



# *Electric Railroads*

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## THE STEINWAY TUNNELS

*by*

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In the preparation of the history of the Interborough Rapid Transit (IRT) Division for the series of **ELECTRIC RAILROADS** Issues on the New York City Transit System, it was found that the tunnels of the Queensboro Line under the East River antedated the remainder of the system and that they had been opened for a brief period of railway operation by street cars eight years

before the first subway train pushed its noisy way from Queens to Manhattan. To give the reader a clearer picture of the early construction and the later rebuilding of these tunnels for rapid transit operations, this issue has been prepared. The history and operations of the IRT will be presented in Issue #33.



# the early years

On February 25, 1885, a group of prominent Long Island businessmen incorporated the East River Tunnel Railroad Co., under the General Railroad Act of 1850. The purpose of their plans was to construct a tunnel railroad from Ravenswood, north of Long Island City, to a convenient point in Manhattan that would serve as a direct connection between the Long Island Rail Road and the New York Central & Hudson River Railroad. The capitalization was for \$2,000,000 and the corporate life was for 99 years.

At the time, a similar plan was being pushed for a bridge over the East River to be known as the Blackwells Island Bridge and it too was for the same purpose as the tunnel project. Although Roebling had performed the miracle of building the Brooklyn Bridge further down the stream and had shown its feasibility, the tunnel backers believed that a tunnel had advantages over a bridge plan and in the end would be considerably cheaper to maintain.

An engineering firm was hired to survey the river bottom for appropriate tunnel sites, but after this work was accomplished, nothing more was done. In 1887, the company was reorganized as the New York & Long Island Railroad Co., with at least two of the earlier incorporators participating (Col. Robert Townsend and C. P. Stratton). The East River Tunnel Railroad Co. passed out of corporate existence.

On July 22, 1887, Walter S. Gurnee (1813-1903) prominent banker and industrialist of New York City who had been one of the original financial backers of the West Side & Yonkers Patent Ry. (see ERR #25), incorporated the New York & Long Island Railroad Co. under the New York State General Railroad Act of 1850. The certificate of incorporation (#4599) was filed in Albany eight days later. The N.Y. & L.I. proposed to build a tunnel (power unspecified) from Long Island City (then a separate municipality) to New York City (Manhattan).

In addition to Mr. Gurnee on the Board of Directors, were men of railroad and construction abilities. Gen. Roy S. Stone had built a monorail system in Philadelphia's Fairmount Park for the 1876 Centennial, while Thomas Rutter was a Civil Engineer who had built the Baltimore & Ohio RR. tunnel under Baltimore. Frank K. Hain later became General Superintendent of the Manhattan Railway Co. The capitalization was for \$100,000 and the corporate life was for 99 years.

On Jan. 7, 1888, the N. Y. & L. I. filed its first map (in the New York County Register's Office) showing the proposed route in Manhattan. This was as follows: begin under the intersection of 9th Ave. and W. 30th Street, thence diagonally under private right-of-way to the intersection of 6th Ave. (Avenue of the Americas) W. 33rd St. and Broadway. Thence again diagonally under private right-of-way to the intersection of 5th Avenue and W. 34th St., thence under E. 34th St. to Second Avenue, thence diagonally under private right-of-way to a point on the East River shore between E. 34th & E. 35th Sts. The entire route was in tunnel.

The Manhattan route was completely changed by another map filed on May 11, 1888. The new route was to be as follows: begin on the surface of W. 38th St. and 11th Ave., thence on the surface of W. 38th St. to a point

halfway to 10th Avenue, thence in tunnel under W. & E. 38th St. to the East River shoreline. At 11th Ave. there were to be direct track connections north and south to the New York Central & Hudson River Railroad, which is now the New York Central's West Side Freight Line. There was also to be a tunnel spur to the Grand Central Depot via Park Ave. (then 4th Ave.) and a tunnel connection to the Hudson Tunnel Railway which would meet in the vicinity of Washington Square. The Hudson Tunnel Railway was then building its route from Jersey City (see ERR #27).

On Jan. 13, 1890, the route was again changed in a map filed in the Register's Office. This map placed the tunnels under 42nd St., and was the final major change of the Manhattan part of the route. This map was also the first to show the Long Island City route. The Manhattan route was as follows: begin under the corner of W. 42nd St. & 10th Ave., thence easterly under 42nd St. to the East River. At W. 42nd St. & 10th Ave. the line was to surface and split into two spurs. One spur was via open cut and private right-of-way to W. 43rd St. & 11th Ave. with track connections to the N.Y.C. & H.R.RR. while the other spur was to terminate at a Hudson River pier via private right-of-way and W. 41st St. & 11th Avenue.

The reason for the changing of the routes in Manhattan was due largely to the very voluble opposition of the residents along the proposed routes, especially along 38th Street, as well as the difficulty in securing adequate financing.

The route in Long Island City (Queens County) was via tunnel under the East River to a shore point near 5th St. (49th Ave.) thence under private right-of-way diagonally to 4th St. (50th Ave.) thence via that Street to Jackson Ave., thence northeast beside Jackson Ave. to Thompson Ave. (near the Queens County Court House), thence to a direct rail connection to the Long Island Rail Road. This route in Long Island City was part in tunnel and part on surface private right-of-way. The exact end of the tunnel was not given.

On Jan. 30, 1892, the N.Y. & L.I. filed a revised map of the Long Island City section in the Queens County Register's Office. The route was shown primarily as a connecting railroad between the various L.I.RR. lines in Brooklyn and Queens. In Long Island City the tunnels ran under 4th St. as before, but now the tunnels continued as far as Van Alst Ave. (21st St.). The remainder of the route was as follows: curving north under the L.I.RR. tracks by either of two alternative routes under private right-of-way to Hunter's Point Ave. & Meadow St. (Skillman Ave.), thence under Skillman Ave. to a portal between Davis St. (Court) & Pearson St., thence one branch over a trestle on private right-of-way near Nelson St. (47th Ave.), then around the north end of Dutch Kills (a waterway), then south around the Kills at the east of Orton (30th) St. via a private right-of-way to the intersection of Review Ave. & Young St. (now closed but then an extension of the present 34th St.), thence by a curve to a connection into the Montauk Division of the L.I.RR.; also at the beginning of the curve, a sub-branch crossing over the Montauk via a trestle and over Newtown Creek on a



bridge. This sub-branch was for a proposed link to the Evergreen Branch of the L.I.R.R. in Brooklyn. There was another branch route planned to begin at the portal along Skillman Ave. and private right-of-way to connect L.I.R.R. Main Line at about the point where Skillman Ave. crosses Queens Blvd.

Another branch route was to be as follows: start at the intersection of the branch to the Montauk Division and 48th Ave., thence via a private right-of-way to the intersection of the branch to the Main Line and Thomson Ave. Finally another branch to begin at the tunnels at 5th St., thence diagonally under private right-of-way north of Vernon Ave. & 3rd St., to Newton Creek & 11th St. Here a tunnel under the Creek would be built to Oakland St. in Greenpoint, Brooklyn. This last route was to be used for passenger trains only.

New York City granted a franchise to the Company for construction on Dec. 31, 1890, for the part in Manhattan, while the City of Long Island City approved the application October 20, 1891 for the section in that area. Various extensions of time were granted by the political bodies for the construction which lagged ending on January 1, 1907.

During this period, various changes were noted in the officials of the company. Mr. Gurnee was succeeded by Gen. Roy Stone in the Presidency, who in turn was replaced by James D. Leary in 1890.

New money was needed to invest in the project & one of the men of the time who became interested in it and believed that it had possibilities was Mr. William Steinway, founder of the Steinway & Sons Piano Co. He owned a sizable part of Long Island City real estate & owned the Steinway and Hunter's Point Railroad which was a local horse car line. By obtaining control of the tunnel company, it would increase the value of his properties. It was his plan to operate the tunnels by electricity which had recently been harnessed for electric traction motors. Stations were to be scattered along the route for both passenger and freight service. Upon assuming control he appointed Henry B. Hammond, a prominent railroad official and lawyer, President with himself as Vice-President. Pomeroy P. Dickinson, who had built the Hudson River Railroad bridge at Poughkeepsie became Chief Engineer and Malcolm Niven, Secretary.

The contract for the construction was awarded to Myles Tierney a contractor who had built the Washington Bridge over the Harlem River at 180th Street. He in turn gave the contract to the Inter-Island Construction Co. which he founded on Jan. 6, 1891 in association with Niven.



SCENE OF THE EXPLOSION.

### GROUND BREAKING FINALLY STARTS

May, 1892 saw the preliminary work begin, with the actual ground-breaking on June 3rd in an area south of the south sidewalk at 50th Ave. between Vernon & Jackson Avenues. The digging consisted of a single work-shaft going down 85 feet, from which tunneling would begin in both directions. Headings were also planned to be made from proposed shafts on Man-O-War Reef (Belmont Island) in the East River and on 42nd Street in Manhattan.

Shortly after the horizontal tunneling started, difficulties arose to plague the work. A fresh water spring was struck and pumping out this water complicated the work of removing the debris. Occasional blasting was necessary and the concussions were damaging property and glass of the local residents and businesses and loud and vociferous complaints were heard.



