point where 29 ft. head is obtained, which furnishes power for driving Holly pumps, which deliver into the mains. A reservoir of 2 acres area supplies the pumps. The highest part of the city is 50 ft. above the reservoir. The ordinary pressure maintained at the pumps is stated to be 100 lbs. and the fire pressure 170 lbs. Five miles of cast-iron mains of 12-in. to 4-in. size, with 40 fire hydrants and 150 taps are in use. Lead and wrought-iron service pipes are used.

The population in 1880 was 4,250, and the daily consumption about 8,000 gallons.*

The works have cost $54,000. The cost was met by bonds bearing 6 per cent. interest, the interest and part of the principal payable annually in such proportion as to extinguish the debt in 20 years.

The expenses of maintenance in 1881 were $300, besides an annual rental of $800. The receipts were $560.

The name of the superintendent is not furnished.

CCXXII.—ST. ALBANS.

St. Albans, Vermont, in lat. 45° 47′ N., long. 73° 9′ W., is on a small stream emptying into Lake Champlain. It was incorporated as a village in 1859. Water-works were built by the village in 1873, after the plans of John T. Fanning, C. E., taking water from the stream.

A dam 400 ft. long and 28 ft. high, of earth, and 20 ft. wide on top, with inner slope of 2½ to 1, and outer of 1½ to 1, and an embankment of 1,950 ft. long across low ground, create an impounding reservoir of 28 acres area, and holding 100,000,000 gallons, stowing the drainage of about 3 square miles. The reservoir is 336 ft. above the town.

Distribution is by 14 miles of wrought-iron and cement pipe with 54 fire hydrants, 37 gates and 500 taps. Five meters are in use. Service pipes are of galvanized iron. The head is so great that it is necessary to use a regulator on the mains. The population in 1880 was 7,201 and the daily consumption 600,000 gallons.

The works have cost $165,000, and the total receipts have been $46,000. The bonded debt is $156,000. The expenses in 1880 were $1,362.61 and the receipts $6,359.73. The works are managed by a board of five trustees; Marshall Mason is the Superintendent.

CCXXIII.—LOGANSPORT.

Logansport, Indiana, in lat. 40° 45′ N., long. 86° 22′ W., is on the Wabash River at the mouth of Eel River. The business part of the town is between the rivers and 40 ft. above them. Two miles back from the river the ground rises to a height of 200 ft.

Settled in 1828 it was incorporated as a city in 1838. Water-works were built by the city in 1876 after the plans and under the superintendence of Walter A. Osmer, C. E., taking the supply from Eel River, which in its course of 100 miles receives the drainage of a territory about 30 miles wide.

A dam of timber across the stream at the city gives a head used to drive a water wheel operating 4 Cope & Maxwell piston pumps, of 11-in. bore and 24-in. stroke, pumping directly into the mains. Auxiliary steam power is provided, but seldom used. The ordinary pressure maintained is 45 lbs., and the fire pressure 80 lbs. Distribution is by 9½ miles of cast-iron pipe, with 89 fire hydrants, 154 gates and 400 taps. Lead service pipes are used. There are 6 meters in use. The population in 1880 was 11,198, and the daily consumption 500,000 gallons.

The works have cost $182,000. The bonded debt is reported at $172,000, bearing 8 per cent. interest. The expenses of maintenance in 1881 were $3,000, and the receipts $6,900.

The works are managed by a board of three trustees, appointed by the City Council. Robert Johns was Superintendent and Engineer from 1876 to 1878, and William H. Schrier from 1878 to 1882. Terrence McGovern is Clerk to the Board.

CCXXIV.—ST. JOHNSBURY.

St. Johnsbury, Vermont, in lat. 42° N., long. 71° W., is in a hilly region, on the Passumpsic River.

Settled in 1787 it was incorporated as a village in 1852. Water-works were built by the village in 1876, after the plans of J. P. Flanders, taking the supply from the Passumpsic River, a timber dam across which worked a water power used to drive a Flanders pump delivering directly into the mains, with an ordinary pressure of 80 to 100 lbs. and a fire pressure of 100 to 125 lbs. per square inch.

The water is delivered to the pumps by passing up through 4 ft. of gravel. This filter is reported to give satisfaction. Distribution is by 8 miles of cast-iron pipe of 12 to 4-in. diameter, with 77 fire hydrants, 27 gates and 303 taps. Service pipes are of wrought iron.

The population in 1880 was 5,806, and the daily consumption 250,000 gallons.

