wire brooms, thus removing all surplus grout sticking to the tops of the bricks and presenting a very neat, clean surface. It was noticeable, too, how very much the paving contractor improved in the character of his work, when this specification of cleaning off the top of the brickwork was strictly enforced. By this method all irregularities of laying and surfacing are strongly brought out, and easily seen and corrected.

Cost.—The cost of track construction of this type for paved streets, including the paving between and for 2 ft. outside of the rails, using the 70-lb. high **T**-rail, under the conditions at Springfield, was approximately $5 per ft. of single track. This cost may seem to be high, but, when the permanent character of the work is taken into consideration, and the cost of doing street work under other methods is analyzed and compared, it will be found to be very reasonable. It possesses several advantages over some of the methods in vogue. It takes less concrete than the old method of filling under and around wooden ties. It places the concrete and the strength where it is most needed, and, when properly put in, it is certainly permanent, and the roadbed will easily outwear two or more sets of rails under heavy traffic. The rail can be changed without disturbing the roadbed in the least, if proper provisions have been made in the steel ties originally.

On one section of similar track construction, known to the writer, not the slightest sign of any motion could be detected after 3 years' operation, and it is reported to be in as good condition as the day it was built.

The writer trusts that the foregoing brief description may prove of interest to members of this society and bring out some discussion on work of this class, concerning which very little has appeared in the technical press.

The work was done by the Springfield Traction Company, owned and operated by the Federal Light and Traction Company, of New York, and was executed under the general direction of Mr. W. A. Haller, chief engineer, the writer being in immediate and full charge of all construction matters at Springfield, Mo.

COST OF PUMPING WATER.

The following costs of pumping water by steam power and by electric power are abstracted from a letter written to Municipal Engineering by Mr. William Plattner, consulting engineer of North Attleboro, Mass.

Electricity in the waterworks has now been used for more than fifteen years, and the electrically driven pump has taken a permanent place among the steam driven machinery.

Like all other machinery in waterworks or elsewhere, the electric pump has its limitations. There are situations, however, and they are very numerous in waterworks pumping, where the electric pump is not only a great convenience but a profitable investment. In any power or pumping device, the use of electricity is a question of service, cost of power and investment charge. Conditions in different localities differ, and no two installations are likely to be the same, viz.: pressure (fire and domestic), hours of pumping (day or night), capacity of stand pipes or reservoirs, number of water consumers (flat rate or metered), total head, including suction, discharge, friction, etc.

Here are a few towns that purchased electricity for pumping water, also the price paid per kilowatt hour:

Lincoln, Ill., population 8,000, rate 5 cents to 2 cents per kw. hr.

Dover, N.H., population 13,000, rate 2 cents per kw. hr.

Norwood, Mass., population 9,000, rate 1.6 cents per kw. hr.

Cheboygan, Mich., population 6,000, rate $26.50 per h.p. per year.

Other towns pumping water with electrically driven pumps are as follows: Lima, Ohio; DeKalb, Ill.; Maywood, Ill.; Grand Haven, Mich.; Rockford, Ill.; East Douglas, Mass.; Dudley, Mass.; Harvey, Ill.; Lagrange, Ill.; Blue Island, Ill.; Holland, Mich.; North Chelmsford, Mass.; Uxbridge, Mass.; Webster, Mass.

A comparison as to cost of pumping water, electricity vs. steam, follows. This is for a town of 4,500 people in New England, 200,000 gallons of water pumped per day or 73,000,000 gallons per year. Water is pumped to reservoir from driven wells, pressure 62 pounds.

By Electric Power.

Cost of Plant.

Brick pumping station, 20 x 20 ft.	$ 800.00
Grading, road, fences, etc.	150.00
One 5½ x 8-inch double acting, triplex pump, capacity 220 gallons per minute, in place on foundations, with all measuring appurtenances, including sand and air chamber, and independent pump for renewing the latter, connected with one 20 h.p. electric motor	1,835.00
	$2,785.00

Annual Expenses.

Interest on $2,785.00 at 4 per cent.	$ 111.40
Depreciation on pumping station, $800.00, at 2½ per cent.	20.00
Depreciation on pumping plant, $1,835.00 at 5 per cent.	91.75
Electric current purchased, 60,833 kw. hrs. at 3 cents	1,824.99
Oil, waste, repairs	50.00
Attendance, one-eighth of one man's time	105.00
	$2,203.14

By Steam Power.

Cost of Plant.

Brick pumping station, chimney, coal room	$6,300.00
Grading, road, fences, etc.	250.00
One 9 x 18 x 18½ x 12 duplex compound condensing pumping engine, capacity 220 gallons per minute, set in place, with all necessary appurtenances, connected with one 90 h.p. horizontal return tubular boiler complete in brick setting	4,750.00
	$11,300.00

Annual Expenses.

Interest on $11,300.00 at 4 per cent.	$ 452.00
Depreciation on pumping station, $6,300.00, at 2½ per cent.	157.50
Depreciation on pumping plant, $4,750.00, at 3⅓ per cent.	158.33
Boiler insurance	21.00
342 tons coal at $4.75 per net ton	1,624.00
Oil, waste, repairs, etc.	75.00
Attendance, one-half of one man's time	420.00
	$2,908.33