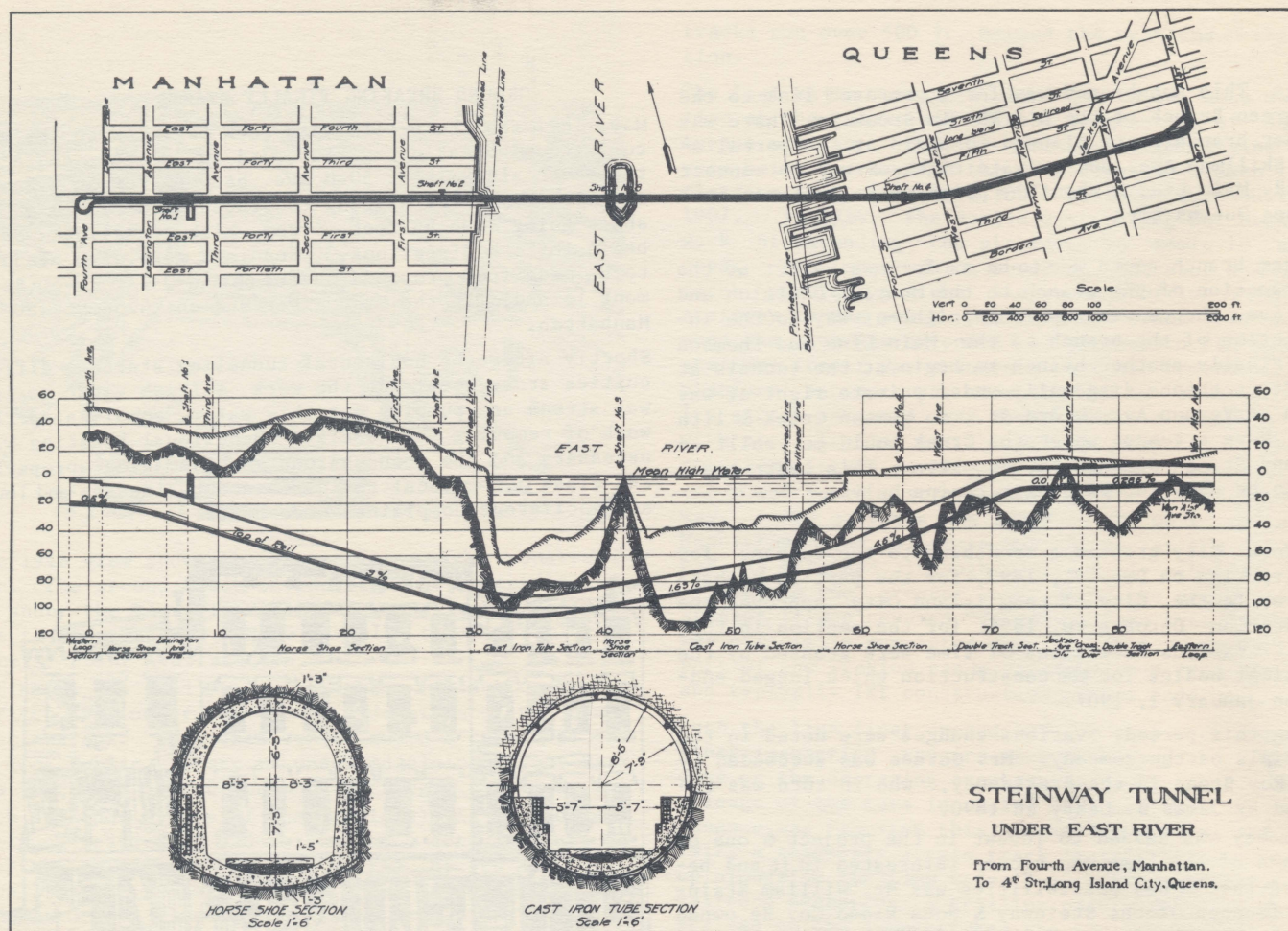
FRONT OF THE ROW OF SHATTERED BUILDINGS.

On the cold morning of Dec. 28, 1892, when the work had progressed 32 feet in a northeast direction, a dynamite explosion occurred on the surface, 20 feet from the shaft. Nicholas Laodano, a workman, was directed by the foreman, Peter McIntee, to attempt to thaw out 100 lbs. of dynamite cartridges which were badly frozen. They were placed in a steam box (which is a common procedure) and they blew up killing Laodano and four others, injuring 20 others, some quite seriously. Foreman McIntee escaped with minor injuries and was later placed under arrest. Most of the accident victims were not tunnel workers. Everyone disclaimed responsibility.

At a subsequent hearing by a coroners jury in February 1893, McIntee and Inter-Island were cleared of criminal negligence, but Inter-Island was forced to pay damage claims and it was reported that they settled for one-third. As a result of this debt they became insolvent.

The financial Panic of 1893 and the continual flooding of the shaft by the afore-mentioned spring caused the tunnel to be boarded up on February 2, 1893. From that time until Steinway's death in 1896, periodic attempts were made to revive the project. During this time, the company was directed by Niven, Louis Von Bermeuth, a son-in-law of Steinway, and John Bogert, an early stockholder. Steinway, however, maintained his majority control of the stock. Proposals were made to extend the line to New Jersey and attempts were made to get new or foreign capital, but all attempts were futile.





## the belmont era

In February 1902, new life began to appear around the abandoned tunnel shafts as August Belmont, Jr. began to take an interest in the project. Belmont, who was German-born in 1853, had inherited his father's vast fortune in 1890 and was an astute banking tycoon in his own right. He was also a friend of Steinway and undoubtedly watched with interest the progress and subsequent failure of the tunnels to be built. He entered the tunnel construction field in New York in 1900, by assuming the cost of building the Interborough Rapid Transit Co. and its plan of equipping and operating the first subway.

Control of the financially shaky New York & Queens County and its sister company the New York & Long Island Railroad passed from Steinway's successors, along with the franchises to Belmont, for the sum of about \$80,000. Although Steinway had owned both companies, they were always kept as separate corporate entities.

The revived tunnel program became known as the "Belmont Tunnels" although Belmont preferred to have them known as the "Steinway Tunnels". New Preliminary surveys and tunnel plans were prepared between 1902 and 1905, when construction was resumed. Many of these new plans were prepared under the direction of Solomon L. F. Deyo, who was also chief engineer of the Rapid Transit Construction Co., the building firm and subsidiary of the IRT. The original plans for the railroad tunnel called for gradients of no more than 1.44% and the bed of the rail to be 75 feet below the surface at the site of the shaft. The revised plans called for the grades

to be changed to 4.5% and the specifications more in line for streetcar or a small rapid transit type of car operation. The rail bed was to be only 25 feet below the shaft surface at the Queens end.

About the time this was all taking place, the Pennsylvania Railroad acquired control of the Long Island R.R. and announced plans for the tunneling of both the Hudson and East Rivers and the construction of a huge station between 32nd & 33rd Streets, in Manhattan. Plans were also being pushed by the New York Connecting Railroad to tie in the LIRR., the New York, New Haven & Hartford Railroad, and the Pennsylvania Railroad via a huge bridge over the Hell Gate section of the East River which would nullify the earlier plans of the Steinway Tunnel backers. With the tunnels being planned for a lighter form of traction, costs could be lowered somewhat.

With the changing of the plans, the connections originally proposed to the NYC & HR RR were dropped and the tunnel terminal in Manhattan was to be a two track pocket under Park Avenue and East 42nd Street. This was changed to a loop plan in 1904, however.

At the Queens end, they were to run under private property under 49th & 50th Aves., to emerge at a portal about North of the North sidewalk between Vernon Blvd. and Jackson Ave. Here a ramp was to be built connecting the tracks with those of the New York & Queens County. This plan was revised again to provide a large loop starting from the portal and going east on 50th Ave.,



north on 21st St., east on 49th Ave. and Hunters Point Ave., north on Van Dam St., west on Thomson Ave., then SW on Jackson Ave., south on 21st St., and then west on 50th Ave. to the portal. This later plan eliminated connections to the New York & Queens County.

Since the shaft at the Queens end would not be as deep as originally planned, it was filled in and abandoned before new construction began. Since the head of construction for chaining and surveying purposes was to be in Manhattan, the shafts sunk were numbered from there. The first underwater tunnel shaft (#4) was sunk in Queens on July 14, 1905, while the one on the opposite shore (#2) saw work begin on Sept. 1st. The rubble from the tunneling under Manhattan streets was taken out of shaft #1 at about 156 E. 42nd St. In the center of the East River in line with the shafts, is a rock obstruction known as Man-O-War Reef. This reef was enlarged slightly, renamed Belmont Island and No. 3 shaft was sunk connecting to the two tunnels. The Queens shaft is at 2nd St. & 50th Ave. on private property.

At the bottom of shafts 2, 3 & 4, shields were inserted for the underwater work and the men worked through ground, rock, sand and clay under a pressure of 40 lbs. per square inch. A total of 1,500 men were on the job. As the shields inched their way forward, they were at times exposed to the river water but this was gradually overcome as they went deeper. At the low point of the tunnel profile, the top of the tunnel was 88 feet below mean high water and 25 feet beneath the river silt.