The works have cost $80,000. The bonded debt is $75,000. Further financial statements are not given. The works are managed by a board of five trustees. John N. Gale is the Superintendent.

* The superintendent reports 200 barrels. This is extraordinarily small.

CCXXV.—LOGAN CITY.

Logan City, Utah, in lat. 41° 43′ N., long 112° W., is on the Logan River, which has a watershed of 150 square miles in the Wachusett Mountains. The town is on three plateaux, rising from the river, and is near the base of the mountains, which rise from 7,000 to 12,000 ft.

Settled in 1859, it was incorporated as a city in 1866.

Water-works were built by the city in 1878, after the plans and under the superintendence of James H. Martineau, C. E., taking the supply from the river 2¼ miles above the town. An open canal, 20 ft. wide on bottom, and used for irrigating purposes also, conveys the water 1¾ miles. That used in the city is drawn then into a settling basin, in which the sand held in suspension is deposited. From this the water is carried 1,100 ft. in a conduit 12 by 16 in., of 2-in. pine plank, laid 5 ft. below ground, and also through a section of stone conduit laid in cement, to another settling basin. From this it is conveyed in pipes for 1,300 ft. to a reservoir 20 by 65 ft. and 12 ft. deep in 6 compartments, built in excavation, with stone walls 2 ft. thick laid in cement and with concrete bottom. The water passes through three compartments on either side of a central wall, with screens between them. Either side can be cleaned and drained while the other is in use. The reservoir is 103 ft. above the main part of the city and 130 ft. above the lower part. Distribution is by 1 mile of cast-iron pipe of 10-in. to 4-in. diameter, and 1 mile of 4-in. wooden pipe, bored out of solid Oregon pine, banded with iron and coated with coal tar. It is made in 8 ft. lengths. There are 13 fire hydrants, 2 gates and 11 taps. Service pipes are of galvanized iron.

The population in 1880 was 2,378 and the daily consumption 5,000 gallons.

The works cost $13,000. There is no debt.

The expenses of maintenance in 1880 were $100 and the receipts $300.

The works are managed by the City Council, with a superintendent, James Adams.

CCXXVI.—KENOSHA.

Kenosha, Wisconsin, in lat. 42° N., long. 88° W., is on the shore of Lake Michigan. The bank is from 8 to 15 ft. above the lake, and rises gradually for three miles westwardly to the divide between the Mississippi River and the lakes, 60 ft. above the lake.

Settled in 1835, it was incorporated as a city in 1850. Water-works were built in 1879 by a private company, after plans of Charles O'Connor, taking the supply from an artesian well of 4½-in. bore and 1,365 ft. deep. Rock was encountered at 90 ft. below the surface. The well is tubed with iron pipe for 185 ft. from the surface, and the pipe discharges directly into the mains, which are of cast iron of 6-in. to 3-in. diameter; 5½ miles are in use, with 27 fire hydrants, 12 gates and 380 taps. The city pays $33½ per year for each hydrant. Service pipes have been used of lead, galvanized iron and plain wrought iron. The last is rapidly destroyed by the water. The temperature of the water is 60° F. The free discharge of the well is estimated at 1,300,000 gallons per day. The head on the mains is ordinarily 20 to 30 lbs., and fire pressure 30 to 40 lbs. The population in 1880 was 5,043. The daily consumption is estimated at 400,000 gallons.

The capital stock of the Park City Water Company is $17,500. The works have cost $25,000, and the receipts have been about $6,000. There is no debt. The cost of maintenance is $800, and the receipts for 1881 were $3,100.

E. G. Hazelton is the Superintendent and the Business Manager.

CCXXVII.—STATE CENTRE, IOWA.

State Centre, Iowa, in lat. 42° N., long. 93° 4′ W., is on level ground on the plateau forming the divide between the Iowa and Skunk rivers.

Settled in 1859, it was incorporated as a city in 1869. Water-works were built in 1879 for the city, by the Batavia Wind Engine and Pump Company, taking the supply from two wells 58 ft. deep, and pumping by three deep-well pumps of 3-in. bore and 10½-in. stroke, operated by two windmills, into a wooden tank 18 ft. high, holding 80,000 gallons, and set on a frame 30 ft. above ground.

Distribution is by 1 mile of 6-in. cast-iron pipe, with 10 fire hydrants and 11 taps. Iron service pipes are used.

The population, in 1880, was 1,000. The consumption is not known.

The works cost $10,000. There is a bonded debt of $7,000, at 7 per cent. interest. The expenses in 1881 were $150, and the receipts $100.

The works are managed by a board of water commissioners. J. O. Cutler is the Superintendent.

