In all 500 cubic yards were moved at a total cost of \$387 or 77 2-5 cents per cubic yard.

The cost was distributed very much as follows: Shovellers: 1,016 hours at 15 cents per hour\$152.40

Picl: men: 817 hours at 15 cents per hour 122.55

Dumpman: 101 hours at 15 cents per hour..... 15.15

Carts: 543 hours at 18 cents per hour 97.74

\$387.84

-\$10 00

From this it will be seen that the cost of picking or loosening of the material comprised about one-thid of the total cost.

BRICK MANHOLE.

Brick is almost universally used for manholes. The one illustrated in the diagram does not show steps. Steps, however, were placed and the cost of the manhole includes placing of steps, covers and 12-inch sewer pipe, but does not cover the cost of material in these three items. The Cost of Material Was

110	OUSL	UI	material	was.
TA	too bri	ck	at \$10	Der M

- ..\$14 00
- 12 bags of cement at \$2 per barrel..... 6 oo
- I cubic yard sand. I 00



Brick Manhole.

Bricklayers, 12 hours at 50 cents per hour.. \$6 00 Bricklayer's helper, 16 hours at 25 cents per

Total cost.\$31 00 Or 1,000 brick in place cost \$22.15.

The brick were laid in cement mortar.

Cost of Labor.

Considerable discussion has been going on in Montreal regarding the proposal of Mr. George E. Drummond to place four street car tracks on Craig Street-which should be widened for that purpose-in order to remove the tracks altogether from the central section of St. James Street, that street being now too crowded with pedestrians to permit of the operation of cars at certain times of the day. Following this, has been a number of other suggestions from many public men, among these being elevated railways and underground tubes. The consensus of public opinion is that something will have to be done ere long to relieve the congestion and that the scheme, whatever it may be, should be a comprehensive one which will also include rapid transit from the central to the outer districts of the city.

CROUNDED TRANSMISSION MEDIUMS-1.

By J. Stanley Richmond, Consulting Engineer, Toronto, Ont.

Historical.

The history of the use of the earth or of grounded metallic substances as portions of the mediums whereby engineers have carried out practical electrical transmission would. almost read like a romance.

First among the engineers to so use the earth were the telegraphists, prominently represented by Mr. W. H. Preece (now Sir William H. Preece), who, up to or about 1899, was for many years engineer-in-chief and electrician to the British post office. It can be easily understood that in such a position and controlling the telegraphs of that country (which are operated by the government) the British authorities were more inclined to make regulations to suit the electrical requirements of Mr. Preece's department than to suit the electrical requirements of the general public; so that, in the eighties, they formulated rather strict regulations to govern the use of grounded returns. Thus it was that electric traction was much delayed in the British Isles; the public of which country, when they finally awoke to the fact that their traction facilities were much behind those of some other countries (such as the United States of America), brought pressure to bear on their parliamentary bodies to again take up this question with the view to make the regulations less restrictive. A joint committee of the House of Lords and Commons was, therefore, appointed in 1893, with the result that a considerable amount of evidence was taken before it and published in one of the blue-books under the title " Electric Powers (Protective Clauses)." A short abstract of such evidence, from an electrolytic corrosive point of view, is as follows :-

Sir Courtney Boyle-The government should, in drawing up regulations, consider the telegraphs first. Referred the committee to Major Cardew.

Mr. W. H. Preece-Had been on the lookout for electrolytic corrosion but, up to the time of his evidence, had been unable to find such. Referred the committee to Major Cardew, who decided that the judicious connection of pipes to rails would prevent detrimental action.

N.B.-Sir William and Major Cardew have, during the past few years, acted jointly as consulting engineers in connection with the installation of single trolley systems in England.

Dr. John Hopkinson-Was pretty common observation, both in England and the United States of America, that pipes became oxidized and had holes eaten in them.

N.B.-Dr. John, for some time previously to his deplorable loss with other members of his family during one of his Alpine excursions, acted as consulting engineer (engineer) to the Liverpool tramways committee during the construction of the first portion of their electrical traction system. Sir Arthur Forward, who, up to the time of his death (about the same time as Dr. John's) was the chairman of this tramways committee, was one of the members of the joint committee.

Lord Kelvin-Grounded returns were a serious menace to pipe systems. It was useless for any one to come in to protect the Glasgow corporation's pipes from their own street railway system.

N.B.-Glasgow uses the single trolley.

Mr. G. E. Fletcher (L. & N. W. Railway)-Grounded returns resulted in detrimental action. Such could be avoided by connecting the pipes to the rails. Trouble would, anyway, result at bad pipe joints.

Mr. C. H. Morse (Boston, Mass.)-A report by him on conditions in Boston submitted-track returns in Boston were in a bad state; and that a considerable loss of power to the company and damage to the pipe resulted, but that such was preventable.

Mr. C. E. Spagnoletti (G. W. Railway)-Non-committal; and his evidence, in the main, of a chemical nature.

Mr. James Swinburne-Electrolytic action, as a result of grounded returns, by no means necessary. Favored connec-