Under the river sections, cast iron plates forming a tube 15' 6" internal diameter were used, while concrete sections in horseshoe form was used under Belmont Island and the Manhattan streets. Rectangular cross sections of reinforced concrete were used under the streets of Queens which was excavated by the "cut and cover" method of construction. The muck and rubble was removed and the supplies were carried in on a 20" work railroad using 1 yd. long dump cars operated by the gravity system wherever possible or pulled by a cable from a hoisting engine, driven by compressed air. The hoisting engines were located on overhead timbers with in the excavations.

The construction work was done by the Degnon Contracting Co., whose chief engineer was Robert A. Shailer. The engineer for the NY & LI was St. John Clarke. The

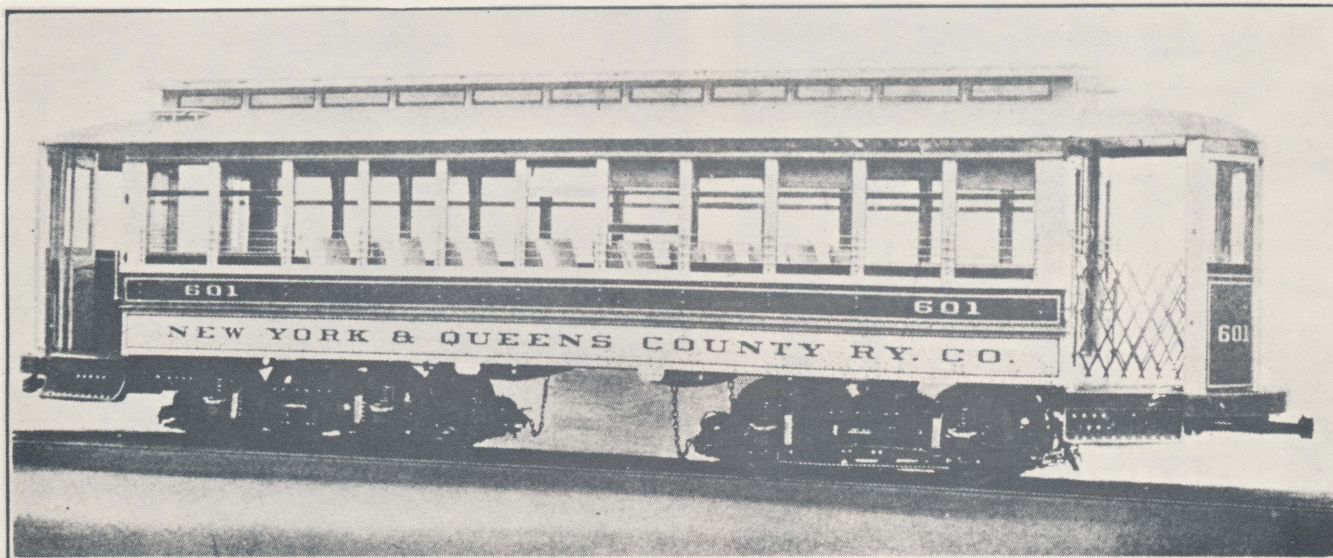
designer of the tunnels and the consulting engineer was Wm. Barclay Parsons, a graduate and trustee of Columbia University, chief engineer for the IRT and a director of many Belmont holdings, including the NY & LI.

On May 16, 1907, the north tube was "holed through" and the south tunnel followed on the 7th of August. Had the tunnels been completed as planned, they would have been the first subway line in the U. S. But, with 15 years passing by, Boston had opened its first subway line in 1896, with New York's IRT opening in 1904. Whether due to misalignment or loss of control of the shields, it has not been established, but a slight "kink" can be observed in the south tube, just east of shaft #3.

The entire tunnel project was completed in only 26 months which was very good time. They would have been completed sooner except for litigation by the City of New York. The city had refused blasting permits in 1906 and had also revoked permits for temporary buildings. At this time, it must be recalled that Queens County had become part of Greater New York under the consolidation of Jan. 1, 1898. Belmont went to court over these obstructions and won his case. But, it was merely the battle and not the war.

The city's objections to the tunnels were based on a number of factors. First, was probably the low rate of revenue from the franchise which was 3% of gross earnings, plus other taxes from operation in Manhattan, but nothing from Queens operations. In addition, the tunnels were privately owned and operated, unlike the IRT which was city-owned and privately operated. Since they were privately owned, they were under the relatively weak control of the Public Service Commission, a state agency, as to fares and service.

In its attempt to stop the tunnels, the City used several arguments; first, the operating franchise even up to Jan. 1, 1907, was illegal and therefore dead; second, the tunnel company did not secure permits from the New York Dock Board (a City agency) to dig under the East River dock area; third, the tunnels were not being built to the exact routes of the original franchise, and also the NY & LI did not have a legal existence! Under the New York State General Railroad Act of 1850, and its 1867 amendments, any railroad company had to spend 10% of its capital towards construction within 5 years and finish and place it in operation within 10 years from



ALL-STEEL BRILL SEMI-CONVERTIBLE CAR. MOUNTED ON BRILL NO. 27-EI TRUCKS.



the time of filing its articles of association, or else forfeit its corporate existence.

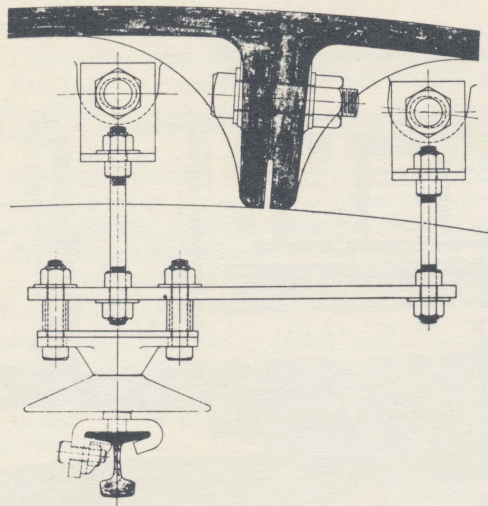
The NY & LI had complied with the first part on expenditures in 1892, but had to get the Legislature to approve construction extensions in 1895, 1902 and in 1903. The last one was good until Jan. 1, 1907.

The City claimed that these legislative extensions were illegal, but the courts held in 1907 and 1908 otherwise. The rulings did hold, however, that the company was remiss in not having permits to dig under the river docks and that the tunnel routes were not exactly as stated in the franchise. It felt, nevertheless, that the public interest would be defeated by stopping the construction and they refused to act. Under the law, as it stood, the NY & LI was forced out of corporate existence as of Jan. 1, 1907 and its control was turned over from the directors to trustees. Mr. E. P. Bryan, IRT President, was elected trustee chairman by the outgoing directors.

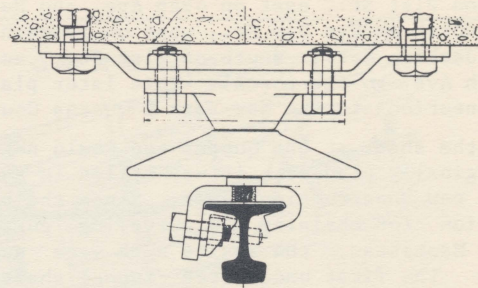
During all this period while the lawyers were carrying out legal maneuverings, other men went about their job of preparing the tunnels for service. One of the important problems to be met was the type of car and power supply to be selected. Various systems were considered and discarded. For a time, Belmont had considered using an electric motor car to pull a train of 4 or 5 trolley cars, the cars going through with their poles hooked down. The power supply method to be used was unspecified.

Plans eventually narrowed down to using trolley cars under their own power. Since the low overhead of the tube precluded the use of the trolley pole, it became necessary to use an alternate system. Third rail operation was impractical as the cars would operate on the streets in Queens eventually, it was hoped.

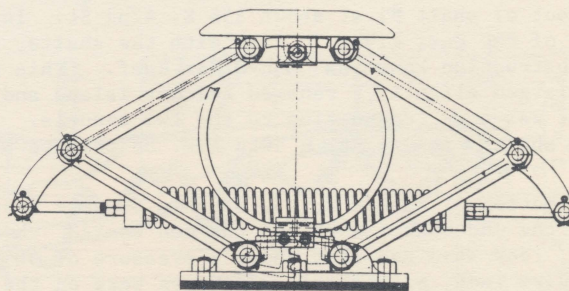
An answer to the problem was presented by Alfred G. Sidman, then a 29 year old assistant consulting engineer. Mr. Sidman's plan entailed placing a small pantograph shoe on the roof of the car and the trolley wire being replaced by an inverted contact rail on the tunnel ceiling. The top of the pantograph shoe was only 11 3/8" above the roof of the car in normal operating position. The contact rail was 20 lb. T rail. The shoe was similar to, but smaller than, that used by the New York Central Railroad on its locomotives.