[TO BE CONTINUED.]

The receipt of statistics, as follows, is acknowledged with thanks: From James H. Martineau, city engineer, statistics of water-works of Logan City, Utah. From R. H. Elam, superintendent, statistics of water-works of Pioche, Nev. From D. Allen, secretary, statistics and rates of water-works of Salem, Or. From Walter A. Osmer, city engineer, statistics of water-works of Logansport, Ind. From O. Z. Hamel, superintendent, statistics and rates of water-works of Three Rivers, Canada. From John C. Knowlton, water commissioner, statistics and rates of water-works of Watertown, N. Y. From P. L. Merritt, agent, statistics of water-works of Mission San Jose, Cal. From E. G. Hazleton, superintendent Park City Water Co., statistics and water rates of water-works of Kenosha, Wis. From the superintendent (who declines to give his name), statistics of water-works of Sidney, O. From J. O. Cutler, superintendent, statistics of water-works of State Centre, Ia. From George W. Howell, C. E., statistics of water-works of Salamanca, N. Y., and Warren, Pa. From John N. Gale, superintendent, statistics, water rates and annual report for 1881 of water-works of St. Johnsbury, Vt. From Eli W. Gilbert, secretary and acting superintendent, statistics of the water-works of Bethel, Conn. From Addison Lane, superintendent, statistics and water rates of the water-works of Melrose, Mass., and reports for 1869 to 1871 and for 1881. From George F. Bliss, superintendent, statistics of the water-works of Eureka, Nev.

CORRECTIONS.—Feb. 18, 1882, p. 58, *Hingham*, 7th line, for *reserving* read receiving. *Waverley*, 12th line, for *center* read *centre*: 14th line, for *breast wall* read *heart wall*. Feb. 25, p. 67, *Hannibal*, 4th line, for *by a private company* read *for a private company, by Carroll E. Gray*. 24th line, for 150,000,000 *gallons* read 1.500,000 *gallons*. 9d line from end, for 7 *per cent.*, read 8 *per cent.* Feb. 4, p. 39, *Greenfield, Mass.* A. A. Rankin writes that the capacity of the reservoir is 18,000,000 gallons, instead of 10,000,000 gallons, as he first reported. There are no water-works in the following towns, included in list of Jan. 28, taken from previous lists:

Ann Arbor, Mich.	Milford, Conn.
Dixon, Ill.	Reading, Mass.
Houlton, Maine	East London, Canada.
Worcester, Vt.	Beloit, Wis.

There are no towns, and consequently no water-works, of the following names in the States to which they are credited in the list of Jan. 28. The names were taken from newspaper items:

Greenville, Mass.	Crawfordsville, Pa.
Lagona, Ohio.	Susquehanna, N. Y.

To the list of water-works, add

Warren, Pa.	Salamanca, N. Y.

THE NATIVE PERSONNEL OF JAPANESE RAILWAYS.

The skill and ingenuity of the natives of Japan have long been well known, and another proof of their possession of these qualities is given by the aptitude which they display in learning the working of railways and qualifying themselves to fill the more responsible of the subordinate positions. The Japanese, from whom, for some time past, all the stationmasters and porters, as well as platelayers and artisans, had been drawn, have latterly been gradually replacing the English engine-drivers, and apparently with satisfactory results. The chief fault to be found with the native drivers is seemingly that they do not thoroughly understand the construction of the engines under their charge, but this is a matter which longer experience will rectify. There also appears to be a lack of presence of mind and watchfulness, and it is somewhat ludicrous to read of a driver starting with only half of his train in broad daylight, and not discovering the want of the other half until he had reached the next station. It is, therefore, not surprising that strict examination and supervision has to be kept on all engines under native drivers, in order to avoid any chance of failures or casualties. At the same time, we are assured that very few mishaps had occurred—indeed, so far as misadventures with the locomotives are concerned, the Englishmen appear to have been quite as often at fault as their native fellows—whilst the increasing number of Japanese employed bears testimony to the confidence which is felt in their capabilities. In other capacities the native workmen display great skill, the carriage and wagon building, for instance, being carried on in a highly satisfactory manner by the Japanese foreman carpenter; and two engines, which had been transferred from one line to another, having been put together again and got ready for work by a native fitter without any assistance from Europeans. The only complaint made against them is that they are somewhat slow. It is clear, however, that the Japanese are quite well enough qualified to carry on the working of their railways; and, after the system has been completed, we should not be surprised to find that eventually they took the entire control into their own hands.—*London Architect.*