely limpid with a scarcely perceptible, light, flocculent sediment." Water taken from the lake one half mile from shore, and one mile east of the lighthouse, was entirely "limpid, cool and pleasant to the taste," even though taken "in a calm sultry evening in August." And water from the spring at Jones' livery stable, northwest corner of the Square, "was hard, and not pleasant to the taste, though much used." Many other places were tested, but the water from the lake was recommended.

The report of this first committee was accepted by the council, and referred to a special committee, instructed to engage competent engineers, "to examine the report, make the necessary survey and draw plans for the work, to be submitted to the council at an early date."

* See Committee's Report.

Theodore R. Scowden was appointed engineer, and on February 28, 1853, he made a report approving in general, the findings of the committee, and estimating the cost at three hundred and eighty thousand, seven hundred and sixty-six dollars and fifty-five cents. The following June, he reported further the details of three plans, to the first board of trustees of the water works, who had been elected the preceding April.[3] This board consisted of H. B. Payne, B. L. Spangler, and Richard Hilliard, and upon them devolved the duty of building our first municipal water works. The first plan contemplated a reservoir of one million gallons capacity, at the corner of Sterling avenue and Euclid street, and a pumping station at the foot of Sterling avenue, at an estimated cost of four hundred and thirty-one thousand, three hundred and thirty-five dollars and sixty cents. The second plan included either the building of an embankment reservoir, with five million gallons capacity at Sterling avenue and St. Clair street, costing five hundred and forty-four thousand, eight hundred and seven dollars and four cents, or with the reservoir at Superior street and Sterling avenue, costing six hundred and seventy thousand, four hundred and nineteen dollars and eighty-four cents. And the third plan, which was the one adopted, placed the entire works on the west side of the river, a five million gallon reservior on Kentucky and Prospect streets, and an engine house at the foot of Kentucky street, at an estimated cost of four hundred and thirty-six thousand, six hundred and ninety-eight dollars and forty cents.

The electors had, April, 1853, voted on a bond issue, with the following results

	For	Against
First ward	365	55
Second ward	285	218
Third ward	423	61
Fourth ward	157	265
Total	1,230	599

On August 10, 1854, work on the engine house was begun, and September 1st, work on the reservoir. The contractors were to furnish all materials for the reservoir "within one mile of the reservoir." Water was let into the mains on September 19, 1856. The bond issues totaled five hundred thousand dollars, but the premiums raised the available amount to five hundred and twenty-three thousand and thirty-eight dollars and sixty-three cents; the total cost was, five hundred and twenty-six thousand, seven hundred and twelve dollars and ninety-nine cents. The works were formally opened on September 24, 1856, while the state fair was being held here. It was the occasion of a great jollification, the entire city joining with its thirty thousand visitors, to celebrate the opening, with bands of music, parades and illuminations.

At the intersection of Superior street and Ontario street, in the center of the square, "A capacious fountain of chaste and beautiful design was erected, from which was thrown a jet of pure crystal water, high in the air, which, as the center of greatest attraction, gratified thousands of spectators."[4]

[3] By Act of Legislature, March 11, 1853.
[4] Engineer's Report, 1856.

The water from our first water works was taken from the lake, "three hundred feet west from the old river bed, by laying an inlet pipe, made of boiler plate three-eighths of an inch thick, fifty inches in diameter, and three hundred feet long, extending from the shore to the source of supply, at twelve feet depth of water. The inlet pipe terminates in the lake at a circular tower, constructed of piles driven down as deep as they can be forced into the bottom of the lake, forming two consecutive rows of piles, two abreast, leaving an eight foot space, between the outer and inner rows, which space is filled with broken stones to the top of the piles. The piles are then capped with strong timber plates, securely bolted together and then fastened with iron to the piles.