ADJUSTABLE BRACKET FOR OVERHEAD CONTACT RAIL IN CAST IRON SECTION



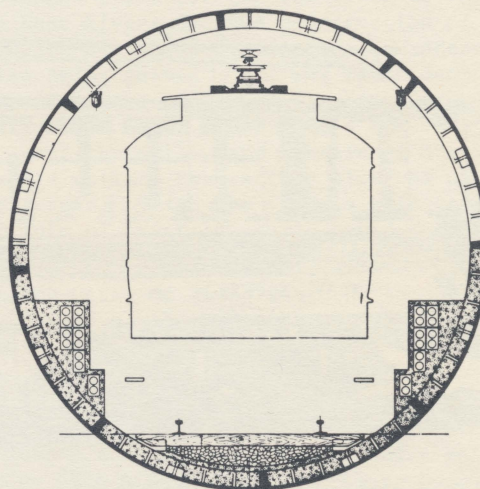
ASSEMBLY OF 20-LB. OVERHEAD CONTACT RAIL



PLAN AND SIDE ELEVATION OF OVERHEAD CONTACT SHOE, DESIGNED FOR THE FORTY-SECOND STREET TUNNEL

Fifty steel streetcars, equipped for M-U operation, were purchased by the IRT and assigned to the NY & QC for tunnel service. Since the IRT controlled both the NY and LI, and the NY & QC, it was decided that the latter should run the cars in view of their operating experience.

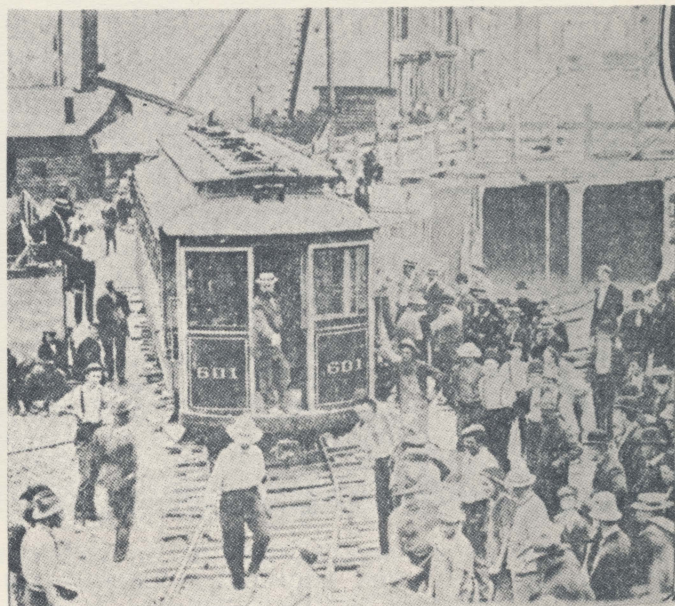
The cars were numbered from 601 through 650, and were large, semi-convertible, monitor roofed, vestibuled cars with pantographing gates instead of side doors, a fender at each end and end doors for use as trains.



CROSS-SECTION OF ONE OF THE FORTY-SECOND STREET TUNNELS, SHOWING LOCATION OF OVERHEAD CONTACT RAIL

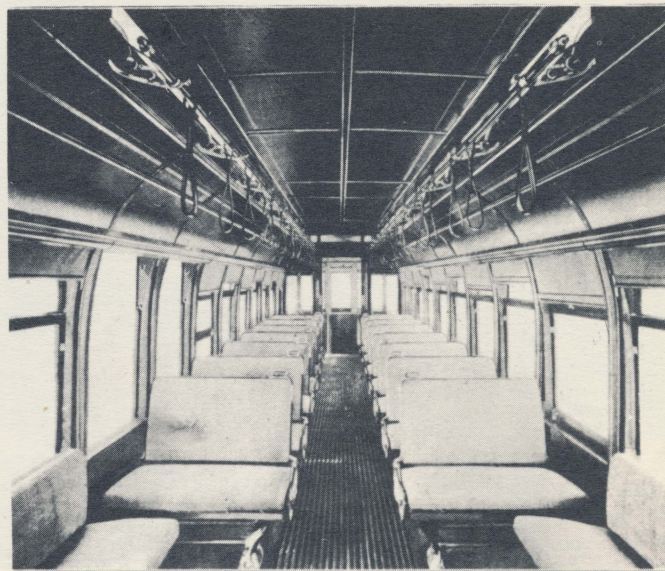


# FIRST CAR RUN TO ENTRANCE OF BELMONT TUNNEL



The views on this page show Car 601 being placed into the mouth of the tunnel at Long Island City on September 16, 1907. Using four sections of specially constructed 30 lb. rail of 40 ft. lengths, the car was run over them while those sections in the rear were taken up and placed in front of the car.

It is believed that the same process was used in reverse when the car was taken from the tunnel a little over a month later. When the car was let down the incline, boys of the area were allowed on for the brief ride. Below shows the interior of the car as it appeared on delivery.





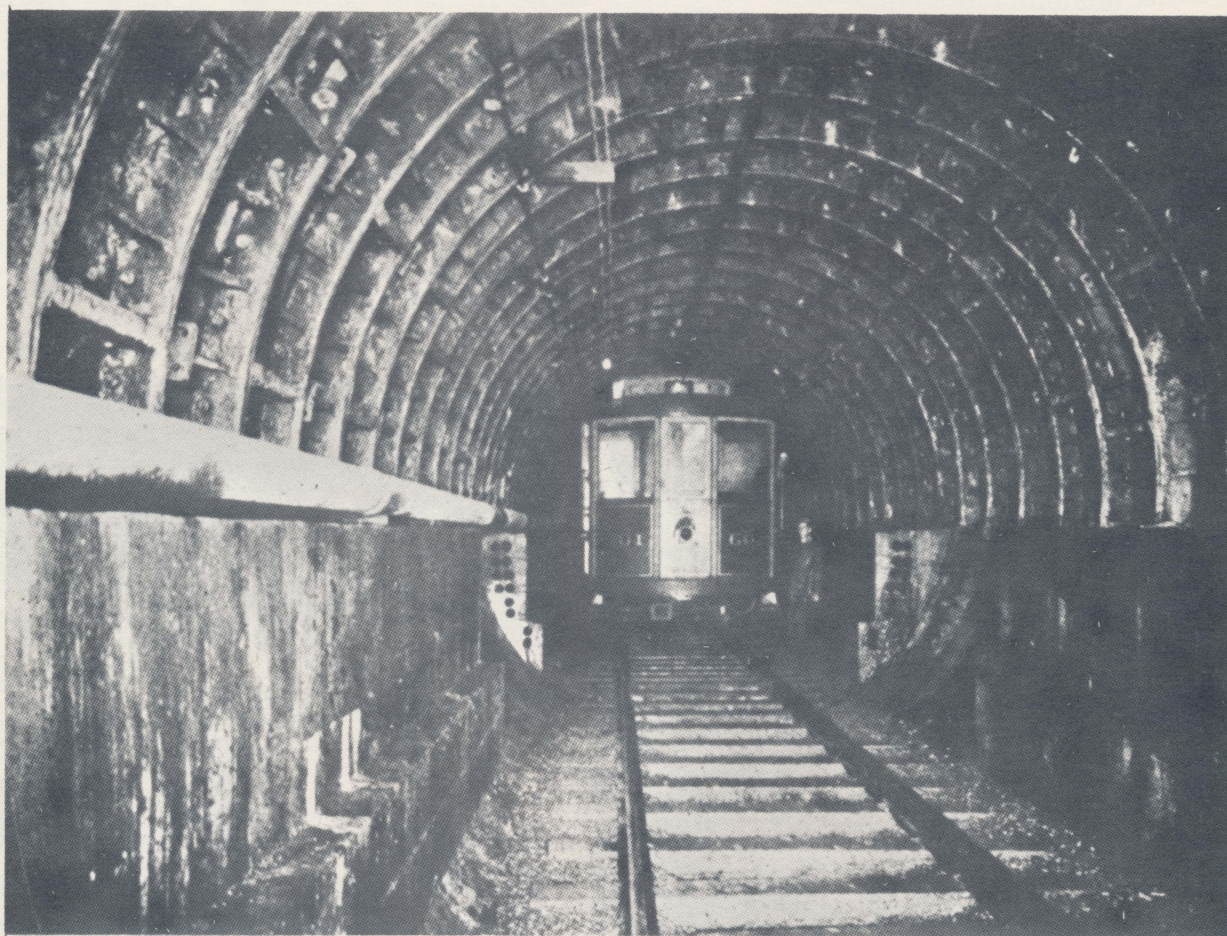


INTERIOR VIEW OF CONCRETE SECTION OF THE FORTY-  
SECOND STREET TUNNEL, SHOWING OVERHEAD CON-  
TACTOR, ROADBED, ETC.

They also had one fixed step at each side on each end for use in streets or with the low level (2 Ft. high) platforms in the tunnel stations. They seated 44 passengers on 14 cross seats in the center and four lengthwise seats on the ends. Having 11 windows on each side, they were similar in appearance to earlier wooden cars bought by the NY & OC from J. G. Brill Car Co. Weighing 32,500 lbs., they were 42'5" long and 8'11" wide. They came delivered in yellow paint with "New York & Queens County" on each side. The interior was in the standard IRT colors of dark green, gold and white striping and cream ceiling. #601 and nine others were built by Brill, with the remaining forty coming from American Car & Foundry Co. Sporting train couplers, they ran on Brill 27 E-1 trucks, with motors of 40 HP and Westinghouse traction brakes.

