

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

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(Continued from page 63.)

CCCLXXXVII.—COOPERSTOWN, N. Y.

Cooperstown, New York, in lat. 42° 42' N., long. 74° 54' W., is in a narrow valley at the south end of Otsego Lake, bounded by abrupt hills.

Water-works were built in 1885 by a private company, taking the supply from springs about 50 ft. above the village and conveying it to consumers in bored pump logs. Additional springs were taken from time to time, and, after some years, a small pump run by water power was placed near the lake, pumping the water 80 ft. into a wooden tank 14 ft. in diameter and 16 ft. deep, whence it was distributed through 2-in. and 3-in. cast-iron pipes. These pipes which had been cast horizontal and were coated, soon gave out from rust, from incrustation and from freezing, not having been laid deep enough.

In 1876 Edward Clarke built small gravity works having a head of 160 ft.

In 1879 new works were built by the company after the plans and under the superintendence of Palmer H. Baermann, C. E. taking the supply from the lake and pumping directly into the mains, by two Worthington crank pumps driven by 50-in. Leffel turbines working under 5½ ft. head.

The supply main is of 10-in. cast-iron pipe laid in the Susquehanna River and into the Lake, to 38 ft. depth of water. Up to 10 ft. depth of water the joints were caulked with five wedges and the pipe laid from a float. At greater depths, a ball and socket joint was inserted at every 8 or 10 lengths of pipe and the intermediate joints caulked with lead in the ordinary way on a long float and then lowered by block and fall to the bottom.

Distribution is by ¾ miles of cast-iron pipe of from 8 to 4 in. diameter with 22 fire hydrants and 45 gates. The number of taps is not given.

The town pays \$25 per year for each hydrant. The population in 1880 was 2,199. The daily consumption in 1882 was 250,000 gallons.

The new works cost \$35,000. No further financial statements are given.

J. McNamee is the Secretary and James Bunyan the Superintendent.

CCCLXXXVIII.—YORKVILLE, ONT.

Yorkville, Ontario, Canada, in lat. 43° 38' N., long. 79° 23' W., is on rising ground, north of and adjoining Toronto.

It was incorporated a village in 1853 and was annexed to Toronto in January, 1883.

Water-works were built by the town in 1853, after plans of Mr. Severn, taking the supply from Baldwin's Creek, a small stream which lies about 10 ft. above the business part of the town, and pumping it by a Worthington duplex steam pump into a reservoir holding 1,500,000 gallons, 105 ft. above the village. For fire protection the pumping is directly into the mains, with 70 lbs. pressure.

Distribution is by 8 miles of cast-iron pipe, of 10 to 4 in. diameter, with 76 fire hydrants and 18 gates. The number of taps is not given. Service pipes are of lead. The population in 1880 was 4,825. The daily consumption in 1882 was 200,000 gallons.

The supply became unequal to the demand, and since the annexation to Toronto the supply is derived from its works.

The works cost \$100,000. No further financial statements are given.

The works have been managed by a committee of the Village Council, G. Heal being the engineer and superintendent.

CCCLXXXIX.—GLEN'S FALLS, N. Y.

Glen's Falls, New York, in lat. 43° 20' N., long. 73° 35' W., is on irregular ground on Halfway Brook. It was incorporated a village in 1839. Water-works were built for the village in 1872 by the American Water & Gas-Pipe Company, taking the supply from springs 5 miles from and about 300 ft. above the village. A dam of earth and concrete forms an impounding reservoir of 24 acres area and 14 ft. deep, holding 75,000,000 gallons. From this the water is conveyed 5 miles through a 12-in. wrought-iron cement-lined pipe to a smaller distributing reservoir formed by an earth and stone dam across a ravine.

Distribution is by 15 miles of cement-lined wrought-iron pipe of from 12 to 4 in. diameter, with 75 fire hydrants, 40 gates and 500 taps. There are 7 meters in use. Service pipes are chiefly of wrought-iron with some lead.

The population in 1880 was 4,900. The daily consumption is not known.

The works cost \$130,000. The bonded debt is \$110,000 at 7 per cent. interest.

The expenses in 1882 were \$700 and the receipts \$5,000. The works are managed by the village trustees.

John S. Hayes is the Superintendent.

CCCCX.—STAMFORD, CONN.

Stamford, Connecticut, in lat. 41° 4' N. long. 73° 34' W., is on quite a level ground, near Long Island Sound.

Water-works were built in 1871 by a private company after plans of H. G. Scofield, C. E., taking the supply from Trinity Lake, a pond about 6 miles from the town, in the hills.

A small dam of masonry with a gate chamber, was built at the outlet of the pond, with waste pipe and outlet pipe, each of 16 in. diameter. The dam was raised a few years later. The supply to the town is of 12 in. cement-lined wrought iron pipe. In 1882 a reservoir was begun. It is in excavation and embankment, holding 6,000,000 gallons at 170 ft. above tide water. Two pipes, of 16 and 12-in. diameter lead from it.

