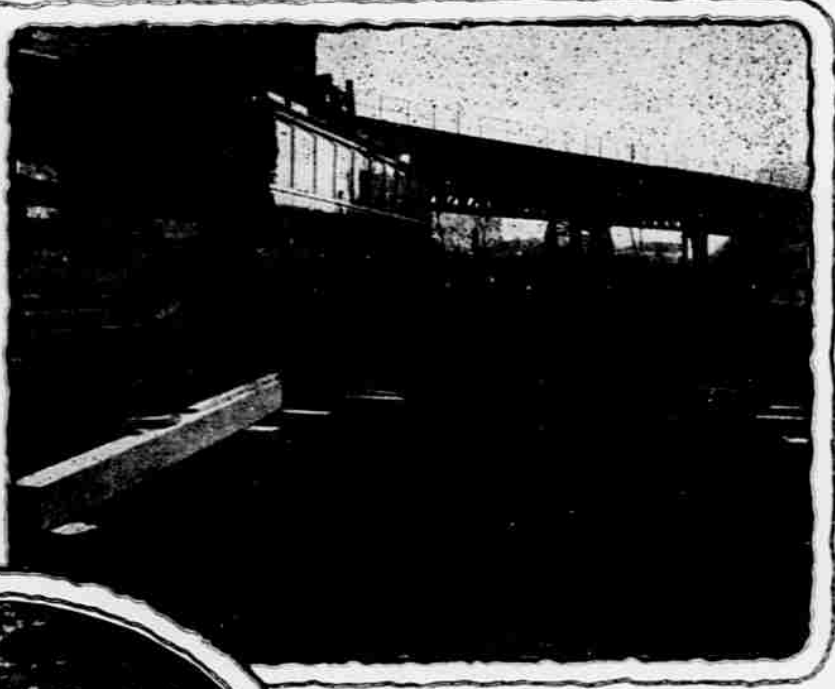




In This Hole the Subway Intersects the Cellar of a Skyscraper Since Erected



Where Elevated, Surface and Subway Lines Cross

it was accounted the greatest engineering wonder of the world. Yet if one could add the famous St. Gothard tunnel to the Simplon, and to them the Mount Cenis tunnel and then splice on the Lake Lucino tunnel for good measure—thus uniting the four longest tunnels on our planet—he would have the length of the underground railways of New York.

Or, let us take the longest tunnels and subways in America:

Baltimore and Ohio tunnel.....	7 miles
Hoosac tunnel.....	4 3/4 miles
Boston subway.....	2 1/2 miles
Cascade tunnel.....	2 1/2 miles
Bowlder tunnel.....	2 miles
Ivanhoe tunnel.....	2 miles
Sarnia tunnel.....	1 mile

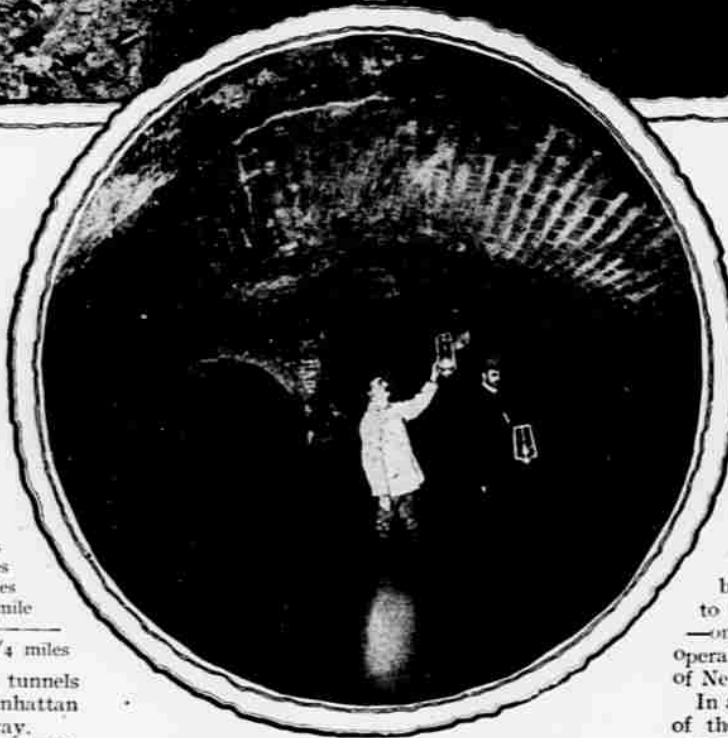
Total..... 21 3/4 miles

The combined lengths of these seven great tunnels is a mile short of the total length of the Manhattan and Brooklyn divisions of the New York subway.

The largest single contract in the history of civilization was entered into for the purpose of constructing this wonderful system of transportation. When it is known that 1,700,228 cubic yards of earth and 921,182 cubic yards of rock have been excavated, 368,656 cubic yards of rock tunneled, 130,088 tons of steel, 15,802 tons of cast iron and 18,519 cubic yards of brick used in the work, to say nothing of the hundreds and hundreds of thousands of cubic yards of waterproofing and concrete and stone and the 300,000 linear feet of steel tracks and the hundreds of thousands of tons of other material—one realizes that a vast undertaking has been in progress. But its very vastness makes it incomprehensible.

