

## The Water Supply of Lancaster

By M. LUTHER HEISEY

*"Ho, every one that thirsteth, come ye to the waters."*

The 22nd of February is a date of great significance to the American people, marking the natal day of the "Father of his country." The date is also one of singular importance to the citizens of Lancaster, marking an event of great import to the health, well-being, progress and security of her people. For on that day, one hundred years ago, a constant and copious supply of water from the Conestoga River was inaugurated, through the establishing of forcing pumps at the old City Mill, at the end of Poor House Lane, and the locating of a reservoir on East King Street, east of North Franklin Street.

Water, being the most vital element necessary to the existence of man, was of prime importance when the selection of a home site engaged the attention of the first settlers. Such a site was established at or near a spring. You, doubtless, know the location of many early homes, built directly over the spring, this being a precautionary measure, necessary because of the hazard of an attack or investment by marauding Indians.

The very site of Lancaster was decided upon to some extent by the element of water, for wasn't Gibson's tavern located "by the side of a fine spring"? Lot No. 730, of the Hamilton Tract, contained a spring; and a reservation concerning the lot stated that a line was to be drawn "so as to form a triangle *at a spring*, by cutting off ten feet from the eastern and ten feet from the southern

boundaries of said lot, which spring and angle shall be and *remain forever* for the use of the inhabitants of the borough." This the Hamiltons evidently intended should be used as a public spring, and, no doubt, gave the name, "Spring Garden Street," to Mulberry Street, by which name it was known in early days. This lot and spring were located near the present northeast corner of Mulberry and Fulton Streets.

The central portion of the city was always well watered by copious streams from subterranean sources. Springs served a useful purpose, until the introduction of water from the city reservoirs. Building operations in the central part of the city were obstructed in excavating and foundation work, by the unremitting flow from these springs, and even today one of the large department stores is required to operate continuously a pump to carry off the flow of water from such a spring.

Another source of water supply, before the introduction of piped water, came from the numerous wells and pumps about the city. These were vital to the welfare of the city, and were protected by city ordinances. We can learn the location of thirty-one such pumps from an old history.\* City councils on October 5, 1819, passed a resolution "appointing a committee, and the mayor, to ascertain the state and condition of the pumps in the public streets of the city." An ordinance concerning pumps was enacted into law, November 17, 1827, and provided that "every stream of water susceptible of improvement in the said city, should be rendered serviceable by means of pumps, or otherwise, so as to be useful in case of fire; to furnish water to cleanse the streets, and thereby purify the atmosphere, and render the same salubrious and healthy." It further provided that "no person or persons shall, at any time hereafter, remove, cut down, or willfully break, injure, destroy, or in any way damage and injure the same, or in any way stop or prevent the same from being used, without the consent of the mayor of the city."

Incidentally, the story of the drinking fountains for man and the watering troughs for beast, scattered about the city, could be

\* Historical Sketch of the Union Fire Company, No. 1, by Alfred Sanderson, 1879, p. 31.

told. William Blickenderfer, a grocer, located at 310 North Queen Street, impelled by humane motives, was one who erected such a fountain in 1874. The water was pumped from a very old well, and the motor that pumped the water to the fountain was the same used to operate the coffee mill in his store. These old wells and watering troughs are shadows of the past, and are another phase of "The Passing America."

Springs and wells served their day, but as the town grew, the agitation for a constant supply of water, piped to their homes and places of business, gained momentum. On July 6, 1819, the first committee was appointed to examine and locate a suitable site, at or near the Conestoga River, for erecting a water wheel for raising water to supply the city, and to ascertain the probable cost of the same. Apparently nothing was done, as another committee was appointed February 8, 1822, for the same purpose. On September 3, 1822, still another committee was appointed to ascertain the practicability of introducing a supply of "running water" into the city. These committees, as other committees have done since that time, talked over the matter, took junketing trips, and by reason of delay and failure to do anything, under the provisions of the charter, lost the right to do so in 1830.

The value and worth of a waterworks was evident as early as 1789. Under date of March 17, Chief Burgess Edward Hand submits to Congress an offer of Lancaster as a prospective site for the national capital. He mentions, among other features, that "our town is possessed of every advantage for Water Works, as will appear from the draughts herewith sent, and peculiarly healthy, with springs, wells and pumps in nearly every portion of the town."

As city councils made no progress, a private concern was organized for the purpose of supplying the city with water. It was known as the Lancaster Water Company, and was incorporated by act of April 23, 1829. The act limited the capital stock to \$60,000, in shares of \$50 each, and authorized the councils of the city to subscribe "for such number of shares as they saw fit, not to exceed one thousand." The commissioners appointed were George L. Mayer, Robert Evans, John Longnecker, Henry Keffer and Philip W. Reigart. This company likewise did nothing, and so a group of citizens petitioned Councils on January 4, 1831, for the forma-

tion of a new company. On February 12, at a town-meeting, it was voted that Councils should be requested to appropriate a sum of money to employ a competent engineer to ascertain the best manner of introducing water into the city and the probable cost of the same.

Again matters were delayed. This time it was caused by a subject of greater moment occupying the minds of the people, for the proposed new railroad was to be built north of the city, and the citizens desired the route changed so that the tracks would run close to the center of the city. This was accomplished at considerable cost to the city, and the subject of erecting a waterworks was forgotten for five years.

Then in 1836 the citizens and Councils again turned their attention to ways of securing an adequate water supply. Councils appointed a committee in compliance with a request from a number of citizens, and on February 8 they reported that they had employed General W. B. Mitchell to prepare an estimate of the cost of procuring water from five different localities. This committee also had under consideration the advisability of having the works erected by a stock company, or having the city alone undertake the task, borrowing money for the enterprise. Fortunately for the city then, and for generations following, this valuable public utility was not entrusted to a corporation operating for profit, but was retained under city management; and in later years, after tempting offers for the sale of the waterworks, our city fathers followed the wise example set by their predecessors.