Distribution is by 16 miles of cement-lined wrought-iron pipe of 16 to 4 in. diameter, with 62 fire hydrants, 80 gates and 625 taps. The Phipps pipe is now used, in which there is no sand mixed with the cement, and there is two concentric shells of wrought iron. Service pipes are of galvanized iron.

The population in 1880 was 2,540. The daily consumption is not given.

The capital stock of the company is \$100,000. No further financial statements are given.

Walton Ferguson is the Secretary and George E. Whitney the Superintendent.

(TO BE CONTINUED.)

The receipts of statistics as follows is acknowledged with thanks:

From G. Heal, Engineer and Superintendent, statistics of Yorkville, Ontario, water-works.

From J. S. Hayes, Superintendent, Statistics of Glen's Falls, N. Y., water-works.

THE RIVER AND HARBOR BILL.

The items of the River and Harbor bill, as reported to the House, are as follows:

FOR CONTINUING THE IMPROVEMENT OF HARBORS.

New England States—Portland, Me., \$15,000; Burlington, Vt., \$4,000; Nantucket, Mass., \$5,000; Newburyport, Mass., \$20,000; Plymouth, Mass., \$1,000; Provincetown, Mass., \$1,000; Wareham, Mass., \$4,000; Little Narragansett Bay, R. I., \$3,000; Newport, R. I., \$15,000; harbor and break-water at Block Island, R. I., \$10,000; Bridgeport, Conn., \$10,000; Milford, Conn., \$3,000; New Haven, Conn., \$50,000; Lubec Channel, Me., \$6,000; New London, Conn., \$3,000; Norwalk, Conn., \$5,000; Stonington, Conn., \$5,000.

New York.—Buffalo, N. Y., \$50,000; Ogdensburg, N. Y., \$12,000; Oswego, N. Y., \$30,000.

Pennsylvania, New Jersey, Maryland and Delaware.—Erie, Pa., \$10,000; ice harbor at Marcus Hook, Pa., \$6,500; Delaware Breakwater, Del., \$65,000; improving channel between Staten Island and New Jersey, \$25,000; Raritan Bay, N. J., \$20,000; Wilmington, Del., \$15,000; Baltimore, Md., \$175,000; Breton Bay, Leonardtown, Md., \$3,000.

Principal harbors of South and West.—Tampa Bay, Fla., \$10,000; Savannah, Ga., \$150,000; Pensacola, Fla., \$25,000; Mobile, Ala., \$100,000; Aransas Pass and Bay, Texas, \$100,000; Brazos Santiago, Texas, \$30,000; Galveston, Texas, \$200,000; Paso Caballo, Texas, \$30,000; Sabine Pass, Texas, \$75,000; Michigan City, Ind., \$50,000; Chicago, Ill., \$75,000; Milwaukee, Wis., \$50,000; Oakland, Cal., \$80,000; Wilmington, Cal., \$50,000.

IMPROVEMENT OF STREAMS.—For continuing the improvement of streams: Merrimac River, Massachusetts, \$3,000; Taunton, Massachusetts, \$5,000; Providence River and Narragansett Bay, Rhode Island, \$5,000; Connecticut River, below Hartford, \$25,000; Housatonic River, Connecticut, \$15,000; Thames River, Connecticut, \$25,000; East River and Hell Gate, New York, \$150,000; Hudson River, New York, \$10,000; Newtown Creek, New York, \$6,000; Cheesapeake River, New Jersey, \$7,000; Elizabeth River, New Jersey, \$6,000; Matawan Creek, New Jersey, \$4,000; Passaic River, New Jersey, \$15,000; Rahway River, New Jersey, \$5,000; Raritan River, New Jersey, \$10,000; Shrewsbury River, New Jersey, \$5,000; Mantua Creek, New Jersey, \$3,000; South River, New Jersey, \$10,000; Woodbridge Creek, New Jersey, \$1,000; Alleghany River, Pennsylvania, \$5,000; Chester Creek, Pennsylvania, \$3,000; Schuylkill River, Pennsylvania, \$13,000; Delaware River, between Trenton, N. J., and Bridesburg, Pa., \$3,000; Delaware River, below Bridesburg, Pa., \$90,000; Delaware River, near Cherry Island flats, Pa. and Del., \$30,000; Mispillion Creek, Delaware, \$1,500; constructing pier in Delaware Bay, near Lewes, Del., \$2,000; Corsica Creek, \$5,000; Choptank River, Maryland, between Denton and Greensborough, \$5,000; improving Delaware River at Schooner Ledge, \$15,000; improving upper water passage or thoroughfare between Deals Island and the mainland on Darnes quarter, Maryland, \$5,000; Susquehanna River, above and below Havre de Grace, \$15,000; James River, Virginia, \$50,000; Great Kanawha River, West Virginia, \$120,000; Cape