If we took the earth and the rock that came from this appalling hole in the ground and loaded them into carts stretched out in a straight line, we should have a procession reaching from New York to San Francisco and back again by the way of New Orleans—a distance of 7,575 miles.

The difficulties of the work have been unparalleled. The authorities say that it is the most remarkable engineering feat on record. Fifteen miles of sewers had to be taken up and relaid—many of them almost as big as the subway itself. There were miles and miles of gas mains and water pipes and conduits that twined themselves in and out and crossed and recrossed; the path of the underground railway like a labyrinth. There were elevated railways and surface railways that had to be undermined, but so bolstered up by artificial construction that the daily transportation and traffic of the great city was not disturbed. Blocks and blocks of busy Broadway in the upper part of the city were hollowed out like a flute. Tunnels were fearlessly bored under lower Broadway, reaching almost to the very foundations of the big skyscrapers and brushing against the walls of Trinity church, while above the rumble of the electric cars and the rattle of the carts never ceased. It costs twenty thousand dollars to construct an average mile of steam railroad. It cost a million dollars a mile to dig out and blast out this subway. But despite the cost and despite the mechanical difficul-



Engineers Solving a Sewer Problem

ties the first great part of the work has been finished.

Yet it is only the beginning of the underground railroad system of New York. Under the supervision of the rapid transit commissioners three other mammoth underground projects are being carried forward. One is the tunnel of the Pennsylvania railroad, which is to extend from Weehawken, New Jersey, under the Hudson river, below the surface of Manhattan along 31st, 32nd and 33rd streets, and under the East river to Long Island City on Long Island, a distance of four and one-fifth miles, and a total length of main tracks of twenty-two and one-fifth miles.

A few weeks ago a tunnel under the Hudson river—begun as far back as 1874—connecting Hoboken, New Jersey, with New York, was completed by the

equipped with electric trains on the same plan as that adopted by the underground railroad.

Work has been already begun by the Hudson & Manhattan Railroad Company (the members of which are practically the same men who compose the New York & Jersey Railroad Company) on a tunnel which is to run under the Hudson river from Courtlandt and Church streets, New York, to the Pennsylvania, Jersey Central and the Erie railway stations in Jersey City. It will also connect with the New York subway at Dey street and Broadway. It will have a length of one and one-half miles, and will be equipped with electric trains which will be running in three years. Both these tunnels to the New Jersey shore are to have twin tubes—one for each track. The trains that are to be operated through them will connect with the railroads of New Jersey.

In a few months the underground terminal facilities of the New York Central & Hudson River railroad will be completed. Direct connection will be made with all the outlying towns within a radius of one hundred miles, to the Grand Union station on 42nd street, by means of electric trains.

Thus, with all these roads stretching out into the country in every direction, a new stream of suburban transportation will be opened.

"In the next ten years I expect to see New York honeycombed with great tunnel lines," said John B. McDonald, the subway contractor. "The tunnels to Washington heights and Kings Bridge and The Bronx, the tunnel to Brooklyn, the tunnel from Weehawken across Manhattan to Long Island City, the tunnel from Hoboken, and the tunnel from Jersey City are the merest beginning. I believe that within a few years it will be possible to go between any two points in the greater city by the underground system."

"I have plans for spending one hundred million dollars in extending rapid transit facilities in Greater New York within the near future," said William Barclay Parsons, the chief engineer of the rapid transit railroad commissioners. "Even this great sum will not provide for adequate accommodation for the rapidly increasing transportation. The entire Manhattan elevated system has, on extra occasions, carried as many as nine hundred thousand passengers a day. In round numbers it will average for a year two hundred and forty millions. The underground will carry more than that; but with all the increase in facilities we shall fall short of what we ought to do. This is based on the calculation that New York is increasing in population at the rate of two hundred thousand a year, and that every man, woman and child averages four hundred and fifteen street car trips annually. According to these figures the city's population will have increased by one million in five years, and the additional fares to be handled by the transportation companies will be four hundred and fifteen millions annually."

So this subway—great work that it is—is only the beginning; but it has opened the way for a system that is astounding in its possibilities.

### Longest Tunnels in the World

New York Rapid Transit.....	22 4/5 miles
Metropolitan Underground, London.....	13 miles
Simplon, Switzerland.....	12 miles
St. Gothard, Switzerland.....	9 1/4 miles
Paris Underground.....	8 1/2 miles
Mont Cenis, Switzerland.....	7 1/2 miles
Baltimore, B. & O.....	7 miles
Arburg, Austria.....	6 miles
"Tup-penny Tube," London.....	5 3/4 miles
Hoosac, Massachusetts.....	4 3/4 miles
Berlin Underground.....	4 1/2 miles
Liverpool and Birkenhead.....	4 1/2 miles
Boston Subway.....	2 1/2 miles
Cascade, Great Northern Railroad.....	2 1/2 miles
New York Central.....	2 miles
Budapest, Austria.....	2 miles
Bowlder, Montana.....	2 miles
Ivanhoe, Colorado.....	2 miles
Sarnia, Canada.....	1 mile

New York & Jersey Railroad Company. It has a length of one and three-quarters miles and runs from the ferry in Hoboken to Eighth avenue and West 10th street in New York. By July, 1905, it will be fully