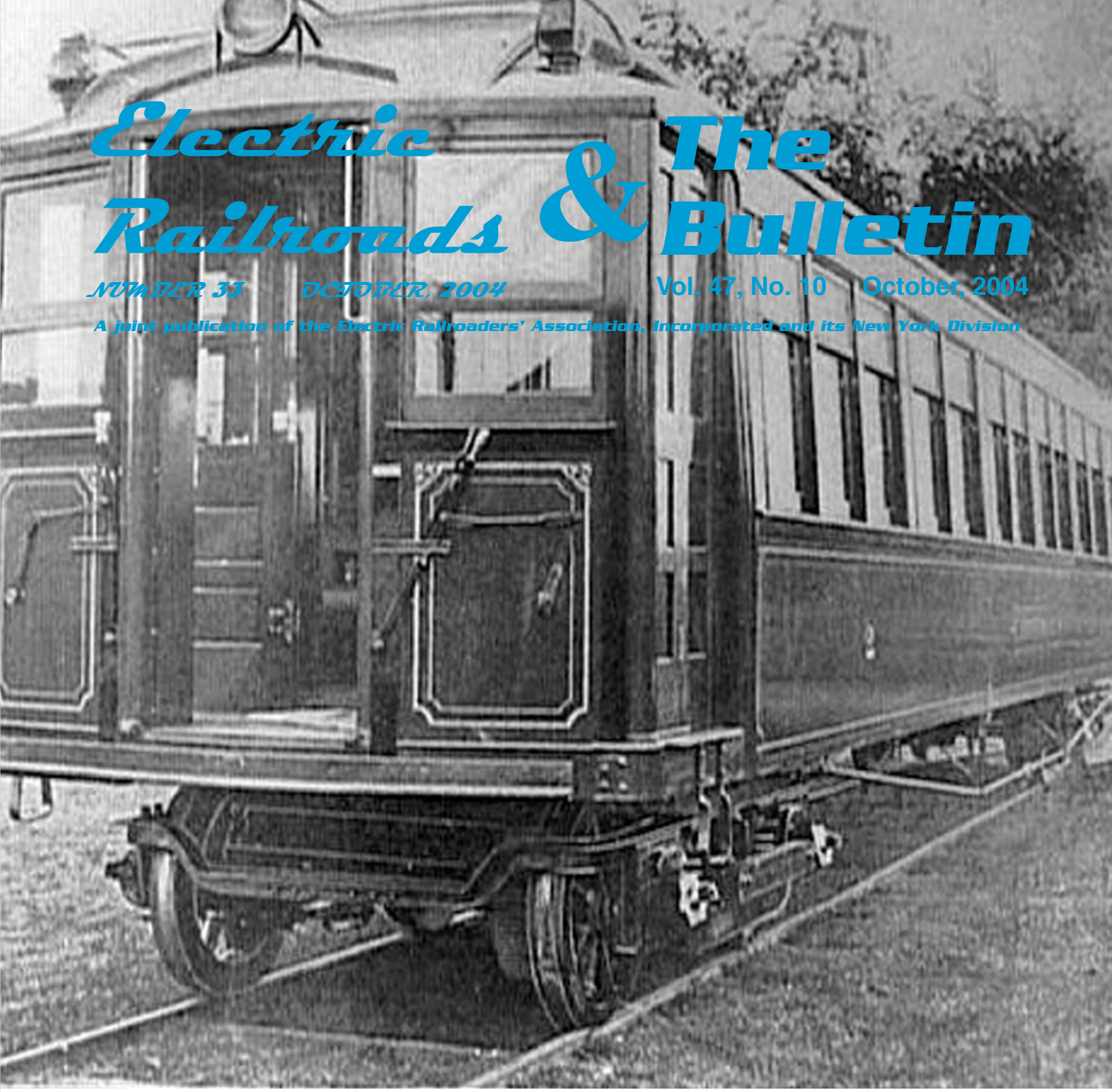

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NEW YORK CITY'S SUBWAY TURNS 100!

Introduction

by Raymond R Berger

The continuous operation of any railroad for one hundred years is deserving of recognition. However, the start of an underground electric rapid transit service in the urban environment of the City of New York deserves even further acclaim because of its impact on the citizens at the time and for every day ever since.

While the concept of an underground rapid transit line was not new when the first passengers arrived on the platforms, the magnitude, scope of operation and potential for growth for both the city and the system was. Boston, Budapest and London already had two-track lines in service, but the Interborough Rapid Transit Company's First Subway employed a four-track line for much of its route. This can be attributed to the topography of Manhattan, a long, narrow island, only twelve avenues wide through much of it, but running many miles in length from the Battery at the southern tip to Inwood at the north. Since growth was somewhat restricted by the borders of the Hudson, East, and Harlem Rivers, it forced congestion and overcrowding within much of the metropolitan area.

Such was the setting when the four steam-powered elevated railroads were constructed in Manhattan and others in Brooklyn in the second half of the nineteenth century. It also was the consideration of planners at the turn of the twentieth century when it was decided to embark on the venture to construct the mainly underground line. Of course, we know that the First Subway was an immediate success and coupled with the increase in immigration to New York before and after World War I, demand was made for extensions to the line and the construction of new rapid transit routes.

Today, the New York subway system extends to almost every part of four of the five boroughs. Trains run from New York City's northern borders with Mount Vernon and Yonkers to Coney Island, Bay Ridge, Flatbush, and Canarsie in Brooklyn and well into Queens. Planning for new lines and extension of existing services continues to occur every year and we know that official plans exist that will result in improved transportation options for certain segments of the city. The foresightedness of these pioneers of New York's rapid transit network cannot be underestimated. We are beneficiaries of those efforts to this very day and will continue to be so into the future.

The Electric Railroaders' Association is an integral part of the history of electric railways in New York. Founded in 1934 in New York City, it was the intention of its founder, E.J. Quinby, to have local organizations throughout the United States, but to have the headquarters in the New York area. This was so information, history, advocacy, and other studies would emanate from New York.

In fact, when the use of street railways and other forms of electrically-propelled railroads declined in the second half of the twentieth century, the remnants of these groups formed separate independent organization to preserve local equipment and history. Nonetheless, the ERA still maintains its domain throughout the United States and is still the premier organization for the study, support and interest in the electric railway industry. Its Sprague Library is still one of the greatest sources of information about electric trains in the world.

Many members of this organization are employed in the transportation industry today. Some started as young, eager enthusiasts and developed into transit executives. While others were already in the industry and owe their enthusiasm and expertise to the ERA These men and women range from clerical, to operating and maintenance personnel, to engineers, to planners, designers, and executives, to those who completed many years of service and are now retired.

Since no member or reader of this publication was alive on October 27, 1904 when the subway started, we all have had electric underground rapid transit service throughout our lives in New York. We hope its continued fine, time-honored, efficient means of transportation will continue to serve every person in New York indefinitely.

Our sources for Bernard Linder's articles are as follows:

Historic American Engineering Record, which was published in 1979 to commemorate the IRT's Diamond Jubilee. This book is in the public domain. The five chapters were written by the following historians:
Wallace B. Katz, *The New York Rapid Transit Decision of 1900: Economy, Society, Politics*
Clifton Hood, *The Impact of the IRT on New York City*
Charles Scott, *Design and Construction of the IRT: Civil Engineering*
Barbara Kimmelman, *Design and Construction of the IRT: Electrical Engineering*
David J. Framberger, *Architectural Designs for New York's First Subway*

Other sources for Bernard Linder's articles are Public Service Commission reports, previous issues of the New York Division-ERA ***Bulletin***, and his own observations.

Front cover: **Car No. 2, the John B. McDonald.** Bernard Linder collection
Rear cover: **R-142As at the recently rehabilitated Brooklyn Bridge station.** Andrew Grahl photograph

New York's First Subway Opened 100 Years Ago

An Exciting Day

by Bernard Linder

New Yorkers were looking forward to October 27, 1904, the opening date of the new subway. It was the biggest event that took place in New York for several years, and it was accompanied by appropriate ceremonies. The Board of Aldermen met in the Aldermanic Chamber at 1 PM. The Mayor was the presiding officer and Chief Engineer William Parsons made a brief speech. The officials then proceeded to the City Hall station, and whistles blew at 2 PM while crowds gathered around every station. At 2:35½ PM, the Mayor started the first train with a silver key. Its consist was 3371-2118-3369-2083-3359. Fifteen thousand holders of passes were allowed to ride until 6 PM, but regular riders were not admitted until 7 PM. Sixty persons attended a dinner to honor August Belmont at Sherry's. At the end of the evening, he was presented with a silver loving cup as a token of his fellow Directors' appreciation for his courageous efforts in bringing both the subway and the IRT Company to fruition. The rest of the night was described by newspapers as a carnival night in New York.

Test Train

Before trains carried passengers, equipment was tested and crews were trained in non-revenue service. Because influential people were anxious to see the new subway, guests were transported on hand-operated flatcars, a picture of which was published in many periodicals. On February 6, 1904, these cars operated from City Hall to 145th Street and Broadway, then back to 125th Street, where the guests attended a luncheon at the Claremont Hotel.

The Mayor and officials inspected the new subway on July 19, 1904. The train made the first stop at 23rd Street, was turned north of 145th Street and Broadway, and returned to 96th Street, after which it proceeded to 125th Street and Lenox Avenue, where the passengers were discharged. The temperature was only 70 degrees in the subway because there were no trains in service.

On August 17, 1904, the first electric train, whose consist was 3306-2045-3223, operated from 96th Street to Brooklyn Bridge and then returned to 96th Street. (3000-series cars were motors and 2000-series cars were trailers.)

When the composites were delivered, they were placed in service on the Second Avenue "L" because the structure was the strongest. They were transferred to the subway on September 1, 1904.

Power was on intermittently a few times before it was turned on permanently on September 1, 1904. Test trains started operating in the subway. The number of test trains was increased from 9 to 12 on September 18, 1904.

A special train with 150 reporters departed from City Hall at 2:30 PM October 3, 1904. This train

And in the beginning...

Bernard Linder collection

was turned at 145th Street and Broadway, after which it proceeded to 96th Street, 145th Street and Lenox Avenue, and then returned to City Hall. The special must have run non-stop from City Hall to 96th Street; the running time was 10 minutes 45 seconds, five minutes less than the scheduled November 23, 1904 express running time.

Effective October 10, 1904, light trains started operating on a 6-minute headway between 137th Street-Broadway and City Hall. Trains stopped at each station and the Conductors opened and closed the doors.

Starting October 21, 1904, light trains operated on the same schedule as the passenger trains would operate a week later.

Nineteenth Century Transit

In 1890, there were nearly one and a half million people living in Manhattan, and nearly 90,000 had moved into the Annexed District north of the Harlem River, the present-day Bronx. But Manhattan's transit system was unable to accommodate the rapidly increasing population. The elevated lines provided the city with temporary relief. Within ten years of the completion of the elevated network, service was inadequate because they created more traffic than they could satisfactorily handle. Trains were so crowded that there was no room for another passenger. Trains could never accomplish the feat predicted in a nineteenth century slogan, "From the Battery to Harlem in 15 minutes." Trains were slow because they were driven by steam engines with poor acceleration. Running time was 23 minutes from the Battery to 23rd Street and Sixth Avenue, and 45 minutes from South Ferry to 129th Street and Third Avenue. After making two to four stops per mile, speeds averaged 12 miles per hour. Street cars running in congested streets were slow. Many lines were loaded close to capacity; they operated on a 15-second headway. On Broadway, there was almost a continuous procession of cars between Bowling Green and 23rd Street. Moving at a snail's pace, they delayed traffic. Pedestrians had difficulty crossing the street.