But to come back to General Mitchell's report, which was as follows:

"Gentlemen:

"Having been employed by your committee to make the necessary examination, I immediately proceeded to the execution of that duty. The surveys have been confined exclusively to the waters of the Conestoga River, and the result enables me to say that an abundant supply of good water may be obtained from that source at a comparatively small expense; the only difficulty which presents itself is the price which may be demanded for water power. Five points have been examined, from all of which an abundant supply

may be obtained by the agency of water power to be derived from the Conestoga. If, however, the Corporate Authorities of the city of Lancaster should not be able to make an equitable arrangement for any one of those water powers, recourse is still left, and that is to erect a stationary steam engine on the 'Poor House' farm, which would not interfere with the Mill powers on the river except so far as the quantity of water subtracted from the stream might affect the interests of individuals immediately below the place from whence it would be taken out.

"It has been found that the high ground on the eastern part of the city, near Ross's corner (Ellis and Evans' History calls it Cross' Corner\*), is sufficiently elevated as to supply the whole city by constructing a reservoir at that place; and from that point all the surveys diverged. As this report is only to communicate facts and not opinions, it is only necessary to furnish the committee with a brief review of those surveys.

"First: From Swartz's mill, the difference of levels between the reservoir and the surface of the dam is 161-8 feet and 265 chains; of this distance 74 chains might be made an open race at a cost of \$1,900. The elevation of the hill is 99-2 feet in a distance of 660 feet, being 62-6 feet below the reservoir; and the whole length of pipe would be 13,266 feet, which at \$1.87 per foot would amount, including the race, to \$26,773.75.

"Second: From Demuth's mill—Difference between the level of reservoir and surface of dam 170-3 feet, and length of pipe 6,000 feet, at \$1.87 per foot, would amount to \$11,261.25.

"Third: From Swarr's mill—Difference of levels between reservoir and surface of dam, 175-2 feet, and length of pipe required, 5,444 feet, at same per foot would cost \$10,395.00.

"Fourth: From Rock below Humes' factory — Difference of level, 182-2; length of pipe required 7,279, at same cost, \$13,612.50.

\* Before the construction of the reservoir, the road to Demuth's mill, known as the Grofftown road, extended to East King Street, and crossed Orange Street, where now Reservoir Street joins it. As it does not appear that a Ross family owned land in the vicinity, it is reasonable to assume that the corner where these roads crossed became known as Cross' Corner. In those days East Orange Street extended in a southeastward direction and joined the old Philadelphia and Lancaster Turnpike.

This 'Rock' is elevated above the pool of the dam, 153.8 feet, or 28 feet below the reservoir.

"Fifth:\* From Coleman's saw mill—Difference of levels between reservoir and surface of dam, 188-2 feet; and length of pipe required, 11,814 feet, at same price would be \$22,151.25. As the different modes which may be employed will vary the cost considerably, no calculation has been made of the mere cost of laying pipe—from which the committee will be enabled to make a relative estimate of the most economical point, after which a more careful examination should be made. No doubt exists, however, of the entire practicability of introducing an abundant supply of water from any one of the points herein described:

"Respectfully Submitted:

"W. B. Mitchell."

Frederick Erdmann, an engineer from Philadelphia, Pa., reported to the water committee on March 29, 1836, that he had examined the several points, and thought that it was most feasible to conduct water from the vicinity of Swarr's mill, and that the best site for a reservoir was on the high ground at Cross' Corner. The cost of constructing the works was estimated at a little less than thirty thousand dollars, but the expense which it was necessary to incur for land made the total cost more than double that amount. On March 30, an ordinance was passed authorizing the mayor to borrow seventy thousand dollars.

The water committee bought of Edward Parker, for sixteen hundred dollars, eight acres of land for a site for the reservoir, and entered into a contract with the executors of John Swarr for the purchase of the mill property on the Conestoga, at thirty-eight

\* To many these five locations have been a matter of conjecture. The distance from the proposed reservoir, as expressed in feet, would to a limited degree reveal the approximate location. Swartz's mill was near Eden, at the first dam above the present waterworks. Demuth's mill was located a half mile north of Witmer's bridge, later known as Ranck's mill, and purchased by the city in 1887. Swarr's mill became the first pumping station, at the foot of "poor house hill"; Matthias Slough's mill first stood on this site. The Rock below Humes' factory is known to us as Indian Rock in Williamson Park. Coleman's saw mill, owned by William and Edward Coleman, was at First Lock, later known as Levan's mill. All these are shown on Scott's Map of Lancaster County, 1843.

thousand five hundred dollars, these purchases being approved by Councils. The salary of Mr. Erdmann, the engineer, was fixed at twelve hundred dollars. Work on the project was now started; trenches were dug through the streets for the purpose of laying pipes in August and September, 1836, and in December the water committee reported that the reservoir was nearing completion.

Finally, the day of great importance arrived, and was greeted with an appropriate celebration. Let us pick up the "Lancaster Examiner and Herald," of February 23, 1837, and read in its columns the following graphic account:

"The imposing spectacle of introducing the water of the Conestoga into the city of Lancaster, was performed on yesterday—the memorable twenty-second of February—the anniversary of the natal day of the 'Saviour of his country,' the good and great Washington—with signal eclat, and to the delight and gratification of the many thousands who had assembled to behold the joyous spectacle. The day dawned cloudless and serene, and a mild pure air, reminding one more of the zephyrs of May than of the blasts of February, breathed its balmy inspiration. At an early hour, according to the notices previously published, the citizens congregated in the Court House square, to marshal themselves into the proper order of procession. Not only the inhabitants of the city, but many hundreds of our country friends attended—all of them alive to the importance and novelty of the occasion. After a brief delay, the ranks were formed as follows: 1st, Military; 2d, the Mayor and Recorder; 3d, Aldermen; 4th, Select Council; 5th, Common Council; 6th, Engineers and Machinists; 7th, Watering Committee; 8th, Superintendents and Workmen; 9th, Fire Companies; 10th, Citizens of the Country; 11th, Citizens of the City. Marshals of the day—John F. Steinman, C. Hager, David Longenecker, John Zimmerman; Assistant Marshals—John F. Long and William B. Fordney.

