veys its passengers to and from the street, 153 feet above.

The tunnel will be twelve feet wide and twelve feet high in the clear, the sides running up six feet straight to the arched roof, which will have a radius of six feet.

The entire construction will be of concrete reinforced with steel in the walls and roof, and permanently shored with timbers where necessary. With the exception of 173 feet at the street end of the tunnel, the entire excavation will be through solid rock, which fact of course greatly increases the cost of construction.

The contract for the construction of Tunnel Street has been awarded to Roswell D. Williams, 21 Park Row, Manhattan, at an aggregate bid of $72,260. An itemized schedule of the prices follows: 5,900 cu. yds. of rock excavation at $6.75 per yd., 2,300 cu. yds. of earth excavation at $1.20 per yd., 1,200 cu. yds. of refilling at 30 cts. per yd., 2,200 cu. yds. of concrete at $7.78 per yd., 750 cu. yds. of excess concrete at $6 per yd., 200 cu. yds. of dry packing at $2 per yd., 30,000 ft. (B.M.) of timber at $30 per M., 1,000 lin. ft. of galvanized wrought iron pipes at 50 cts. per ft., 800 lin. ft. of 6-in. pipe drain at $1 per ft., 360 sq. ft. of concrete (steps, landing, sidewalk, etc.) at 40 cts. per ft., 10 catch basins at $20 each, 33 sq. yds. of surfacing at 15 cts. per yd., 11,000 lbs. of steel beams and girders at 5 cts. per lb., 5,000 lbs. of steel rods and bars at 4 cts. per lb., 11,000 sq. ft. of floor finish at 10 cts. per ft., electric system (for lighting) complete $1,150.

The construction of the tunnel is expected to have an appreciable influence on the development of that section of Manhattan which it affects.

The difficult and devious approaches to the subway stations have hitherto constituted an indubitable and serious deterrent to the popularity as a residental section of a large area in that neighborhood. With its electric lights, adequate drainage and ventilating provision and equable temperature, the underground street will do much to relieve the discomfort of the transit situation.

PRESERVATION OF POWER TRANSMISSION POLES.*

By W. R. Wheaton.

The increasing cost of power transmission poles in recent years and the high maintenance charges have turned the attention of power companies to some process to increase the life of the poles and to cut down the maintenance charges. The first cost of the poles has nearly doubled in the past six years, and these two factors have been largely responsible for the interest shown by operating power companies in pole preservation.

In March, 1908, the San Joaquin Light & Power Corporation set a line of Western yellow pine (Pinus ponderosa) poles. The line is about 30 miles long and contains approximatel 6000 poles. These poles were cut in the Sierras above Fresno at an elevation of about 4,000 ft., and were thoroughly seasoned before treatment. Some of the poles received a brush treatment with carbolineum and with creosote, and the rest were treated in an open tank with creosote, zinc chloride and crude oil. The butt only was treated. Western yellow pine is very susceptible to a preservative treatment. Some of the butts were thoroughly penetrated with creosote and with zinc chloride, the average penetration (at the ground line) being 3 in. The penetration with crude oil averaged about 1½ in. The crude oil used was a heavy oil of asphaltum base supplied from the Kern River fields. In order to get a comparative life of the wood treated and untreated, stubs of untreated timber were set along the line about a mile apart. The writer inspected this line in June, 1910, at which time it had been set for twenty-seven months. The untreated stubs set along the line were completely rotten. Of the poles brush-treated with carbolineum and creosote the conditions were about the same, a large percentage of each showing signs of decay; 27 per cent. of the poles that had a brush treatment with creosote showed signs of decay, and 29 per cent. of the poles that has treatment with carbolineum showed decay, while 45 per cent. of the poles treated with crude oil were slightly attacked by decay. Of the poles treated with zinc chloride, 28 per cent. showed attack by decay. The poles treated with creosote in the open tank (over 50 per cent. of the entire line were treated in this way) were all perfectly sound and showed absolutely no signs of decay.

In August, 1911, two of the poles in this line which had received a brush coating of creosote fell over, owing to decay at the butt. During August and September, 1911, the line was gone over and all of the poles which had had a brush treatment of creosote or carbolineum were so badly decayed that they were strapped to a creosoted cedar stub.

The above results speak for themselves. The value of the experiment is apparent and is enhanced by the fact that the timber used will entirely decay, without treatment, in a year.

The San Joaquin Light & Power Corporation is now treating Western red cedar poles at the butts only by the open-tank process. There is no necessity for treating the top, since the top is not subject to decay. With this process the outer ring of sap wood on the cedar poles is filled with creosote, and if the timber is thoroughly seasoned before treatment there is little difficulty in accomplishing this. The penetration varies from ½ in. to 1 in. with an absorption of from 7 lb. to 9 lb. per cubic foot. As for the efficiency of the treatment, treated and untreated cedar poles have been set for four years. The creosoted poles are still perfectly sound, while the poles set untreated have decayed through the sap wood and into the heart.

The question has been asked why zinc chloride, copper sulphate or some preservative other than creosote has not been used to cut down the treatment charges. It was found that several poles treated with chloride of zinc were, after the installation of irrigation systems, in the middle of irrigated fields. The zinc was washed out of them, and the poles had to be replaced after a service of two years. The saving in the cost of treatment by the use of a metallic salt would not mean a saving in the end if many such replacements took place. A 50-ft. creosoted pole placed in the line means an investment of about $25. The use of chloride of zinc would cut this cost to about $24.25, and the saving is too small to be considered against the possibility of the loss of the preservative by leeching out after one or two years.

* Abstract of a paper read at the annual meeting of the Wood Preservers' Association, Chicago. Ill., Jan. 16-18, 1912.

SALT IN ONTARIO.

The occurrence of salt in that part of Ontario which lies entirely in the southwestern peninsula bordering Lake Huron, the St. Clair River, Lake St. Clair, and the Detroit River, according to such exploratory boring as has been done, indicates that there are a number of separate relatively small basins. The beds range from mere seams to formations 200 feet or more in thickness. The supply of salt in Ontario is practically inexhaustible. The bulk of the salt manufactured is used in Ontario. The quantity of salt produced in 1910 was 84,071 tons, valued at $414,978, as compared with 77,490 tons, valued at $389,573, in 1909.