Planning and Financing the Subway

It was quite obvious that Manhattan needed more rapid transit. When additional elevated lines were proposed, people objected because the structures obstructed and darkened the streets. The smoke and cinders from the steam locomotives dirtied the streets. Most people concluded that the subway was the only satisfactory way to furnish adequate rapid transit. But they were unable to solve the problem of financing the projected subway.

In the latter part of the nineteenth century, numerous corporations were incorporated under the general railroad law. They had planned to build a subway, but never constructed one. Because of the failed attempts to build a subway earlier under special charter or later under the general railroad law, the city secured passage of the Rapid Transit Act of 1891. The subway was built in accordance with this act, which was amended but did not provide for municipal ownership. It specified that a Board of five Rapid Transit Railroad Commissioners could adopt routes and general plans for a railroad. If it was unable to obtain consents of abutting property owners, it could seek approval from the Supreme Court. After adopting these plans, it could sell at public sale the right to build and operate the road to a corporation. The Board of Rapid Transit Railroad Commissioners invited bids in 1891 but could not find a responsible bidder.

Because it was obvious that private corporations were not interested in building a subway, the New York Chamber of Commerce suggested municipal ownership. To determine whether the people wanted municipal ownership, the question was submitted to a popular vote. At the fall election of 1894, there were 132,647 votes in favor of and 42,916 against municipal ownership.

In 1891, the Rapid Transit Commission selected a route, a line on Broadway from the Battery to the city line. It was the most profitable route. The heavy downtown traffic would have balanced the anticipated losses until the Upper West Side was built up. But the Broadway property owners opposed this plan because it might have damaged their properties.

In 1894, the State Legislature created a new Rapid Transit Commission. This eight-man commission included the Mayor, Comptroller, president of the Chamber of Commerce, and five men to be appointed. The new commission sent its Chief Engineer, William Barclay Parsons, to Europe, where he studied their rapid transit systems. After returning to New York, he presented his December, 1894 report in which he stated that the route under Broadway might exceed the stipulated cost of $50 million by at least $15 million. Instead, he recommended a route under Elm Street (the present-day Lafayette Street), which was then being improved. Parsons did not favor the Broadway route because he anticipated objections from property owners. At that time, Broadway was the only thoroughfare in the lower part of the city. It was lined with expensive buildings and traffic was very heavy at all times. Building a subway on a crowded street would have interfered with business. The Board agreed with Parsons' preference for Elm

The kiosk at the Astor Place station. Typical of Contract I IRT station entrances and exits, this is actually a reproduction from the 1980s.

Street because the Broadway route was expensive and inconvenient.

In May, 1896, the Appellate Division of the Supreme Court rejected the report of its own commissioners because they were unwilling and unable to give the court an exact figure regarding the cost of the proposed subway. The justices argued that the subway's cost would exceed and exhaust the city's debt limit of ten percent on the assessed value of the property, and that the projected routes failed to meet the needs of the city since they did not extend to the northern limits on either the east or west sides. The commission was so disappointed that it considered resignation. But it decided to carry on after it received letters of support from labor unions, reformers, and leading businessmen.

Because the Broadway route was too expensive, the commission took Parsons' advice and selected the route of the present-day subway. Starting at City Hall, the proposed route followed Elm Street (present-day Lafayette Street), Fourth Avenue, E. and W. 42nd Street, Broadway, and Boulevard (present-day Broadway) to Kingsbridge. An east side branch would be built from the Boulevard and W. 103rd Street via Lenox Avenue and the Harlem River to Bronx Park. The estimated cost was $30 to $35 million. Because the Elm Street property owners refused to give their consent, the case was taken to the Appellate Division of the Supreme Court, which approved the route in December, 1897. The Court attempted to interfere with the commission's work by requiring the contractor to post a bond greater than $1 million. It fixed a $15 million bond, which discouraged contractors from bidding. When it became apparent that the subway would not be built, public meetings were held demanding a municipally-owned subway. After this bond requirement was reduced to $5 million at the end of 1899, city officials believed that they could find a contractor who was willing to perform the work. On November 15, 1899, a form of contract was adopted and an invitation was issued by the Board to contractors to bid for the construction and operation of the railroad. On January 15, 1900, the date for receiving bids, two bidders appeared. John B. McDonald (1844-1911) had a good reputation. He built the Baltimore Belt Railway and Hoosac Tunnels, the extension of the Delaware, Lackawanna & Western Railroad from Binghamton to Buffalo, the Potomac Valley Railroad, and the Jerome Park Reservoir. The other bidder, Andrew Onderdonk, built the Canadian Pacific Railway in British Columbia, the railroad tunnel under Lake Michigan in Chicago, and a ship canal in New York City. Both men were hard-working construction men who could be trusted to build the road well, but could not run it. McDonald bid $35 million on construction plus $1.5 million for real estate and terminals. He offered the city the required minimum rental. Onderdonk bid $40 million and the minimum rental plus a percentage of all returns above $5 million per year. Instead of gambling on returns from operation, the conservative commissioners accepted McDonald, who was the lowest bidder.

Contract Two's Wall Street station on the Lexington Avenue Line. One of the first stations rehabilitated under the MTA Capital Program in the early 1980s, it has been proposed for a second round of rehabilitation work in the 2005-2009 program.

A plaque at the Brooklyn Bridge station commemorated the Rapid Transit Subway Construction Company.

Contract One

Contract One, or the First Subway, was officially the Manhattan-Bronx Railroad. The contract provided for construction of a 21-mile subway and viaduct system from City Hall to W. 225th Street, with a branch to Harlem and the Bronx. The city's cost of construction was McDonald's $35 million bid plus $1.5 million for real estate and terminals. The proceeds of municipal bond sales were to reimburse the contractor, who was to equip and operate the line at his own expense. McDonald agreed

to pay the city an annual rental equal to the interest on the bonds plus one percent of the construction cost for the sinking fund to amortize the bonds. The term of the contract was 50 years plus an option to renew for an additional 25 years. A $5 million construction bond, a $1 million permanent performance bond, and a deposit of $1 million in cash or securities to cover damages protected the city. The contractor was liable for damage to properties abutting the excavations. Construction was to be completed in 4½ years barring strikes, injunctions, or interference by city authorities.

The contract specified that McDonald must build and also operate the road. But he was at a disadvantage. He had experience in building railroads, but none in operating them. Unfortunately, the security companies that had agreed to supply his bond changed their minds at the last moment. McDonald was unable to get financing until August Belmont (1853-1924), a prominent banker and agent for the Austrian branch of the Rothschild banking house, was brought into the picture. Belmont organized the Rapid Transit Subway Construction Company, which, together with McDonald, built the First Subway.

Rapid Transit Subway Construction Company

Belmont had no difficulty selling the stock of the new company, whose capitalization was $56 million. He was the president and executive head of the new company and McDonald was retained as an employee. August Belmont selected the best engineers and operating experts, supervised the letting of subcontracts, and completed the financial arrangements for carrying on the work. The plan was approved by the Board of Rapid Transit Railroad Commissioners and Contract One was signed on February 21, 1900. This contract included rolling stock, all machinery and mechanisms for generating electricity for motive power, signaling, and lighting, and the power house, substations, and the real estate upon which they were to be erected.

There were appropriate ceremonies when Mayor Van Wyck broke ground for the new subway on March 24, 1900.

Interborough Rapid Transit Company

Included in the contract award to McDonald was the operating lease of the subway. In 1902, Belmont organized the Interborough Rapid Transit Company for the operation of the subway, which McDonald assigned to Belmont for his share in financing the construction. Belmont, however, found it almost impossible to obtain an operating charter from the New York State Legislature, which was then controlled by street and elevated railway interests. Belmont was not easily stopped. He found a small independent street railway in the Bronx with a valid operating charter, the City Island Railroad. He bought the line and had his charter.

He became the president and acting executive head of the new company, with an initial capitalization of $25 million, divided into 250,000 shares. It was increased to $35 million (350,000 shares) in August, 1902.

Contract Two

When the original subway was planned, there was not enough money available to extend it south of City Hall. With $8 million available in January, 1901, the Board planned an extension to Atlantic Avenue in Brooklyn. Belmont was the low bidder for Contract Two, which was awarded on September 11, 1902. Construction proceeded rapidly; trains started running to South Ferry on July 10, 1905 and to Atlantic Avenue on May 1, 1908. Contract Two cost $26.5 million, more than three times the original estimate.

Belmont decided to eliminate competition of the Manhattan Elevated Railway's elevated lines by leasing them. The lease was signed on January 1, 1903 and took effect on April 1 of the same year. The dividend of the Manhattan's shareholders was guaranteed at not less than six percent annually on the capital stock of $48 million in January, 1906 and seven percent yearly thereafter. The IRT also agreed to pay the interest on the Manhattan's bonded debt of $39.545 million with the Manhattan responsible for the principal as previously.

Belmont, who was able to unify rapid transit in Manhattan, had railroad experience before he took control of the IRT. Belmont's father founded the Louisville & Nashville Railroad. After his father died in 1890, Belmont managed the railroad. In 1896, he joined a syndicate that took control of the Long Island Rail Road. Shortly afterward, he took control of the Brooklyn & Brighton Beach and Kings County Elevated Railroads. When they were merged into the Brooklyn Rapid Transit system, he was rewarded with a huge profit and a seat on the BRT's Board of Directors.

Belmont's greatest accomplishment was the financing of New York's first subway and organizing the operating company, the Interborough Rapid Transit Company.

Parsons Supervises Subway Construction

William Barclay Parsons, the Chief Engineer of the Board of Rapid Transit Railroad Commissioners, planned and supervised the construction of New York's first subway.

He graduated from Columbia College in 1879, and received a degree in Civil Engineering from the Columbia School of Mines in 1882. After graduation, he was hired by the Erie Railroad, where he was assigned to the division engineer's office at Port Jervis, New York. He was transferred to Rochester and supervised the reconstruction of the Erie's Rochester Division. His brother-in-law, civil engineer S.A. Reed, advised him to return to New York City and become a consulting engineer. In New York, he was on the engineering staff of two companies, the New York District Company and the City Railway Company, which was not able to build any subway tunnels. After leaving New York in 1886, he became the Chief Engineer for the Fort Worth & Rio Grande Railroad. A year later, he became the Chief Engineer and General Manager of the Denver Railroad & Land and Coal Company. After completing work on the above projects, Parsons returned to New York in 1891, where he was appointed assistant to the Chief Engineer of the New York City Board of Rapid Transit Railroad Commissioners. He was soon dismissed because private companies did not bid on the proposed franchise. He was appointed Chief Engineer of the same board after voters approved municipal operation in 1894. He revised the 1891 plans and

proposed a four-track electrically-powered subway close to the street surface. Parsons was unhappy that construction could not proceed because of negative legal decisions. He spent 1898 and 1899 surveying rail lines in China and returned to New York as soon as the construction contracts were approved. He supervised the design and construction of the new subway and resigned when construction was completed. In 1905, he founded a consulting engineering firm, whose first big project was the construction of the Steinway Tunnel. During the next nine years, he was the Chief Engineer of the Cape Cod Canal, after which he became a military engineer in World War I.