Fear River, from the ocean to Wilmington, N. C., \$50,000; Coosa River, Georgia and Alabama, \$40,000; St. John's River, Florida, \$100,000; Alabama River, Alabama, \$20,000; Red River, Louisiana, including its tributaries above Black River, \$50,000; mouth of Brazos River, Texas, \$30,000; Cumberland River, Tennessee, \$23,000; Tennessee River, \$200,000; Kentucky River, Kentucky, \$50,000; Ohio River, \$250,000; Detroit River, Michigan, \$50,000; Saginaw River, Michigan, \$150,000; Sault St. Marie, \$150,000; Fox and Wisconsin rivers, Wisconsin, \$150,000; improving Illinois River, Illinois, \$50,000; Upper Mississippi River, operating snagboat, \$25,000; Mississippi River, Falls of St. Anthony, Minnesota, \$15,000; Mississippi River, from St. Paul to Des Moines Rapids, \$225,000; Des Moines Rapids, \$30,000; Mississippi River, \$2,150,000; Missouri River, from its mouth to Sioux City, Iowa, \$350,000; Missouri River, from Sioux City to Fort Benton, \$75,000; Sacramento and Feather rivers, California, \$30,000; canal around cascades of Columbia River, Oregon, \$125,000; Lower Willamette and Columbia rivers, Oregon, from Portland to the sea, including bar at mouth of Columbia River, \$40,000; San Joaquin River, California, \$30,000, provided \$8,000 of the amount may be used for improvement of the mouth of the Mokelumne River; mouth of Columbia River, Oregon, \$75,000.

FOR THE MISSISSIPPI RIVER.—The allotment of the \$2,150,000 appropriated by the bill for the Mississippi River improvements is provided for as follows: \$1,500,000 from the head of the passes to Cairo, including the harbors of New Orleans, Natchez, Memphis and the reaches at Plum Point and Lake Providence and the deflection of the waters of the Red and Mississippi rivers from the Atchafalaya River; \$500,000 from Cairo to the Illinois River, including Alton Harbor, and \$150,000 from the Illinois River to the Des Moines Rapids, including a stone and brush revetment at or near Quincy, which sums shall be expended under the direction of the Secretary of War in accordance with the plans, specifications and estimates and under the supervision of the Mississippi River Commission.

Such parts of the money appropriated by this or any previous act for any particular improvement, whether requiring locks or dams or otherwise, as may be necessary in the prosecution of such improvement, may be expended in the purchase or by condemnation, as the case may be, of necessary sites; provided that such expenditure shall be under the Secretary of War; provided, further, that if the owners of such lands shall refuse to sell them at reasonable prices then the prices to be paid shall be determined and the title and jurisdiction procured in the manner prescribed by the laws of the State in which such lands or sites are situated.

The bill has the usual safeguards and provisions in relation to locks, dams, rules, regulations, etc. The only new work recommended in the bill is that for improving the mouth of the Columbia River.

The total amount appropriated by the bill is \$7,937,000.

Boston Harbor is passed over for the reason that there is on hand to the credit of improvements there at the beginning of the fiscal year \$75,000. The same consideration applies in other cases. Amounts on hand have also influenced amounts appropriated in many instances.

MACADAM ROADS.

MACADAM'S IMPROVEMENTS IN ROAD MAKING.

[From the St. James Gazette.]

John Loudon MacAdam, according to his own account, came to Scotland from America in 1783, when the Scotch turnpike acts had been about twenty years in operation and roads were still being made everywhere. He got appointed a commissioner of roads, and afterward removed to Bristol, where he obtained a similar post and was made a magistrate. Gifted with a mania on the subject, he began about 1794 to travel over the country at his own cost; and these labors he continued from Inverness to Land's End for six-and-twenty years, apparently to search for a well made road.

MacAdam's plan of road-making differed as much from the old way which he found in operation as a bridge does from a ford. Instead of going deep for "bottoming" he worked solely on the top. Instead of producing a peaked, roofed-like mass of rough, soft rubbish, he got a flat, smooth and solid surface. In lieu of a road 4½ ft. through, he made one of at most 10 in. in thickness, and for rocks and boulders he substituted stone broken small. His leading principle was that a road ought to be considered as an artificial flooring, so strong and even as to let the heaviest vehicle pass over it without impediment. Then people began to hear with wonder of roads 30 and 40 ft. wide rising only 3 in. in the center, and he propounded the extraordinary heresy that a better and more lasting road could be made over the naked surface of a morass than over solid rock. Another of his easy first principles was that the native soil was