

scheme has been adopted which will probably give good results. The city is divided into comparatively small sections, and in each one of these sections is located a district foreman who has a store yard, and sufficient men at his disposal to properly patrol the streets and to make the necessary repairs without delay. The additional plant spoken of above will provide us with enough rollers and other plant to do this.

A special feature of this organization is that at definite intervals a report will be made showing the condition of all streets in the city, and will enable the department to plan future work a long way ahead.

One of the most troublesome features of maintenance work is the repair of cuts made for the installation of water services, gas services, and private drains, and apparently in Toronto, nothing has yet been devised to prevent this trouble, although frequent attempts have been made. In some cities legislation has been obtained compelling property owners to have all these services installed before the pavement is laid, but here we have no such law, but are permitted by the Local Improvement Act to recommend both water and sewer services as local improvements, charging back the cost to the property affected. This is not an ideal provision, because property changes hands so frequently and services installed to suit one individual would have to be changed to suit the next, who might desire to arrange his buildings on the lot in a different manner, and, as a consequence, the pavement would have to be cut.

By co-operation with the various public utility corporations it is expected to reduce this cutting to a minimum this year, and it is hoped that all cuts made will be promptly repaired as they will be reported at certain fixed intervals by the patrolmen.

In 1908 the civic asphalt plant was put in operation, and since that time all repairs to pavements out of guarantee, and a good deal of new work has been carried out by the department. Costs have been reduced and a more satisfactory condition of the streets has been maintained. In no time since 1907 has our cost exceeded 77c. per sq. yard.

The city has also a small crushing plant, a No. 4 Austin (Gates) gyratory crusher with a fairly large capacity. This crusher is used to crush old material that comes off the street, and which can be used again as broken stone for concrete in track allowance foundations. This plant enables us to use up material that would otherwise be wasted or remain in the store yards for an indefinite period.

It is also a great convenience in times of shortage of broken stone, for the rubble can be secured and crushed and some of our jobs kept going.

## HEATING PIPES UNDER FLOOR.

Heating a building by means of steam pipes embedded in the concrete floor has been successfully accomplished in the chassis testing building of the Moline Automobile Co. at Moline, Ill. The structure is 120 ft. long by 60 ft. wide, with door openings extending completely across the ends of the building.

The workmen are obliged frequently to lie on the floor in making necessary repairs and adjustments, and on this account it was desired to keep the floor surface comfortably warm. To accomplish this, 1¼-in. steam pipes, spaced 42 in. on centres were laid 2 in. below the surface of the 6-in. floor slab. The concrete is reinforced locally against cracking, due to the expansion of the steam pipes, by corrugated, galvanized iron pipes inclosing the former.

Below the floor slab, 8 in. of cinder fill are placed as an insulating material. It is stated that with only five small metal radiators additional, it is possible to obtain a uniform temperature of from 60 to 70 deg. F. throughout the building.

## STREET LIGHTING TESTS.

A description of the tests and comparative results obtained from high pressure gas lamps and high candle power arcs was given lately at the Institute of Electrical Engineers, England. The tests were carried on in Manchester, and the paper on these tests by Messrs. S. L. Pearce and H. A. Ratcliff, is given herewith.

**Gas Installation in Princess Street.**—Four high-pressure lamps were suspended in Princess Street at the same height above the roadway as the arc lamps—namely, 27 ft., 6 in. The distance between the lamps varied from 95 ft. 6 in. to 118 ft. 9 in., but 106 ft. 6 in. might be taken as approximately the average.

Each lamp contained three inverted burners, and clear globes were used. At normal pressure each burner was rated at 1,500-candle power, or a total of 4,500-candle power for the complete lamp; but the maximum candle power obtained was only about half this figure.

As originally installed the lamps were fitted with traversing and lowering gears; but these were apparently not successful, as the lamps were at a later date fixed permanently in position. The flexible gas supply tubing was also replaced by rigid galvanized gas barrel.

Princess Street is 60 ft. wide, and as the lamps were, on an average, only 106 ft. 6 in. apart, the resulting illumination was very good, and far superior to any previous example of high-pressure gas lighting in Manchester.

Presumably in order to improve the maximum illuminating effect, but certainly not the uniform distribution of the light, the lamps have been lowered about 1 ft.

**Arc Lamps in Portland Street.**—The central suspension system was chosen for the lighting of Portland Street, and certain predetermined "units" of light were erected at such calculated distances apart as to give the maximum illumination for the least capital expenditure.

The paper points out that in addition to low initial costs the central lighting system has the following advantages, which appear to outweigh certain known disadvantages:—

(a) The distributing mains can all be kept to one side of the street.

(b) No separate lighting standards are required on the street pavements, with consequent advantage to pedestrian traffic.

(c) A more even illumination is obtained; in other words, the ratio of maximum to minimum illumination is less than with side lighting for a given amount of electrical power employed.

The traffic in Portland Street is of a very dense character all day long, and more especially between the hours of 4 p.m. and 6.30, and it was therefore deemed advisable to aim for a high standard of minimum illumination—viz., something of the order of 0.5 foot-candle. The minimum illumination at any point on a horizontal plane at ground level was expected to be not less than 0.44 foot-candle. This figure was not obtained with the lamps as at first installed, but has since been exceeded.

The length of Portland Street is 1,751 ft., and its width 66 ft. Sixteen 550-watt lamps, working four in series on the 200-volt mains, have been erected. Owing to the positions at which certain important side streets intersect the main street, the distance between lamps varies from 114 ft. to 124 ft.

Eight of the sixteen lamps are run on an all-night circuit, and the remaining eight are switched off at 11 p.m. The lamps are so arranged that, when all sixteen are burning, the lighting is balanced across the three-wire distributing mains; but after 11 p.m. the remaining eight lamps are connected to one side of the system only. The lamps are