Parsons died on May 9, 1932.

Gibbs Designs the Cars

The original IRT steel subway cars were nicknamed "Gibbs cars" because George Gibbs designed them. After he graduated from Stevens Institute in Hoboken, New Jersey in 1882, he started to work in Thomas Edison's Menlo Park laboratory. He was also involved in the early operation of Edison's central power house on Pearl Street in Manhattan. In 1895, he was in charge of the Chicago, Milwaukee & St. Paul Railroad's testing department, where he designed and patented steam heating and electric lighting systems for railroad cars and improved signal systems. When George Westinghouse heard about Gibbs, he hired Gibbs as his representative in Europe. Gibbs was in charge of the electrification of the Mersey Tunnel in Liverpool, England and was a consultant to the Paris Metro. Returning to New York, he supervised construction of rolling stock, tracks, and signals. He invented the trip mechanism that stops trains passing red signals and a latch mechanism for the sliding doors of the subway cars. His design for all-steel railroad cars was soon adopted by the Long Island and Pennsylvania Railroads.

A few days before the First Subway's October 27, 1904 opening, a group of officials posed for this photograph. General Manager Frank Hedley is in front, third from the left.

Contract I Construction

by David Rogoff

Just-delivered composite cars at the incomplete 147th Street Shop, 1903.


Bernard Linder collection


Bernard Linder collection

The design and engineering of the "First Subway" was by and under the jurisdiction of the New York City Rapid Transit Railroad Commissioners (or "Board"). The subway structure belonged (and still belongs) to the City of New York, and only the operation of it was leased to the Interborough. Rolling stock also belonged to the Interborough.

Contract Drawings for the "First Subway" were completed and published by the Rapid Transit Railroad Commissioners in 1898. Essentially, they were the work of the third great figure in the history of the subway construction, William Barclay Parsons (1859-1932), then 39 years old. Parsons was the Board's chief engineer and designer. He was quite close to Belmont, as he had been chief engineer of Belmont's New York District Railroad in 1885.

The engineering and design of the "First Subway" was divided into five sections, or "divisions," each in charge of a Division Engineer under Parsons. Construction, however, was divided into 15 sections, which were each sub-contracted by the contractor, the Rapid Transit Construction Company. The contractor's staff included:

Chief Engineer - S.L.F. Deyo
Car Designer - George Gibbs
Electrical Director - L.B. Stillwell
General Manager - E.P. Bryan
Mechanical Engineer - J. Van Vleck

Station design was by consulting engineers Heins and La Farge. All stations had two outside platforms and were used by both express and local trains except where noted below. All station platforms were originally to have been 200 feet long (five "old type" IRT car lengths). However, before construction all express platforms below the 96th Street station and all platforms from 96th Street north were lengthened to 350 feet (eight old IRT car lengths). Between 1909 and 1911, express platforms were again lengthened, this time to ten old IRT car lengths and local platforms were lengthened to six old IRT car lengths. Since World War II, all active Contract I stations have been lengthened to ten "R" type IRT car lengths, except the 145th Street station.

In 1905 and 1906, an extensive investigation was made in reference to complaints of poor ventilation, by Dr. George A. Soper of Columbia University. A lengthy report was issued on February 1, 1906. As a result, additional ventilation shafts were added throughout the length of Contract I construction, and later structures were built with dividing or separating

This history was written by the late David Rogoff, who wrote similar construction histories for the ***Bulletin*** until he passed away in 1969. This manuscript, which was published in the July, 1985 ***Bulletin***, was sent to us by George Horn, ERA's former Vice-President and editor of ***Electric Railroads***.

walls between tracks for better air circulation. The Brooklyn Bridge station even had a primitive air conditioning system installed on August 29, 1906 (using artesian well water). This air conditioning system has long been abandoned, but an air tempering system using chilled water entered service at the Grand Central station of the Lexington Avenue Line in the summer of 2000.

The cut and fill sections of the subway were shallow, with the top of the subway usually 30 inches below the street surface to allow space for the conduit street railway yokes then in use. The dimensions for each trackway were 12 feet 4 inches above the top of the rail and 12 feet 6 inches from the center of columns to the face of the sidewall. Duct benches were not used in Contract I construction. A four-track section was 50 feet wide. Construction of cut-and-fill sections consisted of concrete floors ("inverts") and steel roof beams and columns ("bents") usually five feet apart. Small concrete "jack" arches were used between the bents on the walls and the roof. There was also some concrete construction in shallow cut-and-fill sections and some concrete arch construction in deep cut-and-fill sections. In addition, there was considerable rock tunneling using either circular or three center-arched roofs and underwater trench tunneling under the Harlem River. The elevated portions of the subway were of the open floor, steel girder type, which was cheaper than the solid floor type used in Philadelphia and elsewhere. Elevated structures were used in lightly settled areas to reduce costs. The more expensive subway construction was used in congested areas to avoid traffic interference. See notes on the various sections below. The design of the "First Subway" was based on an assumed motor car weight of 50 tons and a car length of 46 feet.

The maximum grade was 3% at the Harlem River Tunnels and 2.2% at the Bronx East Side Division portal. The maximum grade under Broadway was, however, not over 1.5%. The maximum curves were 147 feet at City Hall station and 180 feet at E. 42nd Street and Park Avenue.

The running rail was originally to have been 80-pound rail fastened to continuous wooden supports, the latter resting on concrete composing the floor. This type of roadbed was actually tested for one quarter-mile on the Long Island Rail Road near Jamaica, but it was not as successful as 100-pound rail and ballasted track with wooden cross ties, which was approved on September 25, 1902. Pedestrian underpasses were built as part of the original structure at the Astor Place, Times Square, and 72nd Street stations. Pedestrian bridges were built as part of the original structure at the Brooklyn Bridge, 14th Street, Grand Central, 103rd Street, 116th Street (Columbia University), 168th Street, 181st Street, 191st Street, and 149th Street-Grand Concourse (then known as 149th Street-Mott Avenue) stations. Other underpasses were added later at the 28th Street and 66th Street stations.

Where space permitted, express stations of the four-track sections were built with two island and two outside platforms. This permitted maximum separation of express and local passengers. Stations so built were Brooklyn Bridge, 14th Street, and 96th Street. Space was not adequate at either the 72nd Street or Grand Central stations. Local stations were spaced about one quarter mile apart while express stations were about 1½ miles apart.

According to George S. Rice, the Deputy Chief Engineer under Parsons, the engineers used no upset figure in calculating the capacity of the line, or rather did not plan a road to carry any estimated number of passengers, but planned to give it as great a carrying capacity as the limitations of the line would permit. A statement often made, that the line was designed to carry only 400,000 a day, is without backing. It was soon planned, however, to run expresses at longer intervals and with more cars per train than the locals, hence the difference between local and express platform lengths of the actual constructed stations.

The Rapid Transit Construction Company built a 90,000 horsepower power house at W. 58th and W. 59th Streets, between 11th and 12th Avenues, and eight substations scattered throughout the "First Subway" area. The contact rail (third rail) selected was that of Wilkes-Barre and Hazelton Railway, constructed only a few years earlier. It used cover boards over the third rail as a safety feature. This required, in turn, a different location for the contact rail than that used on earlier New York City elevated railways and a different type contact shoe.

Originally, all subway stations sold fare tickets at a railroad agent's booth. These tickets were dropped into a hopper on the platform entrance. This ticket system, much like a movie theatre, was replaced by nickel- (then token- and now *MetroCard*-) operated turnstiles. The first turnstile was placed in service on May 10, 1920. Double level elevators were installed at the 168th Street, 181st Street, 191st Street, and 149th Street-Mott Avenue (now 149th Street-Grand Concourse) stations. Each of these stations' elevators had two levels. One station platform loaded on the lower elevator level, and the other station platform loaded on the upper elevator level, via a bridge across the tracks. The double level elevators, unique in the subway, have since been replaced by common single level types. The elevators now load only from the upper or bridge platform. The lower platform elevator entrances and exits have been sealed.

"Inclined elevators" (actually escalators) were installed at the Manhattan Street (now 125th Street) and 177th Street (now E. Tremont Avenue) stations.

Stations on the elevated or "viaduct" sections usually had two outside platforms which had separate controls. Intervale Avenue-163rd Street and the terminal stations were exceptions.

The construction of Contracts I and II is very similar. They can be differentiated from others by the absence of duct benches in subway sections and by the presence of rounded columns in local stations (and some express stations) and by rectangular station tile trim and fancy roofs. Contracts I and II used ballasted track and small center upright columns with special bulb angles. Some round columns have since been covered by square column falsework.

Cut-and-fill construction was all done in open cut, without any attempt being

made to maintain street traffic. When Contract II construction was in progress, the cut-and-fill construction was covered over by planking so that traffic and business was as unaffected as possible.

The total length of the "First Subway", as completed, was 21.19 miles (Contract I) and 3.35 miles (Contract II).

The route was divided and built as follows:

Section 1 - Ann Street north to the center of Chambers Street. A four-track subway under Park Row with a one-track loop under the park in front of City Hall. Construction was cut-and-fill using steel beams and concrete jack arches. Stations built were City Hall (terminal), one outside platform, and Brooklyn Bridge (express), two island platforms and two outside platforms. This section was 0.5 miles long.

City Hall station entrance kiosk, taken just after the station was abandoned at the end of 1945.

The Contract Drawings showed the loop as a two-track, two-level affair passing around the old Post Office (now the south end of City Hall Park), via the front of City Hall, Broadway, and Park Row. The loop station was to have been on Broadway, approximately where the City Hall station of the BMT is now. This was a complicated and expensive layout which was changed before construction to provide a one-level loop with one track for local trains between City Hall and the old Post Office. Two tail tracks were provided for the switching of express trains. There were also two layup tracks immediately west of the tail tracks. All tail and layup track stubs ended separately north of Ann Street. The subway structure narrowed to a two-track structure and ended near Ann Street, but tracks were not installed to the end of the structure.

The City Hall station was built centered near the front of City Hall and was the most ornate station of the subway. The station loop was on a 147-foot radius. The loop track connected to the south end of the southbound local track at the Brooklyn Bridge station at one end, and to the south end of the northbound local track of the Brooklyn Bridge station, after passing under the two layup and two express tail tracks. The City Hall station was designed to take on passengers only; passengers were to exit at the Brooklyn Bridge station.

The sub-contractor was the Degnon-McLean Contracting Company. Work was begun officially in front of City Hall on March 24, 1900 but actual construction began on March 24, 1901. The City Hall station was abandoned on December 31, 1945, although the loop remained and is still in service. This section was underpinned at Beekman Street by the IRT "Park Place-Beekman Street" subway.