"The outside diameter of the tower is thirty-four feet, the inside diameter is eight feet, forming a strong protection around an iron well chamber, which is eight feet in diameter and fifteen feet deep which is riveted to the end of the inlet pipe. An iron grating fixed in a frame, which slides in a groove, to be removed and cleaned at will, is attached to the well chamber, and forms the strainer, placed four feet below the surface of the lake. The water passes into the well chamber, and out at the inlet pipe."[5]

An oval brick aqueduct, four feet by five feet, three thousand feet long, connected the inlet pipe at the shore with the pump well; thence the water was forced to a stand pipe made of boiler plate, four feet in diameter at the bottom, and three feet at the top, one hundred and forty-eight feet high. A brick tower encased the stand pipe. At the top of the tower was a "look out" reached by spiral stairs, from which visitors could get a fine view of the lake and city.

The reservoir on Kentucky street embraced six and fifteen one-hundredths acres on a natural ridge thirty feet high. It was made of earth, lined with a layer of clay two feet thick and paved with brick; the outer slope was turfed with sod, and the summit was encircled by a walk. A white picket fence enclosed the terrace. This was a favored place. From the summit there was a "fine panoramic view of the city and the village of Newburg, six miles away."[6]

The engine house of brick, housed two Cornish engines, which were worked alternate weeks, the first of their kind erected west of the mountains.[7] Originally the trustees planned for a capacity that could care for one hundred thousand inhabitants, but the works as finally built, were supposed to have twice that capacity. Joseph Singer, the assistant of Engineer Scowden, was made the first superintendent and engineer of the new plant.

The vision of the trustees was far overreached by the actual growth of the city. Within a decade the water works were antiquated. The sewage of the city and increasing filth of the river's current discolored the water, made it unpalatable and a menace to health.

In 1866 public agitation roused the council to action. Investigations were made, and a detailed report from Professor J. L. Cassels, of the Cleveland Medical college, was received. In 1867 surveys for a new tunnel were made, plans were completed and bonds issued, and on August 23, 1869, work was commenced by sinking a shaft to a depth of sixty-seven and one-half feet near

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[5] Engineer's Report, 1857.
[6] "Daily Herald," Sept. 24, 1856.
[7] Engineer's Report, 1857.

the shore. From this shaft a tunnel, five feet in diameter, was pushed out under the lake. On August 17, 1870, after numerous delays, a crib, eighty-seven and one-half feet in diameter, was towed into the lake some six thousand, six hundred feet from the shore, where the water was about forty feet deep. From this point a tunnel was started to meet the one being pushed from the shore. On October 11, 1872, the shore and lake sections of the tunnel were successfully united. March 2, 1874, the entire work was completed, and the following day water was run through to supply the city.

The new tunnel was six thousand, six hundred and sixty-one and sixty-one one-hundredths feet long, five and two-twelfths feet vertical diameter, and five feet horizontal diameter, the lake shaft was ninety and two-tenths feet below the surface of the water, and the bottom of the shore shaft was sixty-seven and five-tenths feet below the surface of the water. Each shaft was eight feet in diameter. The protection crib, which attracted a great deal of attention as an engineering feat, was a pentagon sixty-eight feet high, each side measuring fifty-four feet, built of white pine timber twelve inches square. Inside of this was an inner wall, twenty-four feet from the outer, the faces of all the walls were sheathed with two inch oak planking, and the space between the inner and outer wall was filled with stone, and four hundred cords of stone were piled on the outside of the crib.

The engineers reported many difficulties. After encountering a bed of quicksand while sinking the shore shaft, water and inflammable gas came up through a seam in the clay, making a bulkhead necessary. But before this could be built, three hundred feet of tunnel had been filled with sand. The tunnel was commenced over again, at a deflection of twenty degrees, and many underground springs were encountered. On April 7, 1871, workmen were alarmed by a great noise behind them, and rushing toward the shore, found water pouring through the masonry for a distance of one hundred and fifty feet. Extra pumps were then employed to keep the tunnel clear.

The new engine house was built of brick, near the old one, two new engines, a Cuyahoga duplex, and a Worthington duplex were installed, and began work July 18, 1876. The old Cornish engines were used only as auxiliaries. The total cost of the work was three hundred and twenty thousand, three hundred and fifty-one dollars and seventy-two cents, and seven lives were sacrificed to the city for this improvement.[8] The workers twice crossed the old preglacial river channel, filled to a depth of from sixty to eighty feet with soft clay.