They were unique in the fact that they were probably the first all steel trolley cars built in the U.S. All the framing was of structural steel, while the car siding was of steel also. The steel roofing was covered with canvas, however. Steel cars were purchased due to non-flammability and safety. The IRT, which had bought the cars, already had the experience of losing several cars of semi-wood construction in a disastrous tunnel fire in 1905.

Several of the Brill cars arrived in Long Island City on Aug. 2, 1907. These cars were then shipped, via an unspecified route to the 98th St. car shops of the Interborough-Metropolitan Railroad Co. on Third Avenue, in Manhattan. One or more of these cars were equipped with poles and the pantograph which was placed between the poles. Car 601 was picked for the initial test of



-FINISHED TUNNEL, N. Y. & L. I. R. R.  
FIRST PASSENGER CAR TO PASS UNDER EAST RIVER.



the line.

From the shops, it was towed over Manhattan streetcar trackage and then over the Williamsburg Bridge trolley tracks (North side) to Washington Plaza. Transferred to Brooklyn Rapid Transit trolley tracks at that point, it ran under its own poles to Long Island City via the Vernon Ave. Bridge. It was re-transferred to the NY & QC, via a temporary rail, where it ran to 50th Ave., where another temporary track was laid into the entrance of the North tube ramp. Here a team of horses was used to supply the motive power. This was done on Sept. 16, 1907.

The north tunnel was laid with 100# rail from east of Jackson Ave. to the west end of Lexington Ave. station while the south tube still had 20# and 100# rails laid on a temporary roadbed for the contractors use. The station at Lexington Ave. was accessible through a temporary building at 156 East 42nd St. via a long staircase (escalators were planned but not installed) down to the single platform 65 ft. below street level, and 181'5" in length. Another platform was considered to be built on the loop which would exit into the old Hotel Belmont (now the site of the Airlines Terminal) and the Grand Central Depot which was then being rebuilt. This plan was dropped.

At the other end of the tubes which were 8,500 ft. in length, a station was constructed at Jackson Ave. 150' long with the platforms staggered oppositely and over the site of the 1892 shaft. Further east, Van Alst Ave. station was built on the inside of the Manhattan-bound leg of the Queens loop with a platform 132'8" long. It was at the junction of 50th Ave. & Van Alst (21st) St. The loop itself was entirely underground and part of it was underpinned by Tunnel "A" of the Pennsylvania RR. line, that part being built by the NY & LI contractor to avoid future disruptions and difficulties when the PRR did its tunneling work in the area. The portal was 10 ft. east of the beginning of the loop and led to a ramp in an open cut on 50th Avenue which ran to 21st St. and then north to 49th Avenue where it surfaced.

Passenger controls and ticket booths were to be located in buildings over the stations with the exception of Jackson Ave. which would have them at the foot of staircases leading from the street. A reinforced concrete

terminal building was planned and part of the foundations begun on the NW corner of Van Alst & 50th Aves. Had it been completed, it would have had an arcade concourse with stairway access to the loop platform below, topped by several floors for offices and apartments. Plans were not carried out and what access this station had is not known.

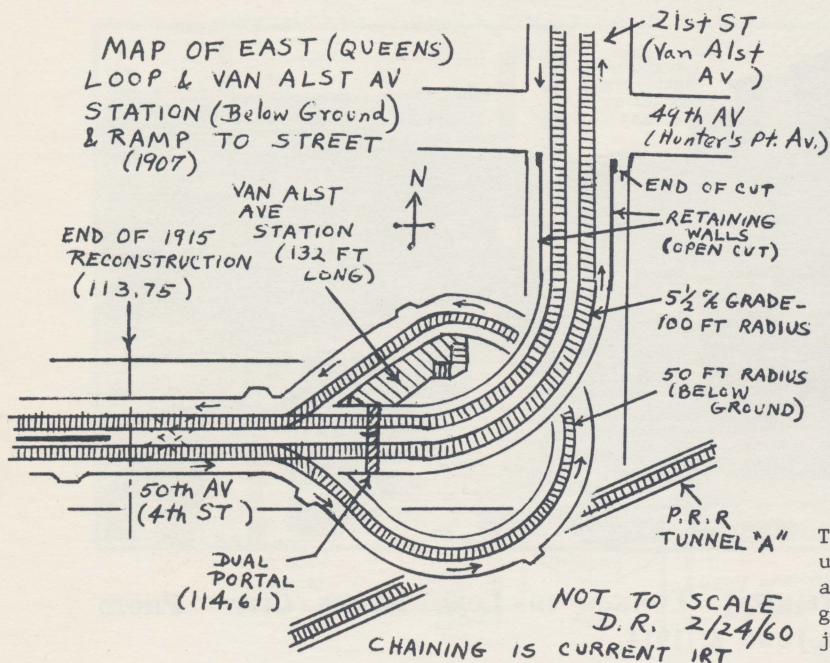
#### THE FIRST TRIPS

Great secrecy had been maintained about the tunnels prior to the official opening. Workmen had guarded the entrances and kept sightseers away. A temporary power house was set up near shaft #4, and Jackson Ave. station had temporary stairs and lights installed. On Sept. 20th, the first trip was planned but was cancelled due to contact rail power failure. It was made on the following day, however, with three round trips as far as Belmont Island in the north tube. The motorman was Chas. Banghart, Motive Power Supt. and the passengers were 22 engineers, superintendents and foremen. An official opening was then set for the 24th and was attended by Belmont, the Mayor, Banghart and assorted officials. This trip ran through to Lexington Ave. where all concerned repaired to the Belmont Hotel for dinner and speeches.

The tunnel became quite an attraction as the first underwater passenger tube in New York City. Car 601 was in almost continuous use shuttling visitors back and forth. Some of the visitors included 200 Queens business men on the 27th, another group early in October and 200 members of the Brooklyn League on October 10th.

On Sept. 29th, the car roof caught fire from a short circuit caused by iron filings from the contact rail collecting under the pantograph shoe. The noise and flashes above their heads caused some passenger panic and some jumped off the car and ran for the nearest exit. The car continued its trip to Jackson Ave. to discharge the others and repairs were then made with the car returning to service.

The Degnon Contracting Co. turned the completed tunnels over to the NY & LI on Oct. 15th, with the only work still to be done were tracks and contact rail to be installed in the south tube, station finish at Jackson Ave. and miscellaneous work at Van Alst Ave. and the ramp.



THE PARTY THAT MADE THE TUNNEL TRIP

The above view shows one of the groups that rode 601 under the river to Grand Central. Since it was quite a novelty to ride under water, most riders had their group photo taken at the New York end as proof of the journey.



Without a franchise to operate for revenue, or a company legally in existence to hold it, Belmont was left with a set of tunnels on his hands. On Oct. 23rd, the NY & QC laid temporary tracks on 50th Ave. to remove the car from the tunnel, but since they had no street permit for this they were forced to remove them by the Bureau of Highways. Later that month though, the #601 left the tunnel and went to the Woodside Barn after a permit had been obtained.

Belmont offered to sell the tunnels to the City over the objections of the Public Service Commission and declared that the tunnels would not pay for themselves for several years anyway. Pending sale of the tunnels, he sealed all entrances and the portal. All of the cars, including 601, were placed in regular street operations with trolley poles on the Steinway St. Line of the Steinway Lines, (a NY & QC affiliate) until 1922 or 1923. By this time, they had been purchased from the IRT for \$14,000 each and when they were cut up for scrap in 1921 and 1926, they were only worth \$100 each. Cars 603 through 605 and 607 through 609 were sold to the Windsor, Sandwich & Amherstburg Railway of Canada in 1920. They had been found to be to

heavy for the rails, shook buildings & wore out track-age.

Between the years of 1907 and 1915, the tunnels lay idle, except for the transmission of electricity from the IRT to its trolley affiliates in Queens. Until 1909, the power was sent through submarine cables in the East River, but at that time, the IRT built a passageway from the north wall of the original subway route where it curves into 42nd St., and goes northeast to a duct manhole on the south wall of the north tube just west of the present Grand Central-Queensboro station. The purpose of this was to bring the cables down to the tunnels and use them instead of laying new ones in the bed of the river.

The passageway was dug without hardly any public notice and only after it was completed did it come to the attention of the Public Service Commission which then had a hearing. The IRT admitted that the tunnel was dug under its orders and that it went directly through an intermediate level between the subway and the tunnels that had been reserved for the projected extension of the Hudson & Manhattan RR. to Grand Central and offered to pay for the passageway relocation if it became necessary.

#### THE TUNNELS ARE SOLD

On April 3, 1913, the City of New York purchased the tunnels from Belmont, as part of a supplementary agreement to the famous Dual Contracts of March 19, 1913. These contracts were negotiated by the PSC between the IRT AND BRT (now BMT) for the construction of new subways and the extensions to existing lines. The IRT was credited with \$3,000,000 for its subsidiary's part in construction although the actual costs were nearer \$8,000,000, and the tunnels were placed under IRT operation.