Section 2 - Center of Chambers Street north to the center of Great Jones Street. A four-track subway under Lafayette Street (then Elm Street). This street had been cut through, but was not paved or opened until 1902. Construction was by cut-and-fill using steel bents and concrete jack arches. Stations built were Worth Street (local), Canal Street (local), Spring Street (local), and Bleecker Street (local). A 600-foot center track or siding was added to the Spring Street station after construction began. It was connected to the express track at each end and had third rail. It was removed in 1906 or earlier. This section was 1.13 miles long. The sub-contractor was Degnon-McLean. Work began July 10, 1900. There were some construction delays due to poor ground conditions, part of the route being on the site of the old filled-in Collect Pond near Pearl Street. The Worth Street station was abandoned on September 1, 1962 after the Brooklyn Bridge station was lengthened and renamed "Brooklyn Bridge-Worth Street" (now “Brooklyn Bridge-City Hall”).

This section has since been underpinned by the BMT Broadway Subway at Canal Street and by the IND Houston Street Subway at E. Houston Street. Canal Street is the lowest point on Contract I, exclusive of the Harlem River Tunnels and their approaches. It is below water line.

Section 3 - Center of Great Jones Street north to the center of E. 33rd Street plus 100 feet. A four-track subway under Lafayette Street (then Elm Place), Fourth Avenue, Park Avenue South (then Fourth Avenue), and Park Avenue (then also Fourth Avenue). Construction was by cut-and-fill using steel bents and jack arches. Stations built were Astor Place (local), 14th Street (express with two island and two outside platforms), 18th Street (local), 23rd Street (local), 28th Street (local), and 33rd Street (local). This section was 1.50 miles long. 14th Street had two layup tracks, one south of the station on the northbound side and one north of the station on the southbound side.

The Worth Street station’s northbound platform, as seen on October 30, 1960.

The 18th Street station was closed on November 8, 1948.

The sub-contractor was the Holbrook, Cabot & Daly Contracting Company. Work began on July 12, 1900.

This section was later underpinned by the BMT 14th Street-Canarsie Subway on E. 14th Street, and was later underpassed by the Pennsylvania Railroad Company's tunnels on E. 32nd and E. 33rd Streets which passed underneath with a clearance of about 36 feet.

The Astor Place station was built in large part under what had been private property at the west side of the place, and considerable property had to be torn down for its construction. This demolition resulted in the present large and odd shape of Astor Place.

Section 4 - The "Murray Hill Tunnels" - Center of E. 33rd Street, plus 100 feet north to the center of E. 41st Street. A four-track subway under Park Avenue. This section consisted of two parallel two-track tunnels constructed by rock tunneling, except for a few feet south of E. 34th Street, where the two tunnels join into a single four-track subway built by cut-and-fill using steel bents and concrete jack arches. No stations were built in this section. This section is 0.38 miles long.

Two separate two-track tunnels were chosen for this section in order to avoid underpinning or destroying the much older street railway tunnel also known as the "Murray Hill Tunnel." This latter tunnel had been originally built as an open cut for the New York & Harlem Railroad Company in 1837. It was converted to a tunnel in 1850. On June 11, 1896, it was leased to the Metropolitan Street Railway for 999 years. The street railway tunnel was centered on Park Avenue. The subway tunnels were also to have been centered on Park Avenue and to have been separated by 17 feet of rock. However, before construction, the easternmost tunnel was relocated 21 feet eastward (see Park Avenue Deviation).

The sub-contractor was Major Ira A. Shaler. Work began on August 12, 1900. This section was plagued with accidents (again see Park Avenue Deviations). Major Shaler was killed by rock falling from the tunnel roof on June 17, 1902 and the section was completed by his estate.

The two separate two-track tunnels were joined by a cross drift between E. 37th and E. 38th Streets for drainage, and by a cross passage between E. 38th and E. 39th Streets for a signal tower.

On August 1, 1918, this section was disconnected from the adjoining Section 5 and connected to the newly built IRT Lexington Avenue Subway. A single-track connection into Section 5 was retained for service moves into the southernmost track of the 42nd Street Shuttle (the original southbound local track). This new section required considerable rebuilding (see 42nd Street Shuttle and Contract III Construction).

Section 5A - Center of E. 41st Street west and north to the center of W. 47th Street. A four-track subway under private property, E. and W. 42nd Street, private property, Seventh Avenue, and Broadway. Stations built were Grand Central (express station with two island platforms only) (centered on Vanderbilt Avenue and E. 42nd Street), and Times Square (local) (centered at the intersection of W. 42nd Street and Seventh Avenue). This section was 0.82 miles long.

This section undercuts the former Airlines Building (then the 21-floor Hotel Belmont) at the southwest corner of E. 42nd Street and Park Avenue, the Longacre Building (1472 Broadway), at the northeast corner of W. 42nd Street and Broadway, and the 23-floor New York Times Tower (then the New York Times Building) between Broadway, Seventh Avenue, and W. 42nd Street. Both the Hotel Belmont and the New York Times Building were built at the same time as the subway. The press rooms of the New York Times were located under the floor of the subway and were 27 feet below the top of the rail. They were abandoned as such when the New York Times moved to a new building on W. 41st Street. The Longacre Building had been built earlier.

Section 5A is currently undercut by the IRT Flushing Subway from Grand Central Terminal to Fifth Avenue, by the IND Sixth Avenue Subway at the Avenue of the Americas, and by the BMT Broadway Subway at Broadway and W. 42nd Street and at Broadway near W. 45th Street. The downtown local track of the BMT Broadway Subway is under the uptown local track of the "First Subway."

The sub-contractor was Degnon-McLean. Work began on February 25, 1901. Work was delayed by a series of unsuccessful negotiations with the New York Central Railroad (see Park Avenue Deviation).

On August I, 1918, this section was broken at the point where the section begins to turn into Seventh Avenue from W. 42nd Street. The four tracks north of W. 42nd Street were connected instead into the newly constructed IRT Seventh Avenue Subway. A single track connection into Section 5A was retained for service moves into the northernmost track of the 42nd Street Shuttle (the original northbound local track). (See 42nd Street Shuttle).

The route of the "First Subway" was changed to the present "H" type operation on August 1, 1918 (see Contract III Construction). That part of Section 5A on E. and W. 42nd Street was isolated for operational use and became the present 42nd Street Shuttle of the IRT between Times Square and Grand Central Terminal. The original shuttle plan had been to connect the Queensborough Subway (see ***Electric Railroads*** Issue #29) to the two southernmost tracks of Section 5A under E. and W. 42nd Street, and to use the two northernmost tracks for the actual shuttle. Both the Times Square and Grand Central stations of the "First Subway" were to have been abandoned and replaced with new two track shuttle stations. Track connections were also to have been maintained, in an altered layout between the shuttle and the present IRT Lexington Avenue Subway for non-rush hour trains between Times Square and Brooklyn.

A new shuttle terminal at Grand Central was actually built east of the original station, but the tracks were never installed. Instead, the track pits were boarded over and the terminal became the present passageway between the original station and the IRT Lexington Avenue Subway mezzanine. The boards were removed and the track pits filled in, and the new passageway was placed in service on March 18, 1946.

A diamond crossover was to have been built west of the new shuttle terminal between the two north tracks (northbound local and express tracks).

The south platform of the 42nd Street Shuttle's Grand Central station, looking west, March 1, 1955.

The north platform of the Grand Central station of the 42nd Street Shuttle, looking east, the same day.

Again on March 1, 1955, the south platform of the 42nd Street Shuttle's Grand Central station, this time looking east.

two tracks of the shuttle are connected by crossovers at the west end of the original station, which is still in use, at the Grand Central station. Trains are brought in and out of these two tracks via a single-track connection left intact from the original "First Subway," between the south track (former southbound local) of the shuttle and the southbound local track of the present Lexington Avenue Subway under Park Avenue.

The former southbound express track of Section 5A under E. and W. 42nd Street was abandoned and torn up in 1975. The original Times Square station of the "First Subway" was converted to a terminal station by boarding over the former southbound express track pit and building a wooden bridge across the track bed of all four tracks. The temporary wooden planking is still in use, although innumerable plans have been suggested to rebuild or replace the shuttle with moving belts, etc. The Grand Central station of the "First Subway" is used today as a terminal station with the former southbound express track pit boarded over and used as a platform. The former northbound local and express tracks end at bumpers at the end of the station.

This crossover would have replaced a single crossover leading from the then northbound local to the northbound express track of the "First Subway" which had been removed in order to build the new and unused terminal. However the new crossover was never built, and the northbound local track was left isolated from the other three tracks of the shuttle. To this day trains are still brought in and out of the north track via a makeshift track connection at Times Square between the shuttle and the present IRT West Side Subway. This requires the removal of a temporary station platform. The other

Park Avenue Deviation- The original construction contract called for a track connection from the subway into the various railroads at Grand Central Depot (now the site of Grand Central Terminal). This would have enabled the subway to operate through service into various suburban areas north of the city over trackage owned by the New York Central & Hudson River, New York & Harlem, and New York & New Haven Railroads. The plans for the actual construction were, however, not included in the Contract Drawings, but were left for future development in conjunction with the railroads concerned.

Accordingly, discussions were held in 1900 with the New York Central & Hudson River Railroad, owner of the Grand Central Depot. The railroad agreed to the connection only if it were not made on railroad property. Railroad officials explained that they had plans to develop a future lower level at the Depot for suburban traffic, using electricity or compressed air as motive power. The city and the subway people, however, believed that to so locate the connection would be prohibitory in cost and would not provide adequate service.

Meanwhile as negotiations progressed, Parsons designed Section 4 to allow for a connection into Grand Central Depot, as he knew it. The Contract Drawings placed the 2 two-track subway tunnels centered under Park Avenue (then Fourth Avenue), only 17 feet apart, which was insufficient to make an adequate three- or four-track connection into the station without crossing each other at grade. To remedy this, he moved the easternmost tunnel further east until it almost abutted the east building line of Park Avenue. The westernmost tunnel was left as shown on the Contract Drawings. Moving the easternmost tunnel put about 21 feet of

rock between the subway tunnels, adequate for a tight clearance three-track depressed connection to be built between the tunnels. A fourth track was to connect into the present northbound local main line track at grade. After the three tracks had arrived between the two subway tunnels, the westernmost track was to pass under or over the two southbound main line tracks to connect into the present southbound main line local track.

The easternmost subway tunnel was relocated before construction and without publicity or notice to the adjoining property owners. Pending completion of negotiations with the New York Central & Hudson River Railroad, he made no other changes to Section Four except relocation of the easternmost subway tunnel. Nobody would have noticed any changes in the plans except that on January 27, 1902 there was a dynamite explosion in a contractor's shanty on the street surface at the east side of E. 41st Street and Park Avenue. Five people were killed and there was considerable damage to adjoining property on the east side of Park Avenue. There were also rock slides inside the tunnels on March 20 and 21 at E. 37th and E. 38th Streets and Park Avenue. The property owners investigated, found the tunnels were not being built as per original Contract Drawings, and sued for damages because of what they called the "Park Avenue Deviation." They claimed that had the tunnel been dug as originally planned, away from the east building line, their property would not have been affected, and that they were not notified of any changes.