Upon the completion of the new tunnel, the old intake was abandoned. The outer crib gave constant trouble.

Within twenty-five years a new supply was necessary, and on July 17, 1886, the city council asked the city engineer, John Whitelaw, to report on the cost of a new tunnel from the lake crib to the pumping houses with all the necessary equipment. His estimate was five hundred and ninety-one thousand, eight hundred and forty dollars. On November 24, 1888, proposals were received, and two thousand, one hundred and ninety-eight feet were built that year. On January 29, 1889, the shore and lake sections were united, and on November 17, 1890, the new tunnel was completed. It was nine thousand, one hundred and

[8] Engineer's Report.

seventy-seven and five-twelfths feet long, and seven feet in diameter.[9] While quicksand was a constant annoyance, the construction of the tunnel was singularly free from accidents and casualties, due to the experience in building the former tunnel and to the advance made in engineering science. The water was not free from sediment, and in stormy weather was quite murky. The two tunnels had a capacity of one hundred and twenty million gallons per day.

The bringing of the water from the west side to the east, under the Cuyahoga river was originally accomplished by laying pipes in trenches dredged in the bottom of the stream. This, of course, made the pipes inaccessible. Indeed, one of the first serious mishaps to the system was caused by a break in the first pipe so laid across the river in 1856 when the works were first used. When the channel of the river was widened, 1897-8, changes were made necessary and it was determined to put the pipes into tunnels large enough to be always accessible. Four tunnels were made, three of them six hundred feet long, and one five hundred and seventy-five feet long. The shafts at each end are nine and one-half feet in diameter, while the tunnels are eight feet in diameter and lined with brick.[10]

The Kentucky reservoir with a capacity of six million gallons, and a head of one hundred and fifty-eight feet above the lake, was entirely antiquated by 1875. Originally all the water was pumped directly into this reservoir and then distributed over the city. With the increase of population, additional pumps were added and these pumped the water directly into the service mains, while the old pumps still filled the reservoir.

In 1880 steps were taken to secure better high pressure service, and by 1885, two new reservoirs, located on the heights that overlook the city from the east, were opened for service. The Fairmount reservoir, on Fairmount street near Woodland Hills, is now used for low pressure. It has an area of six hundred and five thousand, two hundred and sixty-five square feet, a depth of twenty feet, and is divided into two basins, by an embankment, one having a capacity of forty-seven million gallons, the other of thirty-three million gallons. The high pressure reservoir is on Kinsman street in Woodland Hills park. It has an area of two hundred and fifty-six thousand, two hundred and twenty-four square feet, a depth of twenty-three feet, and a capacity of thirty-seven million gallons. With the opening of these reservoirs, the Kentucky reservoir was abandoned and converted into a park.

By 1895, both the quality of the water and the inadequacy of the service, were the subject of much critical comment. In consonance with the general forward movement in public works begun at that time, the mayor appointed a commission of twenty-two citizens, who, through a subcommittee of four, Samuel Mather, C. F. Brush, L. E. Holden and Wilson M. Day recommended as the most important of all the urgent public improvements needed by our city, a new and ample water works system. The necessary bonds were issued and a new tunnel was commenced. The following description of the building of this tunnel is taken by permission bodily from the "Engineering Record," Vol. 48, No 24. It is written by Charles Goffing, C. E., of the Cleveland water works.