"The ranks having been properly formed, the line of march was taken up, and the procession soon reached the reservoir at the head of East King street, where the arrival of the 'stranger element' was anxiously expected. The delay was brief. About half-past ten the water made its first appearance, slowly entering from the pipes into the basin, amid the thundering of artillery, and

the general ringing of the city bells. The floor of the basin was soon covered, and the water gradually rose, promising soon to fill the reservoir, a consummation greeted with huzzas from thousands of voices, that made the welkin ring, having their origin in the happy conviction that yet a very little while and the approach of the devouring flame, whose former threatenings were wont to shake the stoutest hearts, might be almost defied.

"After remaining a sufficient length of time, to be convinced of the entire success attendant upon this creditable and difficult enterprise, the citizens left the reservoir, in the order in which they had marched from the Court House, and returned to their respective homes.

"It is not possible for the citizens of Lancaster to congratulate themselves too deeply upon the happy result of which they were yesterday the witnesses, and of whose benefits they are ever after to be the happy recipients. Their property may now be considered as secure as aught can be from the ravages of conflagration; and the introduction, through the streets of Lancaster, and for the accommodation of every family that desires to partake of a never-failing supply, must have an enduring influence upon the prosperity of the city.

"Too much praise cannot be given to those who have been instrumental in bringing about this glorious consummation. The Mayor and City Councils have exerted themselves, from first to last, with unremitting zeal, and they may now recap their reward in the loud and heartfelt thanks of their fellow citizens. Many, very many, looked upon the whole project as chimerical, whose skepticism has become merged in amazement at the difficulties which have been overcome, and conviction of the great advantages which are to follow. Hundreds could not be brought to believe in the practicability of emptying the water of the Conestoga into a reservoir to more than a mile distance, and on an elevation above the water level of nearly two hundred feet. But it has been accomplished, happily and speedily accomplished, in defiance of the rigors and inclemencies of a severe winter, and after the labor of about seven months. There is now, and can be, but one feeling on the subject, and the able and skillful engineer, Mr. Frederick Erdmann, of Philadelphia, who pointed out the plan to be pursued,

and conducted it to so fortunate a completion, will be held in grateful remembrance by the people of the City of Lancaster."

With all the mechanical difficulties surmounted, there now remained those of a financial nature. The citizens of Lancaster wanted piped water, but were slow in paying the pipers. The loan which the mayor was authorized to make at six per cent, after considerable advertising, was not obtainable at home. But, due to the efforts of Colonel William B. Fordney, a loan of \$30,000 was negotiated with Nicholas Biddle, of Philadelphia, president of the United States Bank. This loan was obtained at a lower rate of interest, five per cent, and ran for thirty years.

#### FIRE AND WATER

To the volunteer fire companies of the town in the early days belongs most of the credit for the improvement of the water supply. They felt the inadequacy of the supply from wells, springs and small dams. As early as 1766, it was "the opinion of the Union Company that a Reservoir be made on the Run in Queen Street." This was near the intersection of Vine and South Queen Streets. At a meeting of the Union Company in 1791, with Hon. Jasper Yeates presiding, it was agreed "to fix two Sluices at proper places, one on the Prison Run (King and Water Streets) and one on the Vine Street Run, in order to collect the water in case of the calamity of a fire." Committees were appointed, whose duty it was—at a fire—"to look for the most convenient place to get water," or "to form ranks, so that the Engine may be well supplied with water *whilst it can be had at the place from where it is taken.*" They continued the agitation in 1819, this time for a "reservoir to be built near the Court House Square." By 1822, they became more progressive in their demands, and sought "the introduction of water from one of the neighboring streams." So they struggled, as Historian Rupp would say, "to stay the igneous element by extinguishing it with copious effusions from their well-directed engines." \*

\* The American Fire Engine and Hose Company enjoyed the distinction of being the first company to use Conestoga water at a fire. This occurred April 15, 1837.

## THE RESERVOIRS

The first reservoir or basin had a capacity of 2,500,000 gallons of water, and measured two hundred feet square on the surface; sufficient for a town with a population of 8,200. No expansion was necessary until 1851, when a new reservoir was built adjoining the old one on its eastern bank, giving a total capacity of 6,000,000 gallons. This improvement cost \$13,700, but many times that amount was spent until the basin was finally made water-tight. Water for the new reservoir was drawn from the old through a flexible connection, placed about eighteen inches below the surface of the water, and controlled by a floating buoy.\* This arrangement was constructed by Neal and Matthews, of Philadelphia, for the sum of \$227.19. Other sites, which were considered desirable by the water committee, before definitely deciding upon a location for this new reservoir, were the ground owned by the Union Bethel Church, on East King Street, east of Ann; and the land adjoining this owned by John H. Duchman; a tract of land on Middle Street [now Howard Avenue] belonging to a Mr. Rhoades and Adam Metzger; and part of the Lancaster Cemetery, with adjacent property. This last tract was found unavailable, because some of the lot holders were unwilling to sell.

The unused ground between the reservoirs and Broad Street was called Reservoir Park, and first used as such in 1898. In 1900 the water superintendent was directed to place twenty-four benches in the park.