Parsons defended the changes in the plans under a broad interpretation of the original contract. The case dragged for years before being settled. Even after the settlement, the tunnel was not relocated, as it had been long completed. In the meantime the negotiations with the railroad had stalled, and they never were resumed. The space between the two two-track subway tunnels was, however, used finally for a two-track connection into the IRT Lexington Avenue Subway on August 1, 1918. The other two tracks of this latter connection were made by other means. Another result of the relocation of the easternmost tunnel was to introduce a slight shifting of the two northbound tracks eastward, just north of the 33rd Street station.

Section 5B - Center of W. 47th Street north to the center of W. 60th Street. A four-track subway under Broadway. Construction was by cut-and-fill using steel bents and concrete jack arches. Stations built were 50th Street (local) and 59th Street (Columbus Circle) (local). This section was 0.69 miles long. This section has since been underpinned at Eighth Avenue by the IND Eighth Avenue Subway and at W. 53rd Street by the IND 53rd Street Subway. The sub-contractor was Naughton and Company. Work began on September 19, 1900. This section underpinned the Columbus statue at Columbus Circle and the Sixth Avenue "L" at W. 53rd Street.

Bernard Linder photograph

Another eastward look at the south platform of the 42nd Street Shuttle, taken on March 1, 1955.

Section 6A - Center of W. 60th Street north to the center of W. 82nd Street. A four-track subway under Broadway. Construction was by cut-and-fill using steel bents and concrete jack arches. Stations built were 66th Street (local), 72nd Street (express (two island platforms only), and 79th Street (local). This section was 1.20 miles long.

The sub-contractor was William Bradley. Work began on August 22, 1900. This section underpinned the Ninth Avenue "L" at W. 64th Street.

Section 6B - Center of W. 82nd Street north to the center of W. 104th Street A four- and six-track subway under Broadway on a single level from W. 82nd Street north to W. 101st Street, thence on two levels to W. 103rd Street, and one level to W. 104th Street. Halfway between W. 96th and W. 97th Streets the two center express tracks descend, spread into three tracks, and swing to the east, leaving Section 6B at the east building line of Broadway. The point at which the center tracks descend is the beginning of both the "West Side Branch" (outer or local tracks) and the "East Side Branch" (center or express tracks). The upper level, after the loss of the two center tracks, expands by switches to three track, halfway between W. 100th and W. 101st Streets and so continues to the end of the section at W. 104th Street. Construction was by cut-and-fill using steel bents and concrete jack arches. Stations built were 91st Street (local) (abandoned on February 2, 1959), 96th Street (express) (two island and two outside platforms)(outside platforms subsequently abandoned), and 103rd Street (local) (upper level only). This section was 1.07 miles long.

The "West Side Branch" was originally planned as a two-track line and construction was begun as such. However, it was soon decided to add a third track to the branch through the 137th Street station (see "West Side Branch Reconstruction" below). As a related part of this construction, a third track was added to both the upper and lower levels, immediately east of the two tracks originally planned for each level. As a result the 103rd Street station was not centered on the center line of Broadway. The third track of the

Grand Central looking east, April 23, 1910.

Grand Central looking west, May 7, 1910.

Grand Central looking northwest.

lower level was located immediately under the easternmost upper level track and ran underneath this track as far as the turnoff into Section Seven where it rejoined the original lower level northbound track. This lower level track was apparently connected to the main line northbound track at its north end only, although space was left for a switch at the south end. It was known as the "Lenox Stub" and apparently was used only for storage and layups. It was subsequently removed and its space is now used for storage. As originally built there was no crossover between express tracks north of the 96th Street station. The sub-contractor was William Bradley. Work began on August 22, 1900.

"96th Street Improvement" - A project related to the building of Section 6B. Section 6B was built with diamond crossovers north of the 96th Street station between the local and express tracks of each direction. As express and local trains were operated into both branches, these crossovers became a serious bottleneck, especially during rush hours. A "96th Street Improvement" was authorized in 1908 to eliminate the bottleneck by adding one track to the east and two tracks to the west of the subway between W. 96th Street and W. 102nd Street, together with necessary underpass (fly-under) tracks and switches. Contract Drawings were prepared and work was almost ready to begin when the project was dropped suddenly in 1909 in favor of better signaling north of the 96th Street station. "Better signaling" was not a

Grand Central looking east, May 7, 1910, with platform extensions under construction.

permanent cure, and by 1959 it was necessary to eliminate the use of the diamond crossovers altogether, by routing all local trains to the "West Side Branch" and all expresses to the "East Side Branch". A diamond crossover was added in April, 1958 between the two center tracks north of the 96th Street station.

East Side Branch - Section 7 - "Central Park Tunnel" - Beginning of rock tunnel at W. 103rd Street, east to the center of W. 110th Street. A single two-track tunnel under private property, W. 104th Street, and the northwest corner of Central Park. Construction was by rock tunneling except for a small section of cut-and-fill using steel bents and concrete jack arches near Lenox Avenue. No stations were built on this section, although a station at Eighth Avenue (now Central Park West) was authorized during construction but soon was dropped. This section was 0.87 miles long. It passed below the IRT Ninth Avenue "L" on Columbus Avenue. As the section was in deep tunnel no underpinning was necessary. The section, however, later underpinned the IND Eighth Avenue Subway at Eighth Avenue (now Central Park West).

The sub-contractor was Farrell and Hopper. Work began on October 2, 1900.

Section 8 - Center of W. 110th Street north to the center of W. 135th Street plus 100 feet. A two-track subway under Lenox Avenue in the Harlem district of Manhattan. Construction was by cut-and-fill using steel bents and concrete jack arches. Stations built were 110th Street (single island platform), 116th Street, 125th Street, and 135th Street. This section was 1.28 miles long.

Lenox Avenue is a wide street, currently with two roadways separated with a small island. When Section 8 was being planned, what is now the east roadway was used by a two-track conduit street railway. The subway was therefore built under what is now the west roadway to avoid underpinning the conduit tracks. Contrary to rumor, the Lenox Avenue section was not built under one side of the street to allow for future four-tracking of the line. The 135th Street station has a third center layup track connected by trailing point switches to both main line tracks beyond the station limits.

The sub-contractor was Farrell and Hopper, but the major part of the section was let to John C. Rodgers. Work was begun on August 30, 1900.

Section 9A - A point north of the center of W. 135th Street north and east to the east building line of Gerard Street in The Bronx. A two-track subway under Lenox Avenue, private property (now the Col. Charles Young Playground), the Harlem River, and E. 149th Street. Construction was by rock tunneling, except under the river, where trench tunneling was used (for the first time in the United States), and a small cut-and-fill section using flat side roofs and walls reinforced by steel rods ("reinforced concrete") south of the Harlem River. Stations built were 145th Street (terminal with two outside platforms) (see Lenox Avenue Extension below). This section was 0.78 miles long.

The sub-contractor was McMullen and McBean. The work began on July 10, 1901 and construction was delayed by consideration of possible route change in the adjoining Bronx section. Instead, a new station called 148th Street-Lenox Terminal, located at W. 149th Street and Seventh Avenue was opened to the public on May 13, 1968, and 145th Street became just another through station. Trains operated light to 148th Street from May 5-13, 1968.

Construction on both the original part of Section 9A and the Lenox Avenue Extension was mainly by cut-and-fill using steel bents and concrete jack arches. There were, however, several small parts which were constructed by cut-and-fill but using concrete walls and roofs reinforced by imbedded steel rods (reinforced concrete). This was the first use of reinforced concrete construction on the subway. It was later used in parts of Section 9B, and to a much greater extent in the "Contract II Construction" of the IRT Subway.

Section 9B - East building line of Gerard Avenue, east to Brook Avenue, just beyond Third Avenue, where the steel viaduct elevated begins. A two-track subway under E. 149th Street, Third Avenue and Westchester Avenue. Construction was by cut-and-fill using concrete arch at the Gerard Avenue end, and by cut-and-fill using reinforced concrete at the other. Stations built were Mott Avenue (called "Mott Avenue-149th Street") and Third Avenue (called "Third Avenue-149th Street"). This section was 0.72 miles long.

The contract drawings called for a portal west of Third Avenue on Westchester Avenue, which would have blocked cross traffic on Bergen Avenue. However in 1902, after some work had begun, it was decided to reduce traffic interference by placing the portal and embankment leading to it on private property just south of the original site on a block bounded by Westchester Avenue, E. 149th Street, and Brook Avenue.

The Mott Avenue-149th Street station was to have been built by rock tunneling, but bad rock faults made it necessary to construct the station in an enormous cut, the largest on the whole subway, and to roof the station with a single concrete arch. The remainder of the section was in cut-and-fill, but was built with reinforced concrete.

Bernard Linder collection

The 96th Street-Broadway station. On the left is an agent's booth and on the right is a door that could be unlocked by the agent when an employee wanted to enter. This door was installed about 1936 to reduce fare evasion. It replaced chains that were opened by employees entering the station.

Construction was delayed by consideration of a possible route change in the Bronx.

Mott Avenue became the Grand Concourse Extension on March 13, 1934 and the station signs were accordingly altered to read "Grand Concourse-149th Street". A platform extension was originally planned at the east end of the Mott Avenue station to provide a pedestrian connection to a proposed adjoining New York Central station. Work was actually begun, but was never completed, as the New York Central station plan was dropped in the planning stage. The west end of the station was cut back somewhat during Dual Contract construction to allow for a track connection from the Lexington Avenue Subway. This section underpinned the Third Avenue Elevated Line at Third Avenue and the New York Central and Hudson River Railroad between Anthony Griffin Place and Park Avenue. The sub-contractor was John C. Rodgers. Work began on June 13, 1901.

The Mott Avenue station, now known as 149th Street-Grand Concourse, on June 7, 1917.

Section 10 - "East Side Viaduct" - West side of Brook Avenue east and north to the Bronx Park and E. 181st Street. A three-track steel elevated structure over Westchester Avenue, Southern Boulevard, and Boston Road. Stations built were Jackson Avenue, Prospect Avenue, Simpson Street, Freeman Street, E. 174th Street, E. 177th Street (now E. Tremont Avenue), and Bronx Park-180th Street (terminal) (single island platform). The Simpson Street station was originally planned as the Fox Street station.

The sub-contractor was Terry and Tench. The viaduct foundations were by E.P. Roberts. Work began on August 19, 1901. This section was 3.13 miles long. This section was originally to have been two-tracked, but it was changed to three tracks in 1902. At the west end, however, it was built with four tracks between the portal and Jackson Avenue. The inner two tracks connected to the Third Avenue "L" via Westchester Avenue at Brook Avenue into St. Ann's Avenue. This connection to the "L" was authorized in 1903 and enabled elevated trains to operate on the section before the adjoining Section 9B was completed. (See ***Electric Railroads*** Issue #25 - "New York's El Lines").

There was to have been an elaborate terminal at Bronx Park and E. 182nd Street. The Park objected violently to a station abutting a Park property and a temporary terminal was built at E. 181st Street instead. Finally a new and permanent station was built at E. 180th Street (single island platform) called "180th Street-Bronx Park" and was opened on October 28, 1910.

Another station, Intervale Avenue-163rd Street, was added to the line on April 30, 1910 after the opening of the "East Side Viaduct." Section 10 also included the large twelve-track West Farms elevated inspection and storage yard, built at the east side of the structure just north of the 177th Street station. The Bronx Park-180th Street station, together with most of the elevated structure between it and the 177th Street station, was torn down after abandonment on August 4, 1952, as was West Farms Yard.