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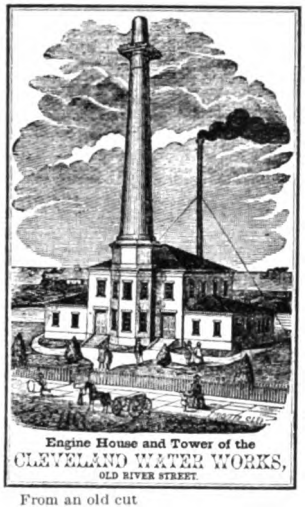
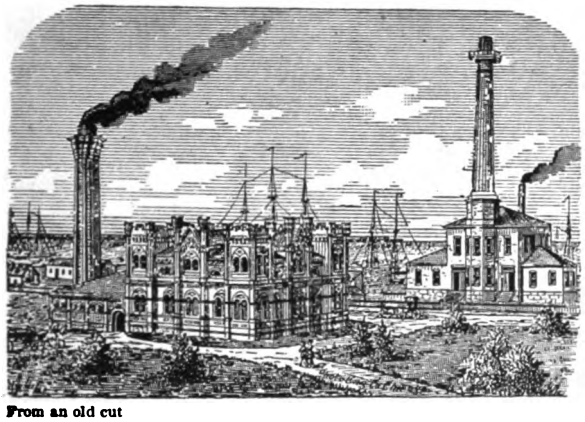
[9] Engineer's Report.
[10] See "Engineering Record," Vol. 38, p. 449.



From an old cut

The first pumping station, 1856. Shows the "lookout" on the tower; old river bed just beyond, and the newly built railroad.

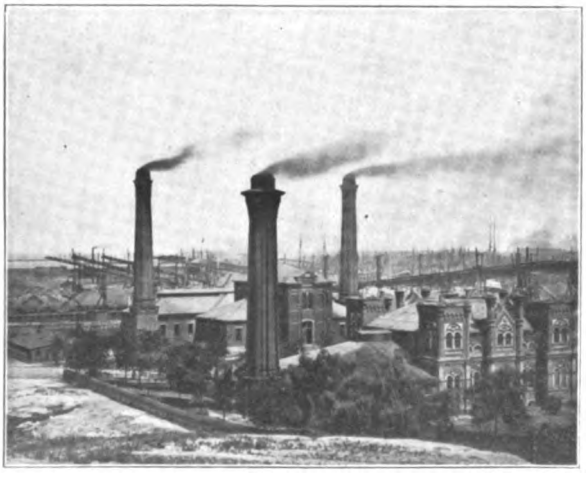


From an old cut

CITY WATER WORKS, SECOND STAGE, 1872

CITY WATER WORKS

The building on the right is the original pumping station



THIRD STAGE OF THE CITY WATER WORKS, 1888

Showing ore docks in the background occupying the old river bed.

THE NEW WATER SUPPLY TUNNEL OF CLEVELAND, OHIO.

"The tunnel is circular nine feet in internal diameter, beginning at a shaft on the grounds of the new Kirtland street pumping station and running northwesterly twenty-six thousand and forty-eight feet in a straight line to the intake shaft. The intake shaft is sunk inside of a steel and concrete crib one hundred feet in diameter located approximately four miles from shore. The position of the crib was selected so as to bring the intake as far west of the mouth of the Cuyahoga river as possible and place it out of the path of the discharge from the river, which is easterly down the lake. The tunnel lining consists of three rings of shale brick laid in natural cement mortar, the walls being about thirteen inches thick. The excavation was through soft clay and was all carried on under air pressure.

"The contract for the construction of the tunnel and shafts was made with Mr. W. J. Gawne and approved by the city council September 8, 1896. Work was begun on the sinking of the shore shaft October 8, 1896, and this was the first work in the actual construction of the tunnel. At first the sinking was done without air pressure, but it was found that the clay was too soft, all the bracing in the lower part of the shaft giving way and allowing the upper part to settle and be thrown out of plumb. An air lock was then put in the shaft and all the subsequent work was carried on under pressure of from twenty to twenty-five pounds. The tunneling from this shaft was prosecuted without accident or serious interruption until May 11, 1898, when a distance of six thousand, two hundred and eighty feet was completed. On that day an explosion occurred in the heading which so badly burned the eight men in the tunnel that they all died within a few days. As a section sixteen feet long had just been mined out, the concussion loosened the supports and the clay roof caved in making a conical cavity extending approximately twenty feet above the roof. After the debris had been cleared away, it was found necessary in order to pass the cave-in to line the excavation with flanged steel plates. After this section was passed the tunnel was carried on in the usual manner until July 11th of the same year, when a distance of six thousand, five hundred and forty-one feet having been completed, a second explosion occurred which instantly killed three bricklayers and eight helpers in the heading. The invert had just been completed and several of the men were caught in the cave-in of the clay roof. After recovering the bodies of all of the men, the heading was closed by the brick bulkhead and no more tunneling was done from this drift.