Jacob Hartman was granted a lease in 1851, giving him the privilege of cutting and storing the ice from the reservoirs. This right the Hartmans enjoyed until December, 1894, when the mayor was directed to notify them that their ice houses must be removed, within sixty days, from the reservoir grounds.

\* There is a story connected with this white-painted buoy—a neat little fiction. Other communities believed—or at least so they told their children—that the stork was the messenger of joy and source of supply of brand new babes. But here in Lancaster, when a doctor had an order for an infant, it was not surprising to find him, satchel in hand, mark you, scampering first out East King Street to the reservoir, and there, from the white floating buoy, obtaining the desired new baby, and later making delivery from the satchel.

## BIDS ON THE SECOND RESERVOIR

RECEIVED BY 6 P. M., JULY 25, 1850.

Excavation	Cost Per Cubic Yard					Sodding, sq. yd.	Brick per thousand	Bidders.
	Embankment below bottom	Embankment above bottom	Pudding	Graveling				
.11	.14	.17	.35	.50	.11	\$9.50	Dellet and Wilson	
.12	.13½	.13½	.70	.52	.13	9.75	Masterson and McGrann	
.11	.14	.17	.55	.55	.12	9.25	McMahan, Steers and Wiley	
.15	.15	.16	.75	.75	.20	9.60	Taylor and Oster	
.12½	.14	.14	.87½	.50	.14	10.00	Patrick Brady	
.10	.12	.14	.50	.60	.15	10.00	George Hitzelberger	
.11	.16½	.18	.25	.37½	.12½	10.00	James Boone	
.12	.15	.18	.58	.60	.12	9.50	A. Leader and Co.	
.12	.15	.18	.58	.60	.12	9.62½	Jacob F. Kautz	

The contract for building the east one of the two reservoirs on East King Street was awarded to Dellet and Wilson. Later Kautz was added to the firm.

A present-day comparison of the above figures would prove interesting. Following the above columns, the present-day reproduction costs, as given in the Inventory and Appraisal of the Lancaster City Water Bureau (1935), are:

\$1.00 1.11 1.00 1.00 1.00 .50 \$30.00—for brick, per thousand, laid.

The total amount, fixed by the local Court for Appraisal, for the two reservoirs, was set at \$383,843.

With the city growing rapidly on "The Hill," or Eighth Ward section, by 1882, it was found that the pressure was insufficient to furnish water to those parts, and therefore a standpipe was erected in the center of the western or old basin, giving the needed altitude to furnish water to every part of the city. Later this standpipe was removed, and a much larger and higher one erected near the east basin, with a capacity of 500,000 gallons. The

capacity of the two standpipes in the west end is 1,000,000 and 5,500,000 gallons respectively.

In the administrations of Mayors Robert Clark and Edwin S. Smeltz, a huge reservoir was constructed west of Franklin and Marshall College campus. This basin, through faulty construction, belied its name; for, on being filled to capacity for the first time, its western wall by the gate house gave way, and the fields to the westward were flooded for a great distance. Fortunately, there was no loss of life, and more fortunately for later generations of children, the basin and surrounding land were transformed into a beautiful playground, which we know as Buchanan Park. The city's loss was the children's gain. Now the two large standpipes, placed near the site of the demolished reservoir, serve that section of the city. Less well known to the present-day citizens is the fact that on two former occasions mishaps occurred at the old reservoirs: once a break caused a flooding toward the north, and at another time an overflow rushed to the southward.

What Mayor Edwin S. Smeltz characterized as the worst break in the history of the water system occurred on May 19, 1894, 3:00 P. M. when the "Y" located near the pumping station broke. The broken joints were braced, and pumpage reduced to relieve strain on the weakened pipes, which nevertheless continued to leak, losing 100,000 gallons every twenty-four hours. This caused the city to be without water for a day, and on a curtailed supply for a week. Thereafter check valves were placed in these supply pipes.

#### RECEIPTS AND EXPENDITURES

The first water rents for the period from May 11, 1837, to April 1, 1838, were collected from the following: Zeph. McLenigan, Charles Sheaff, M. McGrann, Jacob Griel, Henry Flick, Henry Rogers, R. Frazer, Farmers' Bank, Mrs. Fahnestock, Dr. William Fahnestock, Abraham W. Brenneman, George H. Bomberger, Samuel Dale, John F. Long, J. and P. Long, Benjamin Champneys, William Norris, George Ford, John Myers, the Office of Discount and Deposit, Catharine Yeates and Margaret Yeates. These water bills amounted to the grand total of \$187.96. While the income grew steadily there was no thought of profits or of a balanced bud-

