

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

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CCCXX.—FAIR HAVEN, VT.

Fair Haven, Vermont, in lat. 43° 37' N., lon. 73° 16' W., is on Castleton River, a small stream. Settled in 1779, it was incorporated in 1820 as a village.

Water-works were built in 1880 by the village, taking the supply from a lake of 80 acres' area, fed by springs and having a very small water-shed. It is 3.4 miles from the village and 200 ft. above it. The water is drawn from the lake through a tunnel in rock, 150 ft. long and 85 ft. below the summit of the high ground adjoining the lake. The water is conducted to the village by cast-iron pipes. The first 500 ft. is of 10-in. diameter, and then there are 3½ miles of 8-in. pipe. Distribution is by 5½ miles of 6, 4, 2 and 1-in. pipe, with 27 fire hydrants, 15 gates and 170 taps.

The population in 1880 was 2,211. The consumption is not given.

The works have cost \$36,500, and the receipts have been \$2,508. The bonded debt is \$35,000, at 5 per cent. interest.

The expenses in 1881 were \$594.58 and the receipts \$1,558.88.

The works are managed by three commissioners, one being elected each year.

James Pottle is Chairman of the Board.

CCCXXI.—HANOVER, N. H.

Hanover, New Hampshire, in lat 43° 42' 15.3' N., long. 72° 16' 55.8' W., is on a plain half a mile from and 125 to 175 ft. above the Connecticut River, and divided into two parts by a rocky ridge which rises at Observatory Hill to about 100 ft. above the plain. It is the site of Dartmouth College, and was settled under a charter granted July 4, 1761.

Water-works were built by a private company in 1821, taking the supply from springs near the foot of a steep wooded hillside, the soil of which is saturated with water. The company now controls 35 acres of this slope. The water is collected in five wells, 4 to 6 ft. diameter, and 8 to 12 ft. deep, lined with dry stone walls. From the lowest of these wells, 60 ft. above the village, it is conveyed to the village in a pipe 2 miles long. From 1821 to 1828, the pipe was bored pine logs. In 1829 this was replaced by a 1½-in. lead pipe, and in 1880 this was replaced by a 2-in. lead pipe. From the well the pipe descends 60 ft. in the first 1,000 ft. to a brook, across which it is carried in a wooden box laid on the granite bed of the stream, and held down by boulders. Although seldom entirely submerged, the pipe has never frozen, even with the temperature of the air at 35° below zero F. The original pipe was badly aligned vertically, being laid following a very broken and undulating surface. The new pipe was laid on more regular grades.

Near the village it passes a hollow under a head of 110 ft. The pipe used is of the following weights: Under 60 ft. head or less, 7 lbs. per foot; under 60 to 80 ft. head, 8 lbs.; and under 80 to 110 ft., 9 lbs. per foot. Distribution and service pipes are all of lead. There are no fire hydrants or gates. There are about 160 taps. The water is delivered to consumers through gauge butts of copper, perforated with a hole "of the size of a medium-sized sewing needle," which was intended to supply 40 gallons per day, but, with the new pipe, delivers so much more that it has been necessary to throttle the delivery at the well by closing the stop gate eight-tenths of its diameter.

The population in 1880 was 800. The consumption is about 6,500 gallons per day. The works have cost about \$12,000. The capital stock of the company is \$10,000. The cost of maintenance is very small. The receipts are about \$950 per year, being six dollars for each "share" or quota of 40 gallons per day delivered.

The works are managed by the president, who receives a nominal compensation, and three directors, who serve without pay.

CCCXXII.—HANOVER, PA.

Hanover, Pennsylvania, in lat. 39° 47' N., long. 77° W., is in an elevated valley on no water course.

Water-works were built in 1874 by a private company, after the plans of Robert K. Martin, C.E., taking the supply from mountain springs, the water of which is impounded by dams across ravines, in two reservoirs of 2,500,000 and 1,500,000 gallons capacity, 175 ft. above the town.

Distribution is by 6 miles of 8, 6 and 4-in. cast-iron pipe, with 26 fire hydrants, 9 gates and 253 taps. One meter is in use. The town pays \$5 per year for each fire hydrant. Service pipes are reported to be of 1½-in. cast-iron pipe.

The population in 1880 was 2,317. The daily consumption is 80,000 gallons.

The capital stock of the company is \$30,000. There is no debt. The works have cost \$38,000.