"Besides the work done from the shore shaft, tunneling was started in the intake shaft and in two intermediate temporary shafts in wooden protection cribs. Temporary crib No. 1, eleven thousand, six hundred and twenty-five feet from the shore shaft, was placed in position May 27, 1897, and the contractor began sinking the shaft September 17. He carried on tunneling from this point in two drifts, the east drift connecting with the tunnel built from the shore, the junction being made on July 9, 1899. The west drift was carried to a point four thousand, eight hundred and fifty-eight feet from shaft No. 2 and a brick bulkhead was built closing the end of the tunnel. No serious accident occurred on the work built from shaft No. 2.

"Temporary crib No. 2 was located at a distance of seven thousand, two hundred and eighty feet from crib No. 1; it was placed in position September 8, 1897, and the contractor began sinking the shaft January 14, 1898. This work was done during the winter months when the lake was covered with ice. The jarring of the crib due to the impact with the moving fields of ice caused serious injury to the shaft so that great difficulty was experienced in keeping the water out. The surrounding clay was so softened by water following down the sides of the shaft that an air pressure of nearly forty pounds per square inch had to be used in putting in the bottom and starting out the tunnel. After the soft material had been passed, no further difficulty was experienced, and the work was continued in the usual manner, the east heading meeting the west drift from crib No. 1 November 10, 1900. The heading driven westward from shaft No. 3 was extended three thousand, five hundred feet, and a brick bulkhead was built, the contractor deciding to do the balance of the tunneling from the intake.

"The permanent intake crib was placed in position July 1, 1898. The contractor began sinking the shaft on July 4, 1900, and finished July 8, 1901, a great deal of delay having been caused by difficulties in keeping the water out. The contractor resumed work June 13, 1901, in the west drift crib No. 2, as it had been decided to do some more tunneling from this point in order to hasten the completion of the work. August 14, 1901, while the men were in the tunnel cleaning up, the crib superstructure caught fire and was burned to the floor line, five men losing their lives by being burned, while five others were drowned. All the men in the tunnel at the time of this accident were rescued. The work of rebuilding this crib was immediately started and was well under way when, on August 20 of the same year, the shaft at the intake crib broke off at the bottom of the lake allowing the remaining part of the shaft to fill with water and soft clay, the upper portion of the shaft in rising partly wrecking the superstructure of the crib. Four men were in the bottom of the shaft at the time of the accident and were buried in the clay. The fifth man who was in the air lock on top of the shaft fell down and was drowned.

"The contractor not taking active steps to proceed with the work at the two cribs, the city took charge and pushed repairs of the broken shaft and also the tunneling in the west drift from crib No. 2, using much of the contractor's machinery. It required a great deal of time to regain lost ground as the superstructure of crib No. 2 had to be rebuilt, new machinery set up, the tunnel cleared of water and debris, a new floor, air pipes and electric light wires had to be rebuilt at the face of the work. It was a slow and difficult task to remove the broken section of the shaft in the intake crib and to provide and rebuild the top of this shaft and connect it with the old work below. Air pressure was put on the intake shaft and the clay which had swelled in from the tunnel opening at the bottom was removed and the bodies of four men recovered. Tunneling was carried on in both headings until the two drifts met December 11, 1902, completing the tunnel for its entire length. December 14, 1902, an explosion of gas occurred in the west drift of shaft No. 3. Four of the men over in the tunnel at the time were killed or died from injuries sustained. Besides the lives lost in the various accidents a number of men died from the effects of the "bends," or caisson disease.