The original IRT plan was to resume trolley car operation, but this was discarded in favor of a regular rapid transit train service. The tunnels were measured and only slight modifications were needed to allow for third rails and shoe clearance. The loops and the ramp were found to be unsuitable since the 50' radius of the loops was too small for the subway cars, as was the 6½% grade at the base of the ramp too steep. The road-

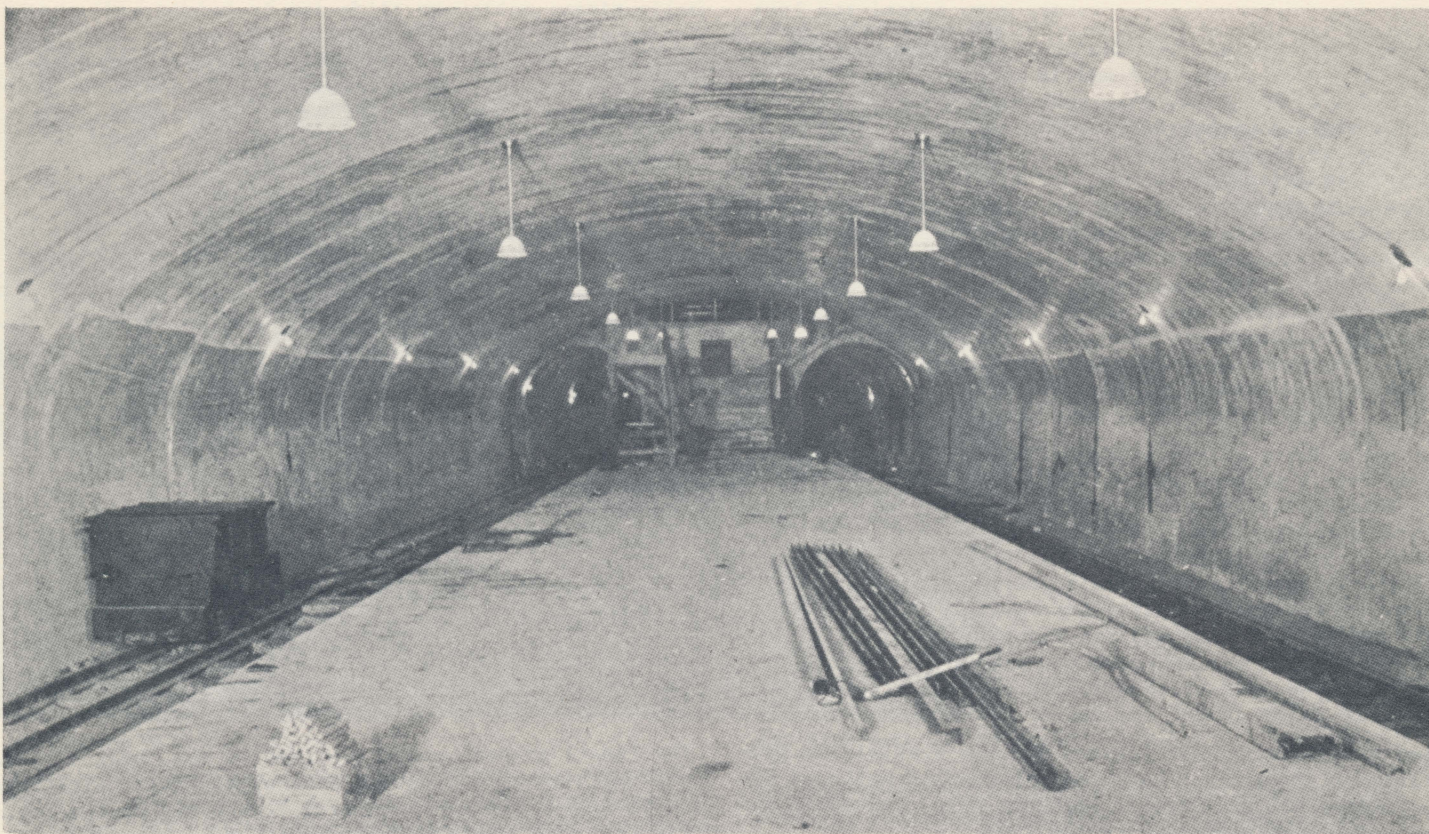


BUILDING THE PRESENT PORTAL IN 1914

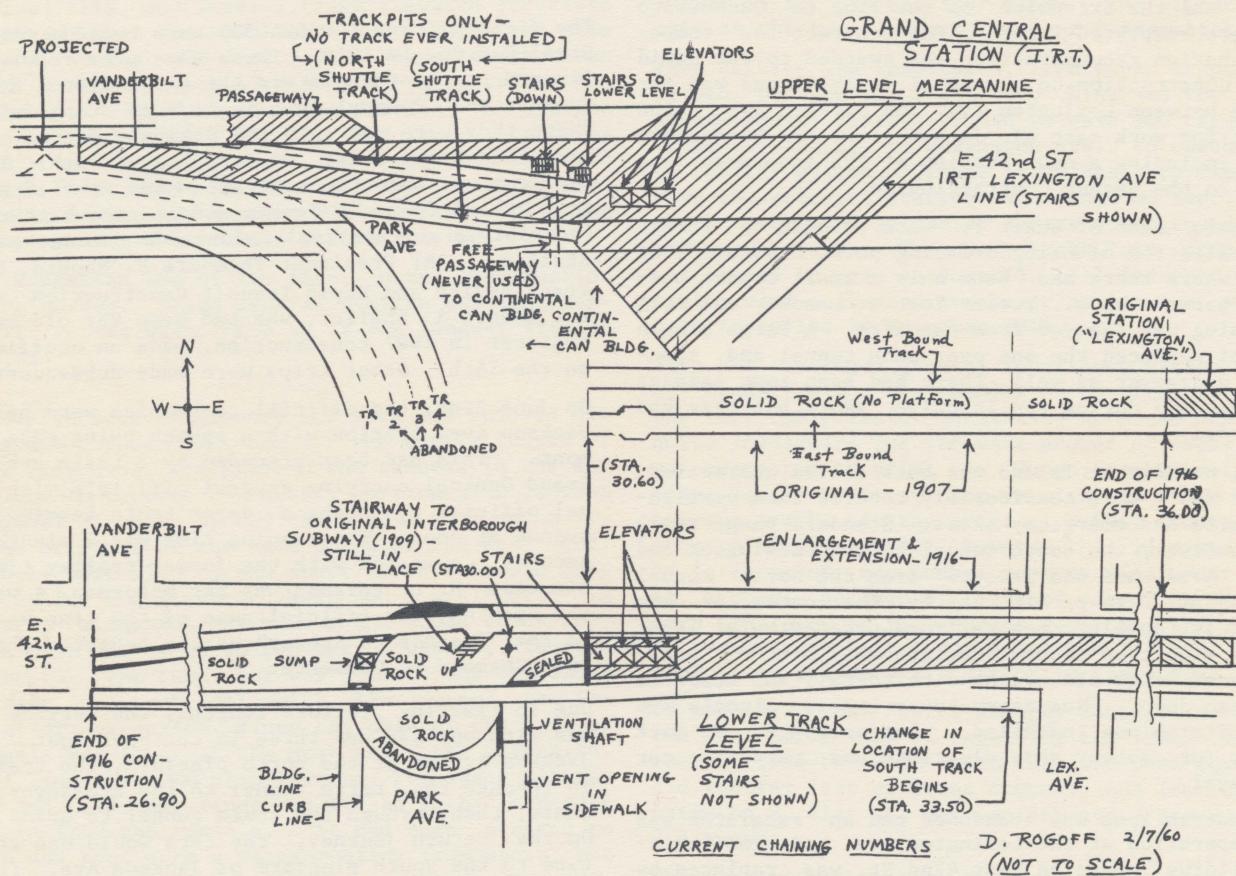


RECONSTRUCTION WORK AT MOUTH OF STEINWAY TUNNEL IN LONG ISLAND CITY. PHOTO TAKEN JUNE 6, 1914.





Grand Central station as it looked just prior to the beginning of train operation. Note the contractors tracks in the north tube roadbed. Passenger trains used the south tracks only until the enlarged program had been completed.





RIGHT - Grand Central station as it appears today, looking East. Note the change in the grade as can be seen by the bending line of newly installed fluorescent lights. The train entering is an R-12 type, on its way to Times Square. This and cover photo taken by Henry Raudenbush of ERA



bed did not have to be lowered nor was special low profile rail required. Duct banks buried in walls of the horseshoe and rectangular sections were abandoned and were replaced with the present type.

In order to have the tunnels in operation as soon as possible, only reconstruction necessary for temporary operation was actually carried out before the official opening. More extensive projects such as platform lengthening, replacement of the old Van Alst Ave. loop station and the extension of the line to Queensboro Plaza were completed later. The contract for temporary operation reconstruction was awarded to the Rapid Transit Construction Co. on April 3, 1914, and was for the line between Lexington Ave. and Jackson Ave. The contract for work east of Jackson Ave. to Queensboro Plaza, including a new station at the loop area was awarded to the Degnon Contracting Co.