The expenses in 1881 were \$9,335.45, and the receipts \$968.85.

S. Keefer is the President and General Manager, and R. M. Wirt, Secretary and Treasurer.

CCCXXIII.—SOMERVILLE, MASS.

Somerville, Massachusetts, in lat. 42° 28' N., long. 71° 7' W., is a suburb of Boston, on the Mystic River. The surface is undulating, rising from 10 ft. above low-water level to 120 ft. Originally a part of Charlestown, it was set off from that town in 1842, and was incorporated as a city in 1872.

In 1868 water was introduced from the Mystic Lake water-works of Charlestown, described in the account of the Boston works on p 142 of *ENGINEERING NEWS*, April 9, 1881. The Somerville works were constructed by the city after the plans of Roberdeau Buchanan. The Mystic works are owned by the city of Boston, the pumping station being, however, in Somerville, and the supply mains of 24-in. and 30-in. diameter passing through the city; the distribution pipes for Somerville are connected with them at fifteen different points. Distribution is by wrought-iron and cement pipes, of which 45½ miles were in use on May 1, 1881, with 288 fire hydrants, 392 gates and 1,227 taps. There are 31 meters in use. Service pipes of lead, of rubber-coated and of enameled iron are used.

The pipes are maintained by Somerville, but the water rates are collected by Boston, and out of them there is returned to Somerville a certain percentage, which in 1881 amounted to \$14,687.37. The cost of maintenance in 1881 was \$14,030. The city pays annually \$20 for each 350 inhabitants.

The population in 1880 was 24,985. The consumption is not known.

The works have cost \$342,608.76. There is a bonded debt of \$335,000, at 5 and 6 per cent. interest. The works are managed by a Board elected annually by the City Council. The Board elects a superintendent annually. Nathaniel Dennett has been Superintendent since 1877. Work of construction is in charge of the City Engineer. This position has been held by George A. Kimball since 1876.

CCCXXIV.—PASSAIC.

Passaic, New Jersey, in lat. 40° 52' N., lon. 74° 15' W., is on the Passaic River, which is there dammed, affording a valuable water-power. The city is on ground, level near the river, but rising steeply from the plain to more than 100 ft. elevation.

It was settled in 1680. The Dundee Water-Power & Land Company, incorporated in 1872, caused a rapid increase of population. Water-works were built by the Acquanonck Water Company in 1872, after plans of Gen. Thomas D. Hoxsey, taking the supply from Vreeland Lake, a reservoir formed by impounding Weasel brook by a dam 40 ft. long and 12 ft. high, a mile from the village. To this supply, which is very limited, is added water from the river, which is lifted 125 ft. into a reservoir of one million gallons' capacity, by a pump driven by a turbine wheel and a supplementary steam engine.

Distribution is by 9½ miles of wrought-iron and cement pipe of from 12 to 4-in. diameter, with 88 fire hydrants, 13 gates and 250 taps.

The city pays \$30 per year for each hydrant. Lead service pipes are used.

The population in 1880 was 7,000 and the daily consumption 500,000 gallons.

The capital stock of the company is \$100,000. The works have cost \$110,000. The amount of the bonded debt, which carries 6 per cent. interest, is not stated. No further financial statements are given. Washington Paulison is the Secretary, and T. D. Hoxsey the Superintendent and Engineer.

CCCXXV.—NEWCASTLE, PA.

Newcastle, Pennsylvania, in lat. 41° 2' N., long. 80° 14' W., at the junction of Shenango and Nesbannock creeks, is on flat ground, surrounded by high hills.

Settled about 1800, it was incorporated as a borough in 1825 and as a city in 1869.

Water-works were built by a private company in 1881 after plans of James H. Harlow, C. E., taking the supply from Shenango Creek and pumping it by a Blake duplex pump into a reservoir built in excavation and embankment on a hill 2 miles north of the city. The reservoir contains 6,500,000 gallons at 266 ft. above the city. It is 150 by 188 ft. at the bottom, and 24 ft. deep. There is a berm 8 ft. wide at 14 ft. above the bottom. The bottom and slopes are covered with 2 ft. of puddle and above the berm the slopes are paved with dry stone on edge, 15 in. deep, on 9 in. of broken stone.