The center track of the "East Side Viaduct" was built to provide non-rush hour storage and layups and rush hour express service to connect with both the New York, New Haven & Hartford Railroad and the New York, Westchester & Boston Railroad. The latter line was then in the planning stage and was not operated until 1912. A direct track connection to these suburban railroads was even envisioned for the future. On March 3, 1917 the "White Plains Line" was built and connected to the viaduct as part of "Contract III Construction". Express operation on the "East Side Viaduct" actually began on April 23, 1953.

A second connection from the Third Avenue "L" (the "Bergen Avenue Cutoff") was built by July 1, 1917. It connected into the upper level track of Section 10, east of Third Avenue and E. 149th Street at grade. Service was discontinued on November 5, 1946, and the structure was torn down in the summer of 1950. (See ***Electric Railroads*** Issue #25 – "New York's El Lines").

This section underpinned the "Bergen Avenue Cutoff" from the portal to Brook Avenue. Section 10 was underpinned by the New York Central and Hudson River Railroad's Spuyten Duyvil and Port Morris Division between Brook and St. Ann's Avenues on Westchester Avenue.

West Side Branch - Section 11 - Center of W. 104th Street north to the south side of La Salle Street (then W. 125th Street) plus 10 feet. A three-track subway under Broadway. Construction was by cut-and-fill using steel bents and concrete jack arches from W. 104th Street to W. 116th Street, and by cut-and-fill with a single concrete arch roof north to La Salle Street. Stations built were 110th Street (Cathedral Parkway) and 116th Street (Columbia University). This section was 1.07 miles long.

The sub-contractor was John Shields. Work began on June 18, 1900. This section was rebuilt as part of the "West Side Branch Reconstruction" (see below).

Section 12 - "Manhattan Valley

Viaduct" - South side of La Salle Street (then W. 125th Street) plus 10 feet north to the north side of W. 133rd Street. A three-track steel and masonry viaduct over Broadway. Station built was Manhattan Street (now 125th Street). This section was 0.41 miles long.

Broadway, at this area of the west side of Manhattan, is situated in the deep "Manhattan Valley." The lowest point is W. 125th Street (then called "Manhattan Street"), which crosses Broadway on a diagonal. A subway under Broadway at this area would have been possible, but would have meant steep grades and difficult construction. It was therefore decided, very early in planning, to cross the valley on a viaduct. The Contract Drawings showed this section as a series of plate girder spans on steel towers. It was found, however, that to build the crossing of W. 125th Street (then Manhattan Street) in such a manner would have meant an almost complete rerouting of the very complicated street railway layout at the intersection of the current W. 125th Street and Broadway. The crossing of the current W. 125th Street was, therefore, revised before construction, to substitute a two hinged arch steel viaduct. The span of the arch was 168 feet and the top of the rail was 52 feet above the street surface at the present W. 125th Street. The section north and south of the actual arch consisted of conventional steel plate girder construction on concrete or steel abutments.

The extreme ends of the section consisted of graded embankments leading to simple portals just south of W. 122nd Street and just south of W. 135th Street.

On April 24, 1921 the name of Manhattan Street was changed to W. 125th Street. The original W. 125th Street, in this section, was renamed La Salle Street. The station signs were repainted with each name change.

The sub-contractor was Terry and Tench. Foundations were by E.P. Roberts. Work began on June 1, 1901.

"Fort Lee Connection" - A proposed two-track steel elevated connection beginning at the portal at W. 122nd Street in Section 12, thence two tracks above Broadway north to the present W. 125th Street, thence one track turning west and crossing under the viaduct, thence both tracks going west on the present W. 125th Street to the Fort Lee Ferry on the Hudson River. The connection was to have been built with one track each along each side of the viaduct. Although extensive plans were completed and the route was authorized in 1903, it was never built.

Section 13 - North side of W. 133rd Street to the center of W. 182nd Street plus 100 feet. A three- and two-track subway under Broadway and St. Nicholas Avenue, passing through the middle of a five track underground storage ("terminal") yard between the 137th Street and 145th Street stations. Construction was by cut-and-fill using steel bents with concrete jack arches through the 145th Street station and by rock tunneling and short sections of cut-and-fill with concrete arches north to the end of the section. The cut-and-fill section has three tracks, the rock tunneling and arch section has two. Stations built were 137th Street-City College (terminal for some trains), 145th Street (local), 157th Street (local), 168th Street (local), and 181st Street (now 181st Street-George Washington Bridge Bus Terminal) (local). All these stations had two outside platforms, and 145th Street had a third or center track for layups. This section was 2.42 miles long.

The underground storage yard ("137th Street Yard") was to have been built with three tracks alongside each side of the two track main line tracks. However, when the section from the 103rd Street station to the 145th Street station was third-tracked, the yard track immediately east of the original northbound main line track became the present northbound main line track, leaving the yard with three tracks to the west, but only two tracks to the east of the present three main line tracks. (See "West Side Line Reconstruction" below.)

The sub-contractor was L.B. McCabe and Bros. Work began on May 14, 1900. McCabe defaulted on the contract and was replaced on December 1, 1901 by his superintendent, Rufus C. Hunt.

The rock tunnel from W. 158th Street to Dyckman Street at the north end of Section 14 is about 2.4 miles long and is the longest single tunnel in the subway system. This section later underpinned the IND "Eighth Avenue Subway" at the confluence of St. Nicholas Avenue and Broadway.

"West Side Reconstruction" - A replanning and rebuilding of parts or all of Sections 6B, 11, 12, and 13. Under the terms of the original contract, the contractor was to build an underground "terminal" (storage yard) in Section 11 at a location of his own choosing. The contractor, however, decided to build the yard between the 137th Street and 145th Street stations (see above) in Section 13. It was also decided to third-track the line from just south of the 103rd Street station through the 145th Street station to provide express service in rush hours and layup space in non-rush hours, and to simplify track access between the four-track section north of the 96th Street station and the yard. However, track construction was partially completed in Sections 11 and 13, and it was therefore necessary to add the third track on one side of the existing structure, without regard to centering the subway on the center line of Broadway. It was decided to put the third track on the east side of the subway, where it is today, as the present main line track. Adding the third track posed many difficulties. Section 11 was built as a single two-track subway with a concrete arch roof. In order to add a new track, it was necessary to blast out the roof and side walls and replace them with new walls and a larger arch, all without disturbing the two tracks already in place. This was quite an engineering feat. Section 12, the Manhattan Valley Viaduct, fortunately had not been constructed and its designs were revised to center the viaduct on the center line of Broadway. Section 13 and the small part of Section 6B affected were constructed in cut-and-fill with steel bents and concrete jack arches and reconstruction was relatively simple. However, as Sections 6B, 11, and 13 were not centered on the center line of Broadway, while Section 12 was, it was necessary to introduce a slight shift of all three tracks westward, just inside each portal.

Section 14 - "Fort Washington Tunnel" - Center of W. 182nd Street plus 100 feet north to Hillside Avenue. A two-

track subway under St. Nicholas Avenue and private property in the Washington Heights district of Manhattan. Construction was by rock tunneling. The two tracks were in a single arched roof tunnel. No stations were built in this section during the original construction, but 191st Street was added later and opened on January 14, 1911. This section was 0.81 miles long. 190th Street is the deepest point below the street surface of the entire New York City subway system, 181 feet.

The north end of this section was at a portal just south of the present Dyckman Street station. The original route of this section was to have been via a long curve to the west from St. Nicholas Avenue (then 11th Avenue) to Broadway (then Kingsbridge Road). This route was changed in 1901 to divert the route to the east to Nagle Avenue and 10th Avenue (then Amsterdam Avenue) to Broadway. The route change lengthened the Fort Washington Tunnel 500 feet northward, but shortened the adjoining Section 15 viaduct by 1,705 feet.

The sub-contractor was L.B. McCabe and Bros., who defaulted on this section as he did on Section 13. This section was finished by McCabe's superintendent, Rufus C. Hunt. Work began on March 27, 1901 (or March 14, 1900).

Section 15 - "West Side Viaduct" - Portal at Hillside Avenue in the Inwood district, north to W. 242nd Street plus 288 feet in the Bronx. A three track steel elevated structure or "viaduct" above Nagle Avenue, 10th Avenue, Broadway, in the Inwood section of Manhattan, the Harlem Ship Canal (commonly misnamed the "Harlem River") and Broadway, in the Riverdale section of the Bronx. Stations built were Dyckman Street (local), 207th Street (local), 215th Street (local), 225th Street (local) (then called Muscoota Street), 231st Street (local), 238th Street (local), and 242nd Street-Van Cortlandt Park (terminus) (one island and two outside platforms). This section as finally built was 2.6 miles long.

The original route of Section 15 was as above only to W. 230th Street (then Riverdale Avenue). Here the work went east on W. 230th Street and crossed the New York Central & Hudson River Railroad Company Spuyten Duyvil and Port Morris Branch (now MTA Metro-North Railroad's Hudson Line) and the NYC&HRRR's "New York and Putnam Railroad Branch" (formerly the New York Central's Putnam Division and dead-ended at the east building line of Bailey Avenue. The Bailey Avenue terminal was to have been a two-track, single island, elevated platform station with no provision for any track connection to either of the Kingsbridge stations of the two NYC&HRRR's lines below.

The 225th Street station was, and still is, on a part of Manhattan known as Marble Hill, although the hill is connected by land to the Bronx and not to Manhattan. Marble Hill, however, was originally part of Manhattan Island. At its north, it was separated by the Harlem River and Spuyten Duyvil Creek from the Bronx. In those days, the Harlem River did not reach the Hudson River, but instead met Spuyten Duyvil Creek, which in turn flowed to the Hudson River. At the extreme northern tip of Marble Hill (Manhattan), a small stream, Tibbet's Brook, fed into Spuyten Duyvil Creek from the north. Much of the Harlem River and practically all of the Spuyten Duyvil Creek was not then navigable. In 1895 the U.S. Corps of Engineers cut the Harlem Ship Canal through Manhattan Island, south of Marble Hill, connecting the Hudson River with a redug and rechanneled Harlem River, making a navigable waterway. The route of Spuyten Duyvil Creek north of Marble Hill was abandoned and later filled in. Most of Tibbet's Brook is now a sewer.

Section 15 was to have crossed the Harlem Ship Canal on the first Broadway Bridge (opened January 1, 1895). This single-level double draw bridge was to have been rebuilt with an upper level for the IRT, conduit street railway tracks with widened roadways, and revised north end abutments to permit a rerouting of the New York Central's Hudson River Division tracks alongside the Harlem Ship Canal and under the bridge. The Hudson Division had previously followed the north shore of the old abandoned parts of the Harlem River and Spuyten Duyvil Creek beds and had a station ("Kingsbridge") alongside the "Kingsbridge" station of the former Putnam Division. Rebuilding the bridge so completely proved to be too complicated, and the bridge had to be replaced with an entirely new bridge, also a double draw turntable bridge, but with two levels. The original or first Broadway Bridge, then only 11 years old, was lifted out of its moorings and floated down the Harlem River to W. 207th Street, all on one day, June 14, 1906. The second or "new" Broadway Bridge was floated into place and by June 16, 1906 one roadway was in operation. The first Broadway Bridge ("University Heights Bridge") was replaced in the 1990s (Bx12 bus service was rerouted via the 225th Street Bridge effective September 9, 1990 and returned to its regular routing via the 207th Street Bridge on June 23, 1996.) Trains operated over the upper level of the second Broadway Bridge to 225th Street on January 14, 1907.