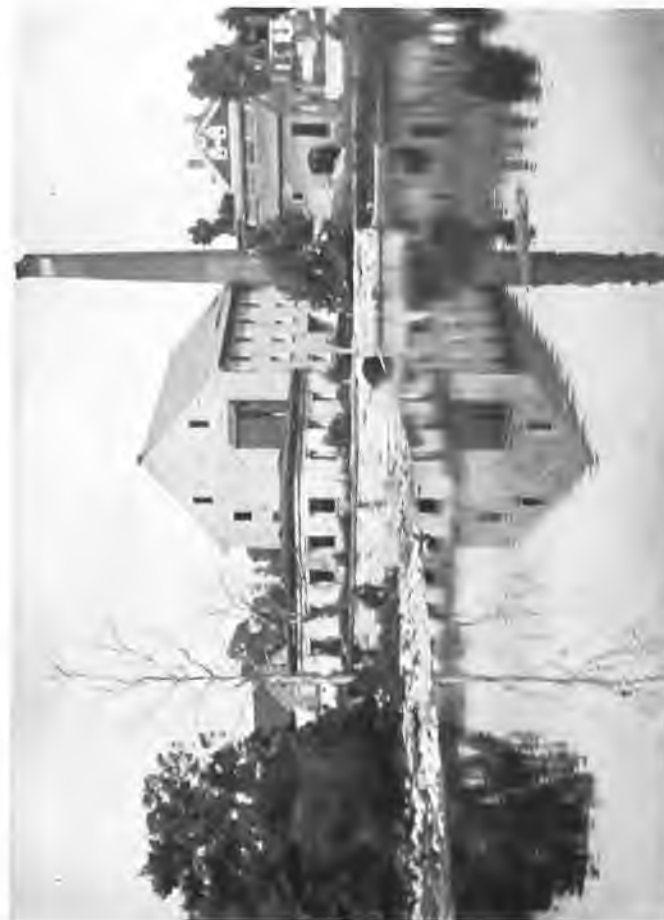


Photo by D. B. Lumis

OLD CITY WATERWORKS, 1837 TO 1888.





LANCASTER'S WATERWORKS, BUILT IN 1888, AS PICTURED IN 1900.



WATER COMMITTEE WHICH SUPERVISED CONSTRUCTION OF THE WATERWORKS IN 1888. ON THE PICTURE, LEFT TO RIGHT, ARE: EX-MAYOR WILLIAM A. MORTON, MAYOR EDWARD EDGERLY, ROBERT A. EVANS, PRESIDENT OF SELECT COUNCIL; WILLIAM RIDDLE, GEORGE M. BORGER, WILLIAM K. BEARD, PRESIDENT OF COMMON COUNCIL; JERE ROHRER AND JOHN H. BAUMGARDNER. MR. ROHRER WAS SUCCEEDED BY ANDREW M. FRANTZ.



get for years, because the initial cost of the enterprise was \$104,168.41. From this should be subtracted the sum of \$16,903.15, received from the sale of a farm connected with the Swarr mill.

In the second year, the amount collected from the users of water was \$1,791, received through the following sources:

32 dwellings at \$7 per annum .....	\$ 224
79 dwellings at \$6 per annum .....	474
45 dwellings at \$5 per annum .....	225
50 pave washes .....	50
1 Tavern stabling .....	28
1 Tavern stabling .....	22
1 Tavern stabling .....	18
1 Tavern .....	28
2 Taverns .....	96
8 Taverns at \$12 .....	96
5 Taverns at \$10 .....	50
4 Taverns at \$9 .....	36
2 factories at \$30 .....	60
Jail and court house .....	30
The Slaymaker House .....	30
Stable and horse .....	8
Brewery .....	25
Brewery .....	20
Currier shop .....	20
Currier shop .....	5
1 Bath house, public .....	50
9 private baths at \$3 .....	27
3 distilleries .....	40
1 distillery .....	43
1 distillery .....	60
2 Barber shops .....	10
2 Hatters at \$8 .....	16
Total revenue, one year .....	<u>\$1,791</u>

By this year, 1839, the whole cost of the waterworks amounted to \$127,186.53. In four more years, the number of city dwellings connected with the water supply had increased to 305. By 1846,



Photo by C. P. Abraham

LANCASTER'S PALATIAL FILTER HOUSE  
ERECTED IN 1933

SHOWING ALSO THE MOTOR EQUIPMENT OF THE WATER DEPARTMENT

the total cost of the water system was \$144,161.32½. Note the half-cent. Other figures for 1846 are:

Salaries for the year .....	\$ 375.00
Expenses, including interest .....	1,200.00

#### RECEIPTS

Water rents .....	2,800.00
From the State, for water furnished to the Canal Commissioners, operators of the railroad .....	700.00
Rent of City Mill, part of property occupied by Abram Leaman, miller .....	435.00
Raised by taxation .....	5,840.00
Receipts from all sources .....	\$9,775.00

On July 13, 1849, the water committee reported the startling fact that Dr. John Light Atlee had installed an extravagant innovation called a bath tub,—and that without the permission of the committee. Thereupon the committee imposed a charge of \$30.00 a year for this service. Dr. Atlee, in turn, removed the tub; but shortly thereafter the warring parties compromised, and the charge was reduced to \$16.00.

In 1877 the receipts amounted to \$29,256.89, and in 1886 they were more than \$50,000. In 1897 the annual income from water rents was \$75,000, while the cost of maintenance, not including the interest on the plant, was \$20,000. The sale of water in 1935 yielded \$383,320.91.

#### THE PUMPS

Geylan pumps, connected to the water-wheel by shafts, were first used. These were similar to the old-fashioned fire-engine pumps, which were worked up and down by hand. For a time, eight pumps were in service, but as the demand grew, the number was increased to fifteen. In 1870, a new turbine wheel and pump, costing \$27,000, were added. By 1878, the pumping capacity was again found to be inadequate, so a Worthington compound condensing pumping engine was purchased for \$17,450. This engine was

capable of pumping 3,000,000 gallons of water in every twenty-four hours. In the fall of 1893 a new 10,000,000 gallon pump was installed, and inspected by the water committee. This inspection was followed by the usual "outing" on such occasions. The caterer was C. W. Eckert, who served food, liquor and beer. The question naturally arises in one's mind whether the serving of the aforementioned liquids cast a reflection on the quality of the Conestoga water, or whether it followed the customary choice.

In 1929 the waterworks was equipped with eight electrically-driven pumps, three low duty and five high duty, the total capacity of which was over 25,000,000 gallons of water per day. In addition to these, three gasoline-driven emergency pumps were ever ready to supply water to the filter plant and the city reservoirs at a moment's notice.

Now there are in service three pumps for low duty and three for high duty, of 5,000,000, 10,000,000 and 15,000,000 gallons capacity, with a 15,000,000 gallon pump at the reservoir booster station.