"In the season of 1903, the city carried on the work of clearing the tunnel of the quicksand which had seeped in through the joints in the brickwork. The walls of the tunnel were cut in a great many places to ascertain the character of the brickwork, which was found to be very poorly done in a good many places. The last work remaining to be done in the tunnel consisted of rebuilding a section immediately west of shaft No. 3 where the roof of the tunnel had sagged while the brickwork was being constructed and where the tunnel had been reinforced for a distance of fourteen feet by additional rings of brickwork making the net diameter about seven feet. The tunnel was here rebuilt to its proper dimension and the openings for the temporary shafts arched over and the shafts filled with clay to the level of the bottom of the lake. The steel and cast iron cylinder of the two shafts from the top down to the bottom of the lake were unbolted and removed. The tunnel was entirely filled with water on November 15 and the upper sections of the intake shaft were removed."

Water was first pumped from the tunnel February 1, 1904. The water was pumped through the tunnel and returned to the lake until February 11, when it was first pumped into the mains from the new station on Kirtland street. On April 6, 1904, all pumping through the west side tunnels was discontinued for city use. These tunnels are now held in reserve for fire use, and are connected with a series of special high pressure service mains that are laid through the business and manufacturing sections of the city. The same year a high pressure service for the higher altitudes of the city, especially the heights to the east, was installed.

The city is now provided with one of the largest water intake tunnels in the world, twenty-six thousand feet long, nine feet in diameter, terminating in forty-nine feet of water, and with a daily capacity of one hundred and seventy million gallons. W. M. Kingsley, C. E., then superintendent of the water works, was the chief engineer, and C. F. Schultz, his first assistant.[11]

WATER RATES.

There was considerable difficulty in adjusting the early water rates. The water was used sparingly, street and garden sprinkling was prohibited from 8 a. m. to 7 p. m. The trustees were constantly struggling between the Charybdis of an annual deficit and the Scylla of a want of patronage. They did boast of their meager surplus, even though they despaired at the lack of popularity. The following table of the first water rates will explain this unpopularity.

"Ordered, that the following rates for supplying water per year be charged to consumers, payable semiannually, in advance, at the office of the trustees of the water works:

Dwelling house, not exceeding three rooms	$5.00
Each additional room up to sixteen	.50
Over sixteen rooms, each	.25
Bath tubs	2.00

[11] See "Engineering News," Vol. 40, p. 82, also "Engineering Record," Oct. 22, 1898.

Water closets 2.00
Hotels, per room 1.00
Boarding house, per room 1.00
Bathing houses, per tub 5.00-10.00
Plugs for washing sidewalks and windows..... 2.00
Livery stable, per stall, up to twenty stalls..... 2.00
Each additional stall 1.00
Private stables, each horse kept..... 2.00
Bakeries, from 5.00-10.00
Stores 5.00
Offices and sleeping rooms.....3.00-5.00
Churches, from 5.00-10.00
Schools, from 5.00-10.00
Cabinet and carpenter's shops 3.00
Printing offices 5.00-10.00
Market stalls 5.00
Markets 5.00-20.00
Stone yards 5.00
Blacksmith shops, per fire 3.00
Steam engines, per horse power..... 2.00
Steam apparatus for warming houses and other buildings, to be assessed.....
Colleges, hospitals, courthouse, jails, to be assessed.....
Water to sprinkle streets, to be assessed.....
Distilleries and rectifiers, gas works, breweries and malt houses, slaughter houses, railroads, to be classified.....1½c per barrel
Foundries and machine shops .....1½c per barrel
Plastering for each one hundred bushels of lime..... 2.50
Wetting and grinding brick with mortar, per thousand..... .10
Private fountains, to be assessed .....

September, 1856."

The following rates were charged for sprinkling yards, in addition to tariff of rates for dwellings:

For 66 feet or less front: ⅝-inch tap, free; ¾-inch tap, $2.00; 1-inch tap, $2.50. For 66 feet to 100 feet front: ⅝-inch tap, $2.00; ¾-inch tap, $2.75; 1-inch tap, $3.00. For 100 to 150 feet front: ⅝-inch tap, $3.50; ¾-inch tap, $4.81; 1-inch tap, $5.25. For 150 to 200 feet front: ⅝-inch tap, $5.00; ¾-inch tap, $6.88; 1-inch tap, $7.50.