The tunnels east of Shaft 2, were rebuilt to permit the installation of a single facing point crossover, at a point where there had been only a small cross passageway between them. Twelve feet of masonry and rock intervening was removed from the site. A large single arch roof replaced the one over each tunnel and spanned the crossover as well. There had been some seepage in the tunnels during the inactive years but they had not flooded.

Shaft 3, on Belmont Island was back filled and sealed. Shafts 2 and 4 were considerably rebuilt into ventilation shafts and emergency exits. Standard gauge track was installed in the south tunnel between Lexington and Jackson Aves. and was removed from the north tunnel west of Shaft 2 to permit use by the contractor who used a 2 ft. double track railroad powered by at least one coal mine type locomotive, probably electric trolley powered. The old overhead third-rail and brackets were taken down. Necessary power lines, signals and station finish was installed, platforms were cut back slightly for subway shoe clearance and raised to car floor level.

The Manhattan loop was abandoned and an escalator was put in operation at the Lexington Ave. end. The temporary building above on East 42nd St. was replaced by a three-floor office building while the station itself received the new name of "Grand Central".

The tunnel grades under the land on the Queens' side were as high as  $4\frac{1}{2}\%$ , which were higher than elsewhere on the IRT. It was questionable whether the standard IRT car would operate efficiently on such grades so a revised type of subway car was designed and called the "Steinway". The "Steinway" was a motor car identical in appearance to the standard type of car but was lighter and had different motor gearing. It would only couple electrically to other similar cars or the later "Worlds' Fair" cars.

The first 12 cars (4025-4036) were built by the Pressed Steel Car Co. in 1915. These cars were reportedly delivered to the tunnels via the new Hudson & East River Tunnels and Pennsylvania Station to Long Island City where they were put into the Steinway Tunnel via a new ramp then being built, on Sunday June 13th. The first test run was made the same afternoon at 4:15 with power supplied from "a dynamo and storage battery room" (probably a sub-station) alongside the Jackson Avenue Station. IRT President Theodore P. Shonts, Gen. Mgr. Frank Hedley and Rapid Transit Construction Co. Engineer Robert A. Shailer, who had been the old Degnon Co. engineer in 1907 construction, made an unofficial trip on the 16th. Other trips were made subsequently.

On June 22nd, the official ceremonies were held at the Jackson Ave. station with a speech being made by Belmont. This had been preceded by a train arrival from Grand Central carrying several officials, with the actual official run being a 4-car train leaving Jackson Avenue at noon. The running time was 2 minutes and 55 seconds, compared with the former trolley time of  $3\frac{1}{2}$  minutes. H. L. Parsons was the motorman. A week after the opening, the official name of the line was changed to the "Queensboro Subway" at the behest of the Queensboro Chamber of Commerce.

Due to limiting platform lengths, the service normally was with one car and three in the rush hour. Leaving Jackson Avenue at the north platform, the train would go through the north tunnel to the crossover near #2 shaft, then through the south tunnel to Grand Central. On the return journey, the cars would use the south tube to the south platform of Jackson Ave. They would be reversed on the trailing crossover just east of the station.



During this period of makeshift operation, construction continued at the east end of the line. A permanent stairway replaced the temporary one at Jackson Avenue. Since the loop was unusable, as was the old Van Alst station, portal and ramp, they were all demolished and filled in so that no traces of it can be seen today. A new station, known as Hunters Point Ave. was planned over part of the site. Due to the unstable ground in the area, pier foundations had to be put in, instead of piles that were planned.

The station runs in a northeasterly direction and does not follow any street lines but cuts diagonally under private property and two separate streets. Space was provided for a crossover at the southwest end of the station, by the omission of roof columns. This end of the station was the site of the platform and single track of the old Van Alst station and undercut private property which is now part of the Queens-Midtown Vehicular Tunnel approach road. A small temporary building with street entrances, ticket booths and other control was planned for this point. Provision was made for a 16-story building at the site by designing the roof columns to carry the load. Neither was ever built. At 2100 49th Ave., a 7-story office building was erected over the station during its construction and is known as the "Queens Subway Building" and was the former offices of Queens County & Borough. It is occupied today by the Paragon Oil Co.

At the northeast end, the station undercut diagonally 49th Ave. between 21st St. and the LIRR Main Line. A mezzanine was built above the station with entrances from the "Queens Subway Building" and 49th Ave. Plans were made for a covered passageway to the LIRR station at Hunters Point Ave. but these were never carried out.

At the extreme end of the station, the new portal and ramp were built at a grade of 4%. The ramp connected, over raised fill, to a steel 2 track elevated structure which crosses over the LIRR North Shore Yards and then turns north over a 250 foot radius curve to run over Davis St. to 23rd St., to 43rd Ave. where it splits into two levels at Queensboro Plaza Station. A station was erected midway at 11th St. and is now known as "45th Rd.-Court House Square". Operation was extended to Hunters Point Ave. on the eastbound track on Feb. 15th, 1916, and to Queensboro Plaza on the following Nov. 5th, opening Court House Square station.

At the Manhattan end of the line, other construction was being pushed. Grand Central station was lengthened 535 ft. to the west, making it the longest station on the IRT.

First, twelve feet of masonry and rock was removed out of the space between the tubes for the entire length of platform extension. The grade of the tunnels in the extended area was lowered to a nearly horizontal 0.2% from the original 3% which placed the base of rail seven ft. below the original at the same point on the west end. The tunnels were also spread apart further here to make allowances for a 3 elevator shaft and a stairwell. A change of 5° alignment was made in the south track 200' from the west end so as to run west southwest instead of due west. The tube roof was removed and replaced by a single span arch roof which also covered the island platform extension. Since the base of the rail of the tunnels was lower at the west end of the extension, the roof line there was also lowered. The space between the new and old roof lines was filled in by concrete brought in from the tunnels. It had been planned to give the new roof arch a waterproofing from above, but this was changed to a "monolithic cement plaster process" from below. This proved to be a mistake and the

roof has leaked ever since.

The new platform ran to about 100' east of the beginning of the old loop. At the west end of the platform, the elevators and stairway were installed in a 63' sq. shaft from Mezzanine "B". The old duct manhole was left intact except that it had to be lowered several feet and its stairway access was partially obstructed. The construction also included two tunnel stubs west of the platform extension as far as the southwest side of Vanderbilt Ave. & E. 42nd St. The south tunnel cut through the loop at two places as well as cutting into the unexcavated centre of the loop. The north tunnel stub cut off the old north tube at the beginning of the loop and went west south west to come alongside of the south tunnel stub at Vanderbilt Avenue. It did not, however, intersect the centre of the old loop.

The three separate sections of the loop were not destroyed. Part of one section was used as a work shaft and later converted to ventilation purposes, while the remainder still retains much of its original appearance. A second section of the loop between the two tunnels is being used as a sump room, while the third section has been sealed closed and is located between the north wall of the south tunnel and the wall west of the elevators. The old and new parts of the station can be distinguished by the differences in grade and construction and that safety niches are installed in the walls for trackmen in the newer parts.

The elevator shafts pass through six levels. The top level is for passengers from the "Grand Central" station of the Lexington Avenue line. Beneath this is a second level for elevator motors and control switches. The third level is used for storage by the Ventilation & Drainage Department which has offices on the fourth floor level which is at the tunnel roof. The fifth level is for the platform for the trains, while the lowest is for the elevator pits. The elevators stop only at the two platform levels for passengers.

When service was instituted, free paper transfers were issued between the Queensboro Line and the original subway route. Passengers had to walk 900' from the exit at E. 42nd St. to Lexington Ave. to reach the rest of the IRT system. These transfers were discontinued when the enlarged station was opened on Sept. 11, 1916, which permitted an easier access underground through new passageways. The north track into Grand Central was placed in use on June 15, 1917 and the eastbound trains used a diamond crossover at 1st Ave. which had been installed in November 1916.

With the continued growing importance of the West Side of Manhattan and the opening of the 7th Ave. Line of the IRT, the transfer facilities at Grand Central were quite inadequate for the vast number of users. A plan was suggested to bring the Queensboro Line tracks to Times Square by tying them in with the south local and express tracks of the original subway route going across 42nd St. By 1922, however, this idea was discarded in favor of new tunnel construction under W. 41st St. Probably because of ideas of extending the Queensboro Line over to the Hudson River and the fact that it would again have to dip under the IRT West Side Line near Times Square was a factor in the change.

In mid-1922, the Powers-Kennedy Contracting Co. began the excavation work of extending the line. Debris was removed from the work shaft that had been cut into the old trolley loop at Grand Central, and from shafts located on W. 41st St. between 6th Ave. & Broadway and at 7th Avenue.

The extensions began at the end of the tunnel stubs under E. 42nd St. & Vanderbilt Ave., climbed to a level





#### THEN...

This 1916 view shows the present ramp under construction. The second track on the right is descending to dip under the East River for the Pennsylvania Railroad line to Penn Station. Note the LIRR train stopping at Hunters' Point Ave. station.

just below the 42nd St. Shuttle Line and continued over to Fifth Ave. under the south sidewalk and the south shuttle track. They then curved under a corner of the New York Public Library and under adjoining Bryant Park in a southwest direction and reaching W. 41st St. at Sixth Ave. (now Avenue of the Americas). As the tunnels continued west, they had to stay at a deep level to go under the BMT Broadway Subway and the IRT 7th Ave. Line, as well as the proposed subway under 8th Ave. The end of construction came at the centre line of 8th Ave. As things are today, they can go no farther since the lower level platform of the IND-8th Ave.-42nd St. station now stands as a barrier with the tunnels ending at the station's east wall.