#### CONSUMPTION OF WATER

In 1887, William Uhler Hensel made an interesting study and comparison with other cities and found that "the water consumption, about 1,400,000,000 gallons annually [or a daily consumption of 3,835,660 gallons], is twice as much *per capita* as in Buffalo, Boston, Cincinnati, Philadelphia, Montreal or Brooklyn; three times as great as in Baltimore and Cleveland; four times as great as Columbus; six times as much as in Dublin or Liverpool; five times as great as Paris or London; four times as much as Hamburg, Germany, and three times as much as Glasgow, which has the highest average of European cities." What can be deduced from that comparison—were Lancastrians extremely clean or grossly wasteful? You can draw your own conclusion.

The mayor, in his message to City Councils, on June 6, 1894, states that the per capita daily consumption was 168 gallons, a quantity larger than that consumed by any other American city of the same size. With the introduction of meters, there was a consequent reduction in pumpage and in the quantity of coal consumed, but increase in receipts. This measured water service has de-

creased the average daily consumption to less than 100 gallons per capita.

TABLE SHOWING AMOUNT OF WATER PUMPED AT THE OLD WATERWORKS IN GALLONS

Year	By Water Power	By Steam	Total Gallons	Daily Average	Per Cent Pumped by Water
1880	451,354,013	395,585,100	746,973,113	2,040,811	64
1881	260,084,567	700,735,450	969,835,017	2,903,706	26
1882	398,638,800	699,337,300	1,118,975,100	3,257,494	35
1883	375,204,209	723,646,880	1,098,851,080	3,010,578	34
1884	420,752,120	845,027,400	1,265,799,680	3,458,414	33
1885	261,305,080	1,215,617,456	1,476,922,536	4,017,155	18
1886	349,116,310	1,036,526,726	1,385,643,036	3,785,323	25
1887	406,402,200	1,007,168,730	1,413,570,930	3,872,796	28
1888	502,109,456	1,108,112,135	1,610,211,591	4,422,218	31
1889	No report.				
1890	Removed to new Pumping Station. Pumping by steam only, for eleven months .....				
			1,548,274,706	4,318,410	
1891			1,851,283,856	5,072,010	

The average daily consumption in 1897 was 6,000,000 gallons; in 1919, over 7,000,000 gallons; in 1925, 9,635,000 gallons; in 1927 this was reduced to 8,828,000 through the installation of the meter system and the stoppage of leaks, the waste from the latter cause amounting to 736,000 gallons daily. The average daily consumption in 1936 was between 6,500,000 and 7,000,000 gallons.\*

The Conestoga provides a normal flow of 246,000,000 gallons every twenty-four hours. This, it was said, has been reduced, in times of drought, to 20,000,000 gallons per day. No less an authority than Edward D. Ruth tells us that, at the peak of the dry spell of 1929, 34,898,688 gallons flowed down the Conestoga in a day.

But not drought alone caused water officials to worry. On the morning of January 12, 1917, no water passed over the dam at the waterworks. This was caused by the ice on the Conestoga, which

\* For 1936, the city of Reading, Pa., reports an average daily consumption of 12,900,000 gallons.

was, at some points upstream, frozen to the bottom. Such a condition was not known to have existed previously, but by noon time the flow of water was again nearly normal.

Curtalement of the supply of Conestoga water was threatened from another cause. In 1900 the city of Lebanon planned to construct a pumping station on the old Horseshoe Turnpike, northwest of Brickerville, to draw water from Hammer Creek into the impounding basins over the hill in Lebanon Township. This situation was brought to the attention of the local court, but no legal action was ever taken against the city of Lebanon. The flow from Hammer Creek was especially desirable as it was a "soft" water, which tended to modify the "hard" water flowing down from the upper reaches of the Conestoga.

#### ANALYSES AND CRITICISMS

Critics of the clarity and palatability of the water supply are by no means of a modern order. In 1744, Witham Marshe was in Lancaster as secretary of the Maryland Commissioners, who, with those of Virginia and Pennsylvania, held the Great Treaty with the Six Nations. He commented in his daily journal that "the water here is very bad; occasioned by their springs, and even wells, being stored with limestone. This palled my appetite, but this soon left me after I refrained from drinking the water by itself."

In Sketches of Pennsylvania, No. 5, as found in Hazard's Register, date of August 3, 1833, we read:

"Lancaster suffers (in the estimation of strangers, at least) for want of good water. That in common use, derived from wells, is so strongly impregnated with lime, as to be disagreeable to the taste, and unfit for many domestic purposes. We would recommend this subject to the serious attention of the friends of Temperance in that city. When they urged *water* as the best beverage, they should be prepared to supply it of good and wholesome quality. For our part, we never drink the article in Lancaster, except in the form of tea or coffee, and even these are rendered unpalatable by the properties of the water. We do not know whether any plan of supplying the city with pure water is practicable. If it be so, we would hold up the example of other cities, all situated, like Lan-

caster, on a limestone rock, and yet all supplied with excellent water from the surrounding hills."

An analysis and comparison of waters taken from hydrants, wells and cisterns of Lancaster in 1884, and tested by Professor Thomas R. Baker, of the State Normal School, Millersville, Pa., showed that most of the waters examined were up to a high standard of purity. The hydrant water, for purity, wholesomeness and softness, showed a more satisfactory result than waters drawn from the wells and cisterns. In February, 1887, in a test with Conestoga water and a sample from the Lititz Springs, the result was by no means unfavorable to the city water. But while the water of the Lititz Springs was ever clear, the water of the Conestoga was not. Rain, the providential source of our supply, was also the cause of much distress to the drinker. Before the days of filter plants, when Lancaster would be visited by a heavy rain storm, it seemed that all the top soil from the watershed of the Conestoga valley above the waterworks' dam would be washed down and pumped into the city's reservoirs. Instead of water, from the household faucets issued a heavy, brown clayish substance, disagreeable to look at, and more disagreeable to quaff. If allowed to settle in a glass, one-third of the contents would be found to be pure clay. At such times the citizens would revert to the use of the old town pumps, until the streams again cleared. But even with a modern filtering system, all is not as desired, for when the waters of the river become roily, more chlorine is added to the filter beds, which in turn gives a noticeable and unpleasant taste to the water. Could anyone, living through the former unsatisfactory conditions, object to this? With constantly improving facilities, even this slight "taste" will in course of time be eliminated.