Distribution is by cast-iron pipe. The force and supply mains are of 12-in. diameter, and there are 12 miles of mains of from 10 to 4 in. diameter, with 95 fire hydrants, 60 gates and 83 taps. Two meters are in use. The city pays \$5,000 per year for 100 fire hydrants and \$40 per year for each one over 100. Lead service pipes are used. The population in 1880 was 10,292. The works being just

finished, no statistics of consumption or finances are given.

L. H. Williams is Secretary and Treasurer of the Company, and John W. Taylor the Assistant Superintendent. J. H. Harlow is the Engineer and Superintendent.

CCCXXVI.—MISHAWAKA.

Mishawaka, Indiana, in lat. 41° 42' N. long. 86° 12' W., is on the St. Joseph River. It was settled about 1800 and incorporated as a town in 1886. Water-works for fire protection only were built in 1860 by the town, taking the supply from the river, which is here dammed for manufacturing purposes by a dam built in 1832, 300 ft. long and 8 ft. high.

A 16 in. Metzger rotary pump, driven by a Leffel turbine wheel, keeps the pipes constantly filled at a low pressure, which is increased in case of fire. There are 2 miles of cast-iron pipe of 8, 6 and 4-in. diameter, with 15 fire hydrants and 25 gates.

The population in 1880 was 8,500. The works have cost about \$10,000, and the annual expense of maintenance is about \$100. They are under the control of the Town Trustees. J. H. Whitson is the President.

CCCXXVII.—SALEM, N. C.

Salem, North Carolina, in lat. 36° 3' N., long. 80° 14' W., is on irregular ground, on the middle fork of Muddy Creek. Settled in 1760, it was incorporated in 1854. A water supply was first introduced about 1800, a force pump being used to fill the town cisterns. In 1878 water-works were built by a private company, taking the supply from two wells 10 ft. in diameter, sunk near the creek, and pumping by water-power 150 ft. into a brick reservoir holding 90,000 gallons at 50 ft. above the city.

Distribution is by 2 miles of cast-iron pipe, of from 8 to 2-in. diameter, with 20 fire hydrants and 65 taps. The town does not pay for hydrant service. Service pipes are of wrought iron, some plain and some zinc lined.

The population, in 1880, was 1,500. The consumption is not known.

The capital stock of the company is \$8,000, which is the cost of the works. The receipts are \$500 per year. L. N. Clinard is Secretary of the company, and C. A. Fogle the Superintendent.

(TO BE CONTINUED.)

ACKNOWLEDGMENTS.—The receipt of statistics as follows is acknowledged with thanks: From R. M. Wirt, secretary and treasurer, statistics of the water-works of Hanover, Pa. From James Pottle, chairman water commissioners, statistics and water rates of the water-works of Fair Haven, Vermont. From George R. Harlow, assistant engineer, statistics of the water-works of Newcastle, Penn. From G. A. Kimball, city engineer, statistics and water rates of the water-works of Somerville, Mass. From an unknown source, report of construction of works to May 1, 1880, at Peru, Ind. From Prof. R. Fletcher, Dartmouth College, statistics and water rates of the water-works of Hanover, N. H. From L. N. Clinard, secretary, statistics and water rates of the water-works of Salem, N. C. From J. H. Whitson, president, statistics of the water-works of Mishawaka, Ind. From W. Paulison, secretary Acquanonck Water Co., statistics of the water-works of Passaic, N. J. From William H. Vibbard, sanitary engineer, annual reports of village of Kalamazoo, Mich, 1882. From M. Scannell, superintendent, water rates of the water-works of Tiffin, Ohio.

CORRECTION.—June 3, 1882, p. 179, *Lockhaven*. The lightning struck a *house*, not a *horse*.

A SINGLE MERIDIAN.

At the recent International Geographical Congress held at Venice, a resolution was adopted at the instance of the American delegates asking for the appointment of an international commission, to consist of three members, to be appointed by the different governments, from geologists, geographers and men interested in commerce, "to consider the question of an initial meridian, having in view not only the question of longitude, but that of hours and dates." The reform thus contemplated is one which should receive the hearty support of our own and other governments. It is high time that a single meridian should be in use by all the civilized nations, instead of England using the meridian of Greenwich, the Germans using that of the Island of Ferro, the French that of Paris, the Spaniards that of Madrid, and America using the meridian at Washington. Much confusion would be avoided by uniting on a single meridian, while there would be a great saving in operations which are now necessary in making reductions from observations taken with reference to one meridian, so as to be comparable with observations taken in reference to another. Unification is the day, and let us have full unity on the meridian question.—U. S. Eeon.