In 1856 these rates were reduced a little, and revisions in rates were made annually until 1887, when a system of charges was adopted that remained until 1893. In 1896 a revision was made that continued until 1910.

The introduction of meters has materially affected the water rates. Early in the '70s meters were introduced. The following table will illustrate their introduction:

Year	¾-inch.	Inch.	1½-inch.	2 in.	3 in.	4 in.	Total.
1874	6	17	13	25	4	..	65
1875	13	42	24	22	7	3	111
1876	47	56	31	23	8	3	168

With the completion of the new tunnel came the universal introduction of meters in houses, by Professor E. L. Bemis, the superintendent of water works. The following indicates the progress of this work:

TABLE SHOWING THE PER CENT OF CONNECTIONS METERED AND THE EFFECT OF METERING ON THE PER CAPITA CONSUMPTION.

Years	Total Connections in Use	Total Meters in Use	Per Cent of Connections in Use Metered	Gallons Used Each Inhabitant Per Day
1874	5,693	73	1.28	45.36
1875	6,349	126	1.98	57.09
1876	7,130	185	2.59	49.22
1877	7,760	266	3.43	55.91
1878	8,384	312	3.72	51.13
1879	9,285	389	4.19	62.69
1880	10,013	444	4.43	65.25
1881	11,486	540	4.70	76.76
1882	12,923	761	5.89	68.41
1883	14,841	913	6.15	75.60
1884	16,963	1,057	6.23	82.66
1885	18,411	1,175	6.38	93.49
1886	20,395	1,365	6.69	91.26
1887	22,655	1,525	6.73	95.97
1888	25,477	1,644	6.45	95.08
1889	28,287	1,725	6.10	98.71
1890	30,938	1,794	5.80	106.05
1891	33,940	1,856	5.47	111.16
1892	36,508	1,930	5.29	117.56
1893	38,166	1,992	5.22	129.73
1894	42,013	2,143	5.10	112.83
1895	44,666	2,228	4.99	136.60
1896	46,389	2,355	5.08	128.50
1897	48,207	2,474	5.13	136.30
1898	49,832	2,606	5.23	138.20
1899	52,303	2,810	5.37	153.30
1900	53,473	3,140	5.87	168.90
1901	55,130	3,540	6.42	169.40
1902	56,816	11,296	19.88	167.80
1903	58,852	25,193	42.81	141.60
1904	60,627	30,370	50.09	138.50
1905	64,137	44,706	69.70	130.80
1906	69,128	56,712	82.04	123.00
1907	72,225	63,993	88.60	117.50
1908	74,490	69,733	93.61	100.30

At first the introduction of meters did not seem to allay the difficulty of adjusting the differences between the large and small users. The meter rates in 1875 were as follows:

When 50,000 cubic feet are used in six months.....16.0c per 1,000 gallons.
When 100,000 cubic feet are used in six months.....14.7c per 1,000 gallons.
When 200,000 cubic feet are used in six months.....13.3c per 1,000 gallons.
When 300,000 cubic feet are used in six months.....12.4c per 1,000 gallons.
When 400,000 cubic feet are used in six months.....11.7c per 1,000 gallons.
When 500,000 cubic feet are used in six months.....11.2c per 1,000 gallons.
When 600,000 cubic feet are used in six months.....10.9c per 1,000 gallons.
When 700,000 cubic feet are used in six months.....10.7c per 1,000 gallons.
When 800,000 cubic feet are used in six months.....10.52c per 1,000 gallons.
When 900,000 cubic feet are used in six months.....10.4c per 1,000 gallons.
When 1,000,000 cubic feet are used in six months.....10.29c per 1,000 gallons.