The precautionary measures, taken to safeguard the purity of the water supply, are shown by the following account of tests and analyses, as explained by the city chemist, J. E. Goodell:

"Bacteriological analyses are made upon seven samples of the water each day. The samples are: 1, of the raw water; 2, the water from which the sediment has settled, after treatment with alum and activated carbon; 3, the filtered water; 4, the finished water, treated with chlorine and ammonia; 5, sample from tap in

the municipal building; 6 and 7 are samples obtained from outlying parts of the city. These samples are examined for the number of bacteria which will develop at body temperature on standard agar culture media. As the water passes through the several steps of coagulation, sedimentation and filtration, the number of bacteria rapidly diminishes. The No. 1 sample may show from several hundred to many thousands of colonies. Usually approximately 90% of these organisms are removed by the preliminary treatment and sedimentation. Filtration through sand removes nearly all of those present in the settled water, and the few which are left are killed by the small amount of chlorine which is added for that purpose. The finished water, and the samples obtained in the city, seldom show more than one colony per cubic centimeter.

"To test for the possible presence of B. Coli, water from each sample is added to nutrient lactose broth medium to find out whether or not organisms are present which are capable of fermenting lactose (milk sugar). Organisms common to the intestinal tract (B. Coli) are included in this group and transplants are made, from any of the above tubes, which are fermenting, to other culture media to confirm the presence of B. Coli. B. Coli should be absent from drinking water, as they indicate a probable sewage contamination. During the period of warm weather we find a number of fermenting broth tubes, but in all cases the organism proves to be a spore forming bacillus which grows only in the absence of oxygen. The tests for B. Coli are always negative.

"In addition to the bacteriological examination, the first four samples are tested for the hydrogen ion concentration, color, alkalinity, turbidity and free carbon dioxide. Also, the last four samples are examined for the amount of residual chlorine. As stated before, chlorine is added to kill the few organisms which pass through the filters. The amount of chlorine used is sufficient to leave an excess in the water of approximately 0.3 part per million at the filter plant.

"A small amount of ammonia is added to the water just ahead of the chlorine, which combines with the chlorine to form chloramine. This is a disinfectant which is much more lasting than chlorine alone and can be detected at the outskirts of the city."

### THE FILTER PLANTS

Bringing water into the city was an accomplishment of which the city fathers were proud, but while the convenience was appreciated, the demand for a purer supply became more and more insistent. But it was not until 1906 that a filter bed was erected, in East Lampeter Township, across the river from the present waterworks. The first one was designed by P. M. Maignen, a French engineer, for a private concern. It did not prove satisfactory, however, and the filtering system was subsequently reconstructed during 1907-08. In 1925, the filter plant was purchased by the city, thus bringing the entire water system under municipal control.

On March 17, 1931, a comprehensive water and sewer improvement program to cost \$3,250,000 was approved by the electorate at a special election. This was the greatest forward stride ever taken by the city in its water and sewer plans. Part of this huge sum was spent on a palatial stone filter plant of 16,000,000 gallons' capacity. It is one of the most beautiful structures in the county. This plant was finished and turned over to the city authorities on Sunday, December 10, 1933, when special dedication exercises were held. The filter plant is located on a tract of eighty-four acres, on which are planted 50,000 evergreen and larch trees.

### REMOVAL OF WATERWORKS

The "old city mill," back of the Lancaster County Almshouse, served well its purpose as a pumping station, first using water power only, and later steam and water, from 1837 to 1888. When in 1887 there was talk of removing the pumping station, it was not for faulty service or deficient power of the "old mill."

The rapid growth of the city in the northeastern section, with a consequent increase in sewage, which emptied into the Conestoga above the old City Mill, and created a condition inimical to the health of the city, demanded the removal of the waterworks to a point farther upstream, beyond any hazard of contamination to a pure water supply.

Contemporaneous with the fiftieth anniversary of the introduction of water into the city, a proposition was submitted to the electorate, at the regular municipal election, Tuesday, February 15,

1887, to determine by their votes the approval or rejection of a city loan of \$125,000, to be expended in improvements to the water and sewerage system. That loan, while large for the times, was approved by a decided majority, but how insignificant it appears in comparison to the loan approved by the electorate nearly a half-century later, of a sum exactly twenty-six times as large (\$3,250,000).

Acting promptly, in fact just eleven days after the approval of the loan, Mayor W. A. Morton purchased for the city, for the sum of \$21,980, the Ranck mill property, located a half mile north of Witmer bridge. This site, with its improvements, was an excellent location for the new pumping station, but for some reason was not approved by City Councils.\*

Looking for a site farther up the river, land was bought north of the Pennsylvania railroad (at the "Big Bridge") in Manheim Township, from Sheriff George W. Tomlinson, and there the new waterworks was erected, and placed in operation, late in 1888, with two steam pumps operating with a daily capacity of 11,000,000 gallons. The water committee then serving was composed of Mayor Edward Edgerley, chairman; Robert Evans, president of Select Council; William Riddle, George M. Borger, William K. Beard, president of Common Council; John H. Baumgardner and Andrew M. Frantz.