"5th Avenue-Public Library" station was built at the north end of the library. The south track underpinned a small corner of the library but no part of the station underpinned the shuttle. An underground passageway for pedestrians was built above the shuttle tracks going from the west end of the control mezzanine above the station into a street entrance through the basement of Stern's Department Store on the north side of West 42nd St. The rails at this point are 42' below the street surface.

Several planned roof columns and the two easternmost stairways from the platform to the mezzanine were not built at the same time as the rest of the station. The area was left vacant for the use by trains over a crossover to reverse their direction when that station was opened on March 22, 1926. The special track work was removed in 1927, however, when the tunnel service was extended to Times Square. The temporary tower was removed from there and the platforms were extended 150' into the area.

Times Square station opened on March 14, 1927. A crossover track was installed at the site of the W. 41st St. shaft near Broadway which is just east of the station and space was left for one west of the station, but it was never installed. The necessary tower and dispatchers offices are at the east end.

Through connecting passageways, the Times Square stations of the IRT 42nd St. Shuttle line, the 7th Avenue line and the BMT Broadway Subway are all accessible. The depth of rail base at this station is 53 ft. The

tracks run over 500 ft. beyond the west end of the station.

The last major reconstruction job to be done on the line at the Queens end was the lengthening of Jackson Avenue station. The increasingly longer trains that were being operated on the line required a much longer platform than the one of 150' that had been built in 1907. In 1924, the Joslin Contracting Co. began the work of extending the platforms to admit 10 subway cars. The interlocking tower at the east end of the north platform and the Dispatchers office under the stairway to the south platform had since been closed when the line was extended to Queensboro Plaza. The stairway itself was abandoned but not removed. Its platform entrance was concealed by an unmarked door. Its street entrance was covered with a concrete slab with steel grating and the private property above was converted into a parking lot. A new entrance to each end of the south platform replaced the abandoned stairway. A new entrance was added to the west end of the Manhattan-bound platform but the one at the opposite end was retained although considerably rebuilt. As a tribute to the greater coverage of the newly rebuilt station, it was renamed "Vernon-Jackson Aves." The work was officially completed Jan. 26, 1926. The original part of the station can be distinguished from the later and typically IRT construction on its ends.

When the line first opened and the cars were new, only minor inspection repairs were necessary and this was done on the operating trackage at Jackson Ave. As the mileage of the cars increased and more thorough maintenance was required this became impractical and so in 1917, a temporary single track inspection shed was put up alongside the ramp beneath 49th Ave. on Pennsylvania Railroad property. A trailing point crossover was installed on the ramp between the two tracks and a trailing turnout from the Queens bound track led into the shed and beyond into the LIRR tracks. It is believed that this track was used for new car deliveries in 1916 and 1925. For a complete overhaul, the cars were taken over the Queensboro Bridge trackage of the 2nd Ave. elevated line which reached Queensboro Plaza in 1917, to the main shops of the IRT at 147th St. via connecting trackage in Manhattan and the Bronx. In 1928, the



#### ...AND NOW

An R-15 type train snakes its way towards the portal after passing over the LIRR yards on its way to Times Square.

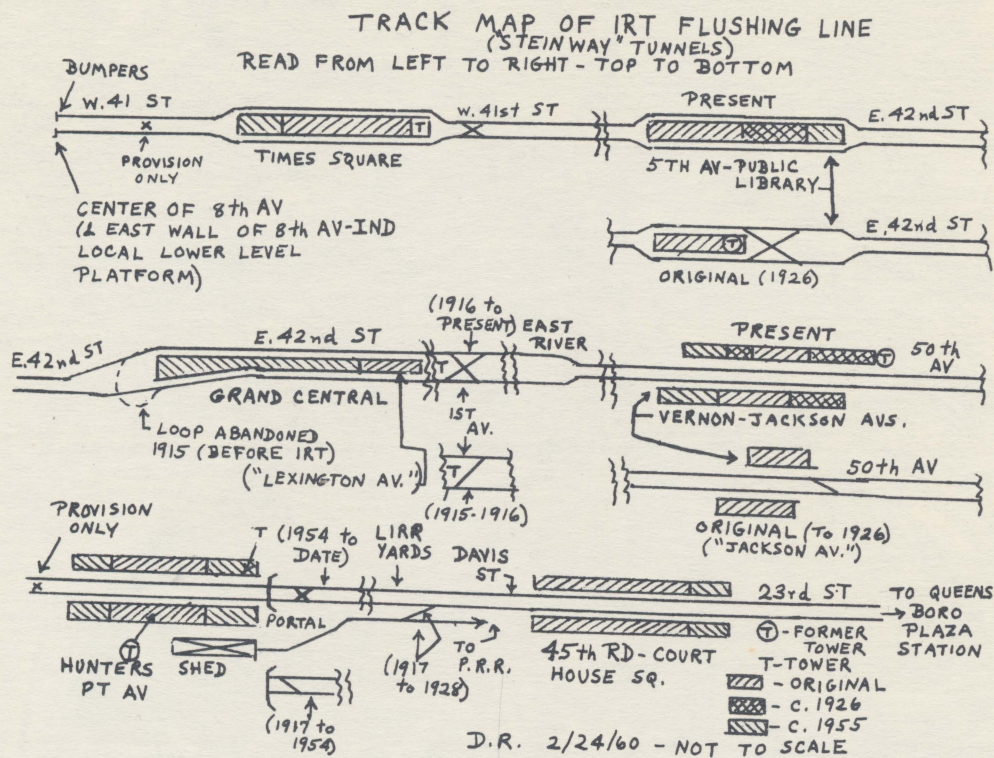
(Henry Raudenbush Photo)





In this photo, taken for ELECTRIC RAILROADS, author David Rogoff, Bill Chamberlain of the TA, and editor George Horn inspect old third rail bracket hanging from ceiling of former trolley car loop just west of Grand Central station. Blur in background doorway is Queens-bound train. Pipes on right are for drainage purposes and are of recent origin. (Roland Harvey photo)





temporary inspection shed was closed and the track into it was removed on April 6th, in favor of the new permanent type of installation at Corona on the line to Flushing, which was opened.

In 1942, when the 2nd Ave. elevated service was discontinued, the major overhauls for the cars were transferred to the Coney Island Shops of the BMT Division over whose tracks the IRT cars are still taken from this line.

With the building boom in northern Queens and its accompanying population increase, the Queensboro Line has been modernized in recent years to handle the additional traffic with newer cars and longer trains. In 1938, 50 new cars were placed in service on the line. Since they were bought to handle the increased crowds visiting the New York World's Fair in 1939, they have been known as the "World's Fair Cars". These cars were of a new design with distinctive roofs, relocated side doors and a permanent motorman's cab at one end of each car and, although they did not resemble the "Steinway" cars, they were able to couple to them for operation.

These cars were removed from the line starting in 1948 when a newer type of car was introduced known as the "R-12", followed by the "R-14" and "R-15". With improved circuits and controls it was possible to operate 11 car trains.

The only limitation to this was that the platforms were of insufficient length and so a platform lengthening contract was awarded to the Waldman Co. Times Square was extended 85 ft. west; Fifth-Ave.-Public Library, 86 ft. east; Vernon-Jackson Aves., 150 ft. west, with 56 ft. being abandoned on the east end on the Manhattan-bound side, and Hunter's Point Ave., 55 ft. west and 30 ft. east, including a rebuilding of the portal. A diamond crossover replaced the existing trailing point crossover at the same time with all work being finished in 1955.

From June 13th, 1942, when the Second Avenue elevated line discontinued service over the Queensboro Bridge until May 12th, 1955, when the Third Avenue elevated line ended service in Manhattan, free transfers were issued at Grand Central to the 3rd Avenue "e1".

The tunnel chaining for measurement purposes in 1907, was just west of Park Ave. in the loop. In 1914, this "0+00" mark was changed to "100+00". In 1927, as the tunnel was extended to Times Square, the chaining was again changed to make the "100+00" mark read "30+00", and is the current chaining. "0+00" today is approximately at east building line of Seventh Ave. under W. 41st St. Chain marks and signals west of this point in the Times Square station have extra letter "A" as a prefix.

With modern type signaling installed, stations illuminated by fluorescent lighting, new escalators at Grand Central and modern train dispatching using Centralized Traffic Control ("CTC") for the movement of trains of the latest rapid transit design, the Steinway Tunnels Line of the Queensboro Subway are among the most up-to-date facilities of the New York City Transit System. One overhead third-rail bracket from the trolley car days still remains to public view, however. It can be seen at the centre of Vernon-Jackson Avenue on the ceiling on the Queens-bound side.

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Booklets on the histories of the Hudson & Manhattan RR. and the New York & Queens County Railway and its predecessor companies are available from the Association.

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