The Dyckman Street station was built with a third track between the station and the "Fort George" portal. This third track, the "Fort George Siding," was on the west side of the two main line tracks and connected into the southbound track at its south end. The north end of the siding had a bumper just short of the southbound platform of the station. The siding was authorized at the same time as the third tracking of the West Side Viaduct. It was probably used for layups and storage, had third rail, and was removed in 1929. Part of its roadbed has since been covered by a platform extension of the southbound platform of the Dyckman Street station.

"Van Cortlandt Park Extension" - A change to the route of Section 15, built as extra work. It was a three-track steel elevated viaduct over Broadway from W. 230th Street north to W. 242nd Street plus 288 feet in the Kingsbridge and Riverdale districts of the Bronx. Stations built were 231st Street (local), 238th Street (local), and 242nd Street-Van Cortlandt Park (now also Manhattan College) (terminal) (one island platform and two outside platforms). Work began on December 1, 1906. This section was 1.0 miles long. Construction was standard steel, open floor, plate girder type.

The extension was originally planned as a separate "Route 14." It was, however, decided to abandon the

Looking north toward the University Heights-207th Street Bridge on July 16, 1951. This was the first Broadway Bridge before it was moved to 207th Street and replaced in 1906.

original 0.11-mile part of Section 15 planned above W. 230th Street and to substitute "Route 14" as extra work on Section 15. The change was prompted in part by the desire to give better access to the Bronx, which since the abandonment of part of the old Harlem River and Spuyten Duyvil beds, was now connected by land to Marble Hill, and was expected to grow fast. Also, with the abandonment of the New York Central's Hudson Division's old "Kingsbridge" station, and its replacement with a new station at Marble Hill adjoining the canal and West 225th Street, there no longer existed any traffic potential at a Bailey Avenue Terminal.

An elevated storage yard and inspection sheds ("240th Street Yard") with a total capacity of 185 cars was built on the west side of the structure at W. 240th Street, together with an extra or fourth track parallel and west of the three original tracks between W. 238th Street and W. 240th Street. Work began in November, 1909. The inspection shed opened May l, 1911. The "Van Cortlandt Park Extension" was designed with provision for an additional extension north to the city line, which was, however, never built. The 242nd Street-Van Cortlandt Park station was therefore built to be converted into a regular three-track station by removing the center platform, which was a temporary wooden structure.

This section crossed the Tibbet's Brook at W. 240th Street. The brook passed under Broadway in a four arch masonry culvert. As this culvert underpinned several elevated columns, considerable special construction was required. Tibbet's Brook at this point is now a sewer.

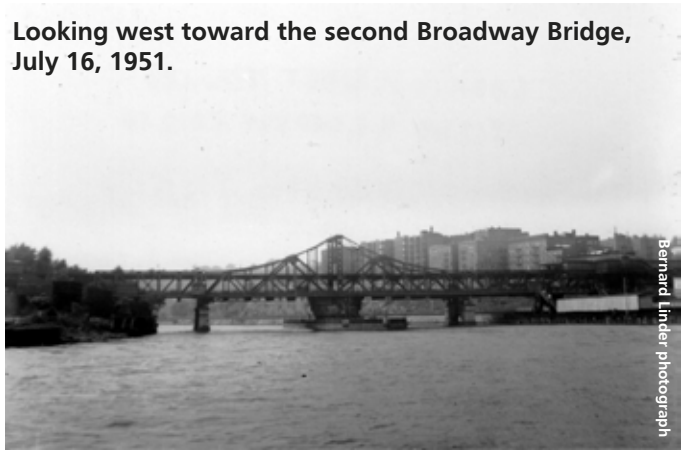
The delay in building the second Broadway Bridge delayed the construction of Section 15, and it was necessary to open it in sections as follows: 157th Street to 221st Street on March 12, 1906; 221st Street to 225th Street on January 14, 1907; 225th Street to 230th Street on January 27, 1907; 230th Street to 242nd Street on August l, 1908.

Initial operation between the 157th Street and 221st Street stations was by two shuttle trains between the stations at 12- and 16-minute intervals. The shuttle trains were abandoned on May 30, 1906, at which time the 168th Street station was opened and through service began.

When the line was extended to 225th Street at 12:01 AM January 14, 1907, the temporary 221st Street station was closed and dismantled. It was reassembled at 230th Street, where a temporary station, probably an island platform, was opened at 12:01 AM January 27, 1907. This station was removed after the line was extended to 242nd Street on August 1, 1908. Details of these temporary stations are lacking. The 207th Street station was finished in 1906 but was not opened until April 1, 1907, when the W. 207th Street (University Heights) Bridge was opened. The 191st Street station was also built after the beginning of regular operation and was finished on January 14, 1911.

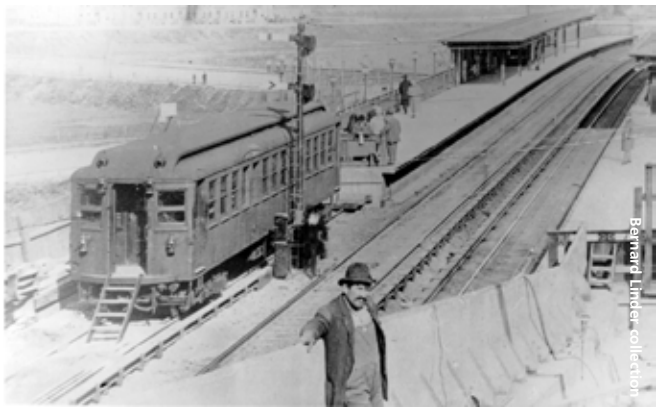
The second Broadway Bridge was damaged by fire on October 11, 1956 and was removed on December 24,

Looking west toward the second Broadway Bridge, July 16, 1951.



The second Broadway Bridge, looking east, April 25, 1959.

Looking south toward the second Broadway Bridge from the 225th Street station, April 25, 1959.



Pay car 3342 at the Dyckman Street station, looking north. For another view of this car, the first steel subway car in the United States, see page 34.

1960. It was replaced with a large single lift bridge (the third Broadway Bridge) on December 26, 1960.

Section 15 was underpinned at W. 207th Street by the yard lead tracks of the IND Eighth Avenue Subway going into the 207th Street Yard. (A flyover from the Broadway IRT to 207th Street Yard entered service November 8, 1987.)

...and the same scene, looking east.

Free transfers now exist on parts of Contract I Construction as follows:

1. Brooklyn Bridge station to Chambers Street station (BMT)
2. Canal Street station to Canal Street station (BMT)
3. Bleecker Street station to Broadway-Lafayette Street station (IND) (from the southbound side of Bleecker Street only). No transfer from northbound side
4. 14th Street station to 14th Street and Union Square stations (BMT)
5. Grand Central (original station) to Grand Central stations of both the Lexington Avenue and Queensborough Lines (IRT)
6. Times Square (original station) to Times Square and 42nd Street stations (IRT Seventh Avenue and Queensborough Lines and BMT Broadway Line)
7. 59th Street station to Columbus Circle station (IND)
8. 168th Street station to 168th Street station (IND)
9. 149th Street-Grand Concourse station to 149th Street-Grand Concourse station of the Jerome Avenue Line (IRT)

The following transfer points to the Third Avenue "L" have been discontinued:

1. 149th Street-Third Avenue station to 149th Street station of Third Avenue "L" (1905-1973)
2. Brooklyn Bridge station to City Hall station of Third Avenue "L" (IRT) (1950-1953)

The author wishes to thank the following for their assistance in compiling this and earlier IRT histories: George E. Horn, Henry Raudenbush, Herman Rinke, Vincent Seyfried, Martin Schachne, Robert Presbrey, Robert Olmsted, etc.

Looking north, toward the third Broadway Bridge under construction, October 11, 1961...

This manuscript was completed by David Rogoff on July 10, 1962 and was edited and updated in May, 1985 and again in March, 2004.

The Marble Hill station of what was then known as Penn-Central, looking west, with the 225th Street station above. Note the wooden low-level platforms. (April 4, 1969)

Signals and Tracks of the New IRT Subway

by Bernard Linder

Signals

The designers predicted that traffic would be very heavy and they planned a high-capacity subway where expresses could operate on a 2-minute headway and locals would operate on a 1-minute headway. This frequent service could not be operated without a block signal system and power-operated switches controlled from central points at all interlockings. A complete block signal system was installed on the express tracks between Brooklyn Bridge and 96th Street, both directions on the middle track between 96th Street and 137th Street for rush hour service, and the local tracks between 145th Street and Dyckman Street. Other local tracks were signalled only on curves or locations with poor visibility. Most local tracks were not signalled until the early 1930s and the last line, Lenox Avenue, did not receive signals until 1939. Color light signals were placed in the subway and semaphores were installed on the structures. The designers found that the best results could be obtained from the electro-pneumatic block and interlocking system where power could be transmitted in small pipes and utilized in compact apparatus in restricted spaces. An automatic train stop prevented collisions. Alongside the track rail at the entrance to each block was an automatic trip, controlled electro-pneumatically by the same mechanism used to operate the signals. The movement of the signal to "danger" triggered the valve circuits of the automatic trip, and moved it to an upright position. On the truck of each subway car a similar trip, connected with the mainline of the train's air brake system, extended downward towards the track. If the train passed the "danger" signal, the upright track-level trip hitting the trip on the truck opened the main air pipe and set the brakes. There was another safety measure: To move the train, the Motorman had to apply pressure on the "dead-man's button." If he eased the pressure, the train would stop. These safety and traffic control installations had been standard equipment on steam railroads for several years.

The original schedule provided for northbound trains alternating between Broadway and Lenox Avenue while alternate southbound trains switched to local or express tracks north of 96th Street. The trains that were delayed at this double crossover slowed operations on the entire line. In 1908, Parsons wrote, "this junction is found in practice to be the limiting condition of the whole railway." After time signals were placed in service on April 23, 1909, the track capacity at this junction was increased by one-third. Bion Arnold, a consulting engineer, recommended installing automatic speed control devices that allowed trains to enter the station block slowly rather than stop completely in the next block. On November 28, 1909, station time signals were in service on the express tracks at 96th Street, 72nd Street, Grand Central, 14th Street, and Brooklyn Bridge. These signals allowed the IRT to run two or three more trains per hour.

Contact Rails

Contact rails were made of special soft steel to secure high conductivity. Although it contained low percentages of carbon and manganese to increase rail conductivity, its resistance was eight times that of an equal section of copper. The contact rail weighed 75 pounds per yard. It rested on block insulators supported on malleable iron castings. To protect the employees, a wood plank 8½ inches wide and 1½ inches thick was supported in a horizontal position directly above the contact rail.

Track Rails

Track rails were 100-pound American Society of Civil Engineers cross-section fastened to selected hard pine crossties and resting on broken stone ballast. Tie plates were attached to all ties and all curves were protected with steel inside guard rails.