Along the tracks at the western approach to the "Big Bridge" (which, by the way, was just completed that year) a siding and coal bin and chute were constructed. A familiar figure, along this short stretch of the Conestoga, was the driver, with his one-horse cart, making almost ceaseless trips from the bin to the storage room at the pumping station. With the introduction of electrically-driven pumps, his work was ended. Jacob Halbach, the water superintendent, did not approve of the change from part water-power

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\* Among the numerous and desirable sites suggested were the Lititz Springs and the Leman Rifle Factory. The latter was located in Upper Leacock Township, about five miles upstream from the present pumping station. Because it was looked upon as a likely site, and from a sense of loyalty to his city, Henry E. Leman, who died May 12, 1887, had decreed in his will that the factory was not to be sold, except to the city of Lancaster for a waterworks site. The water committee did not avail themselves of this offer.

to all steam-power pumps, claiming that the cost of operation would be three times as large.

#### THE WATER RATES

In the early days, the rate was supposed to be less than the equivalent of ten cents per thousand gallons. Meters were unknown then, and many people were prodigious consumers. With the introduction of meters, the rate was established at ten cents per thousand. In 1931 the rates were greatly increased, so as to meet the expenses of the huge loan, contracted for the extension of both water and sewerage facilities. These rates included a "ready-to-serve" or "service" charge, a manipulation unknown to former city officials, not as wise as the present city fathers. This service charge is graded, for meter or pipe size of  $\frac{5}{8}$  to 10 inches, from 75 cents to \$37.50 for city dwellers, while those served outside the city are charged double rates. The water rates are:

75,000 gallons or less, @ 25 cents per thousand;  
the next 925,000 gallons, @ 18 cents per thousand;  
over 1,000,000 gallons, @ 10 cents per thousand.

For those dwelling outside the city, the rates are 60, 30 and 12 cents. Water companies outside the city pay 60 cents per thousand.

The vast extent of the present water system is shown by the 17,000 service connections, 900 fire hydrants, and 2,000 large valves in the man-holes about the city. There are approximately 100 miles of distribution mains, from two to thirty-six inches in size.

#### FUTURE NEEDS

While few cities the size of Lancaster can boast of a better water system, yet expert opinion shows the need for many improvements. Among these are large sedimentation basins, a large impounding dam, a gravity storage reservoir to relieve the constant operation of the pumps, and a reforestation of the water shed. Edward D. Ruth has said, "the city should acquire all the cheap hillsides along all branches of the Conestoga above the pumping station, and reforest them with evergreen and larch trees, which are to be had for the asking from the State of Pennsylvania." Such

a reforestation plan would assure us a better quality of water, and would conserve the rainfall, which now rushes off bare hillsides and fields.

In relation to a gravity storage reservoir, Engineer J. W. Ledoux, in 1914, recommended to the city the construction of such on a site between Rohrerstown and Centreville, where the elevation is 540 feet. At that time, he estimated the cost of the same to be \$40,000, and the cost of a 36-inch main to the site to be \$200,000. Charles M. Howell, former city commissioner, and Edward D. Ruth, former water superintendent, concur with the opinion of this engineer.

With such improvements Lancastrians will be assured of an abundant, pure and healthful supply of water for years to come.

#### ELEVATIONS

	<i>Feet</i>
Level of the water at extreme stages in the Conestoga River, at the pumping station .....	261 to 271
Surveyor's plate or bench mark at the court house, East Grant Street side .....	369
Bottom of old reservoirs .....	404
Buchanan Park .....	404 to 430
Flow line of reservoirs .....	418
Curb level at fire hydrant—	
corner Shippen and Grant Streets .....	404
corner Marietta and West End Avenues .....	412
corner James Street and College Avenue .....	422
Franklin and Marshall College grounds .....	431
Flow line of standpipes .....	510
Elevation of land between Rohrerstown and Centreville .....	540

NOTE. The writer secured much of his information from old newspapers, Journals of City Councils, and the writings of William Riddle. He gratefully acknowledges the hearty cooperation of Chas. P. Abraham, water superintendent, and Edward D. Ruth, former water superintendent.



## WATERWORKS OFFICIALS

<i>Year</i>	<i>Superintendent</i>	<i>Engineer, Pumping Station</i>
1843	John A Messenkop	
1846-48	Mr. .... Weimer	
1848	Jacob Graeff	
1849	John A. Messenkop	David L. Graeff
1850-51	Henry Diehl	(salary, \$350 per year)
1857	James Chambers	
1859-60	Henry F. Benedict	
1863-64	Hugh Dougherty	
1866-67	James L. Messenkop	Lewis Knight
1868-69	M. H. Mercer	
1873-74	William Hensel	Taylor Schuyler
1874-81	Jacob Halbach	David L. Deen
1882-83	Jacob Halbach	William Stehman
1884-86	Jacob Halbach	
1888	Peter C. Hensel (May 1)	Charles S. Halbach
1889	William J. Smith	
1890-91	Edward F. Frailey	
1892-93	John F. Pontz	Fred Sener, Jr.
1894-96	Edward F. Frailey	Israel Bair (1894)
1897-00	Edward F. Frailey	Israel B. Baer
1901-06	Edward F. Frailey	James A. Fellenbaum
1907-08	Edward F. Frailey	Albert L. Burns
1909-10	Edward F. Frailey	James A. Fellenbaum
1911-13	Frank H. Shaw	Christian N. Nagle
1916	Elmer K. Saylor	John L. Coyle
1917-22	Charles K. Will	John L. Coyle
1923-28	Edward D. Ruth	John L. Coyle
1929-33	Chas. P. Abraham	John L. Coyle
		George W. Fordney
1934-35	James J. Malone	George W. Fordney
1936	Chas. P. Abraham	George W. Fordney

Supervisor of the Filter Plant, 1906 to 1929, Amos Schaeffer;  
since 1929, Leon S. Duckworth.