In 1877 it was ordered that the rates for water furnished by meter measure shall be upon the following basis for each collection of six months, or less:

For the first 50,000 cubic feet or less.....1.2 mills per foot.
For any amount 50,000 and 100,000 cubic feet.....1.0 mills per foot.
For any amount 100,000 and 200,000 cubic feet..... .9 mills per foot.
For any amount 200,000 and 300,000 cubic feet..... .8 mills per foot.
For any amount 300,000 and 400,000 cubic feet..... .7 mills per foot.
For any amount exceeding 400,000 cubic feet..... .6 mills per foot.

"Provided that in no case shall the charge be less than ten ($10) dollars per annum.

Payment shall be made in advance as in other cases upon the estimate of the secretary of the probable consumption for six months, subject to adjustment according to the actual amount consumed as indicated at the subsequent reading of the meter."

In 1908, the meter rates were as follows:

Rule 2. Meter Rates.—"The rates for metered water for premises inside the city limits shall be uniform, towit: 40 cents per 1,000 cubic feet, equal to 5 1/3 cents per 1,000 gallons, provided that when the meter is furnished and set by the water department, and the water taken through a 5/8 inch meter, no payment shall be less than $1.25 each semiannual collection, where the semiannual assessment rate is less that $4.50 and shall not be less than $2.50 semiannually in all other cases, but the payment for water used through a 3/4 inch meter shall not be less than $5.00 semiannually; through a 1 inch meter, $6.00; 1½ inch meter, $8.00; 2 inch meter, $12.00; 3 inch meter, $25.00; 4 inch meter, $40.00; 6 inch meter, $75.00.

"Where such meter, however, is furnished and set by the consumer, the minimum semiannual payment shall not be less than $2.50 in the case of a meter 3/4 inch or less, and $4.00 for all larger meters."

The administration of the water works was originally entrusted to a board of three trustees, elected by the people for three years.* During all the

* Act of March 11, 1853.

mutations of the city government from that day to 1891, when the federal plan was inaugurated, the board of water works trustees remained quite unchanged. The federal plan placed the water works under the care of the department of public works, presided over by a director of public works, appointed by the mayor. In 1902, when the uniformity decision of the Supreme court annulled the federal plan, the water works were placed under the care of the board of public works, consisting of three members elected by the people. In 1909, when the Paine law went into operation, the board of public works was disbanded and a director appointed by the mayor again resumed control. There has, from the beginning, been a superintendent and engineer. Originally these two offices were held by one man, but as the work became complex, two men were necessary and with the development of the system, a multitude of assistants and employees have become necessary. These will be under civil service rules, when the new civil service board, appointed in January, 1910, has completed its classification.

CHAPTER XIV.

CEMETERIES.

The first burial in Cleveland was that of David Eldridge, a young man employed by the Land Company in its second surveying party. He was drowned while crossing the Grand river in 1797. Alonzo Carter, son of Lorenzo Carter, was present and describes the burial: "We got some boards and made a strong box for a coffin. We put him in and strung it on a pole with cords to carry him up to the burying ground. Built a fence around the grave." [1] The grave was made in the first burial place of the village, lot No. 97 and part of 98, on the east side of Ontario street, at the present corner of Prospect avenue. The second burial was that of Peleg Washburne, a blacksmith's apprentice of Nathaniel Doan, who died of dysentery, in 1797. At least one Revolutionary soldier was buried there, David Clark, 1806. December 2, 1825, Hiram Hunt, who owned lots 97 and 98, gave notice that he intended to occupy them for building purposes and that no further interments would be permitted there.

ERIE STREET CEMETERY.

In 1826 the village secured a tract of land on Erie street for a cemetery, which was at first called the City cemetery, and later the Erie Street cemetery. The entire tract contains ten and a quarter acres but at first only two acres were used. There was popular disapproval at locating a burial ground so far out of town. No records of the interments and sale of lots before 1840 are in existence. It is not definitely known whether any records were kept or whether they were destroyed. In 1840 the entire ten acres were replatted and laid out in twelve sections with from two to three hundred lots in each section, and from that date a careful record has been kept. The lots were virtually all sold by 1860. In 1870

[1] Whittlesey's "Early History of Cleveland," p. 396.