Success! Riding Increases Rapidly

by Bernard Linder

The opening of the IRT altered traffic patterns in New York. In the built-up sections of Manhattan, the street cars lost passengers to the faster subway and the elevated trains. The street cars, which were delayed by street congestion and frequent stops, averaged only 8 miles per hour. Elevated trains ran at an average speed of 14 miles per hour and subway locals were scheduled for 15 miles per hour. Subway expresses, averaging 25 miles per hour, were the fastest form of urban transportation in New York City.

The IRT express service was extremely popular. The planners thought that the locals would carry most of the passengers, but they were wrong. In 1908, Parsons complained that the large number of people transferring between locals and expresses delayed the trains. Expresses were crowded while locals contained empty seats. When the subway was opened, Brooklyn Bridge became the most crowded station because the bridge was the only direct connection across the East River.

Traffic was greater than anticipated. The planners believed that the maximum capacity was 400,000 daily riders. When the subway was opened, General Manager Hedley estimated that it could accommodate 600,000 passengers.

Service was gradually increased to transport the additional riders. The original platforms could accommodate eight-car expresses and five-car locals. In 1909, the Public Service Commission ordered the IRT to extend the platforms for ten-car express and six-car local operation. Southbound Broadway platforms north of 96th Street and Bronx platforms on the elevated structure were not extended. All rush hour locals were lengthened to six cars on October 27, 1910 and the first ten-car express was operated on January 23, 1911.

In 1907, the average rush hour headway was 2 minutes 4 seconds for expresses and 2 minutes 8 seconds for locals. Five years later, after 325 additional cars were placed in service, the average rush hour headway was 1 minute 48 seconds (33 trains per hour) for both services. With longer trains in service, they provided about 40 percent more seats per hour. But the trains were just as overcrowded, because riding increased rapidly from 300,000 daily passengers in December, 1904 to 800,000 in 1908 and 1.2 million six years later.

There were five motors and three trailers in each eight-car express. The consist of the five-car locals was three motors and two trailers.

At the present time, rush hour Lexington Avenue trains are probably just as overcrowded as they were when the subway was new. The stations, which are illuminated by fluorescent lights, are much brighter than the original stations were when they were opened, and they are being rehabilitated. With more than a thousand new cars assigned to the IRT, they should furnish reliable service for the foreseeable future.

HEADWAYS—WEEKDAYS

Schedule Date	Service	Midnight	Rush Hour	Midday	Evening
October 27, 1904	Local	5, 10	3	3	3
October 27, 1904	Express	—	4	5, 10	5, 6
November 23, 1904	Local	7½	2	2½	3
November 23, 1904	Express	—	2½	5	5
March 14, 1910	Express	—	1 min 48 sec	2½	3

We believe this is the interior of a composite car, but we do not have the date or the car number.

Bernard Linder collection

NOVEMBER 23, 1904 RUNNING TIME

	Local	Express
145th Street-Lenox Avenue	—	—
96th Street	12	12
72nd Street	17	15
Grand Central	25	20
14th Street	31	24
Brooklyn Bridge	N/A	28
City Hall	38	—

Rapid Transit Subway Cars of the Interborough Rapid Transit Company

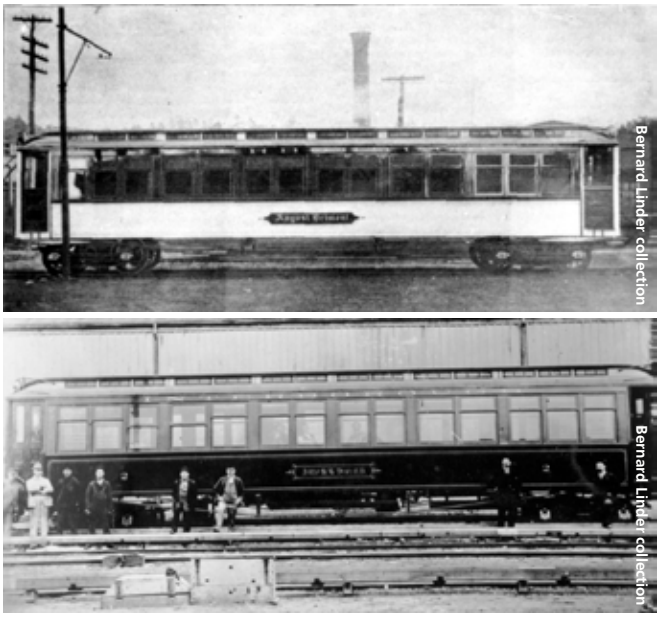
By Raymond R. Berger

A great deal of enthusiasm is generated by railfans, employees, citizens of the City of New York, and other interested parties about the opening of The Subway, the first underground rapid transit line in New York City, one hundred years ago. Much of this enthusiasm is centered on the construction of the line, the first four-track wide rapid transit service in the world. People marvel at the track, signals, stations, tunnels, and elevated structures — basically, the infrastructure itself. All these are quite worthy of consideration of what was necessary to accomplish those tasks and we rightly marvel at the foresightedness of the leaders of the time in allowing for the construction to be brought forward with such great magnitude, within a set time frame and within budget. The facts surrounding these things are discussed in other chapter of this special issue. However, let us now turn our attention to the chronology of events involving the design, construction, and operation of the rapid transit passenger rolling stock throughout the life of the Interborough Rapid Transit Company.

While design of the initial rapid transit equipment was at first very advanced, over a short period of time car design became very standardized. Toward the end of the operation of the IRT as a private enterprise, it was thought by some to be conservative, stagnant, and even backward when compared to other rail cars constructed at the same time periods.

There were reasons why this conservative approach was taken. Interchangeability with the current fleet, unwillingness of car designers to risk anything beyond what was tried and proven, a desire to save as much money as possible, labor costs, and requirements to build new cars to fit the current clearance envelope were all factors in making the selections that were made. However, the operation of the fleet was unbelievably precise and with little delay to service. Reroutes, breakdowns, and car failures were virtually unknown. Remember that the Public Service Commission kept a close watch on everyone's operation, including the IRT's. Car Maintenance and Transportation operations were extremely strict; everyone knew their job and performed at the highest levels possible.

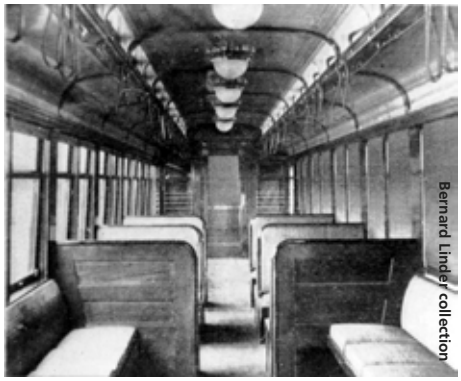
Today we look back at these events and we marvel at our predecessors and the decisions that were made at various points in the history of the IRT Company from the first plans in 1900 to municipal takeover at Unification, June 12, 1940. This work examines the various IRT subway cars that were constructed between those times. It tries to limit this history only to that equipment.

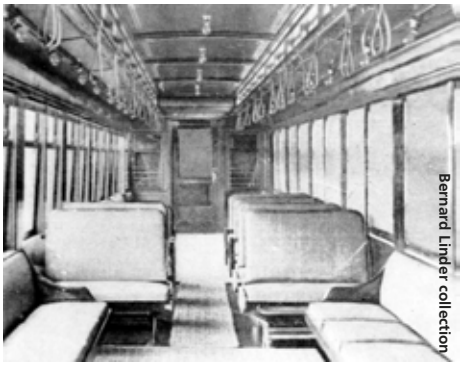


Cars Nos. 1 and 2—the *August Belmont* and the *John B. McDonald*.

Composite Cars; Experimental Pilot Cars, Motor Cars, Trailer Cars

Once it was decided to construct The Subway, the Interborough Rapid Transit Company's engineers worked in earnest to plan a vehicle that was equally worthy as the physical undertaking of an underground rapid transit railroad. The car design engineers





Interior of the *August Belmont* (left) and the *John B. McDonald*.

wanted to have as standard, a steel electrically-propelled passenger car. Dimensions of the car were based on the idea that the railroad would be built underneath or above existing streets as much as possible. Therefore, the outside dimensions were based on the ability to negotiate ninety-degree turns with a radius as tight as possible. This would minimize the requirement to purchase property where such turns required tunnel construction there.

When various car builders were approached to build the cars the IRT engineers designed, they refused to agree to a contract. There were two reasons for this. First, construction of steel-bodied passenger cars was only in the experimental stage. The carbuilders were wary of difficulties not only in the construction of the car, but also once they were delivered, they did not know whether the cars would fail after a period of time in service. Second, they feared failure of the trackway, stress failure of the steel members and frames of the cars themselves, and failure of the on-board propulsion and braking systems. There was no proof that the cars would not be real trouble.

All this resulted in a request by the carbuilders for additional time, but construction of the line by the City was progressing at a rapid pace. The IRT wanted to have cars available for service as quickly as possible, certainly in time for opening day. Still, the car design engineers finished their work in the spring of 1902, and at that time the only steel passenger cars were the experimental steam coaches built by the Pennsylvania Railroad at its Juniata Main Shops near Altoona. With about 2½ years before opening, the IRT could not afford to concede to any delay, so it reconsidered its plan for an all-steel subway car fleet.

This resulted in the design of another class of passenger car: The composites. These were 500 cars built to the Manhattan (Elevated) Railway clearance envelope of a wood car, but with enough metal and fireproofing to protect them in case of fire or accidents. In the first months of 1902, two sample cars were built. These were the "August Belmont," Car No. 1, and the "John B. McDonald," Car No. 2, which were built by Wason and which served as test vehicles for the remainder of the composite fleet that followed. The "August Belmont" had a light-colored exterior, while the "John B. McDonald" had a dark-colored one. Car No. 1 was soon renumbered 3340 and became the instruction car at 147th Street Main Shops, while Car No. 2 became 3341. First it was a pay car, but later it was placed in the regular passenger fleet.

During 1902, all the car manufacturers were very busy with orders and none was able to guarantee delivery of an order in time for the October, 1904 opening date. A solution was found: divide the order among four car builders.

The IRT Company felt it had ordered a fleet of cars that were stronger and safer than any other electric railway car running at that time. Of course, this was a major concern as they were the first heavy rapid transit operation underground in the world. While other cities such as Boston and Budapest did have subways, these were really street railway operations beneath the street. The IRT realized that it planned a step beyond that in that there was a potential of much greater traffic and in turn a greater risk of catastrophe because of the crowds. Speed and carrying capacity had to be matched with a vehicle that was faster, stronger, and safer than any other electric railway vehicle in service at that time.

Builder	Cars
Jewett	2000-2059, 3000-3039
Stephenson	3040-3139
St. Louis	2060-2119, 3140-3279
Wason	2120-2159, 3280-3339

The IRT car designers wanted a car as fireproof as possible. The steel underframe was reinforced with white oak timber and the side frames reinforced with steel. The floor was of double thickness compared to Manhattan Elevated cars and was made of maple with asbestos fire-felt between the two layers. One-quarter-

Interior of composite car 2084 — the Motorman's cab and front window have been rebuilt for elevated service.

Deck roof Hi-Vs on the Broadway Line at 125th Street.

The interior of flivver 4094.

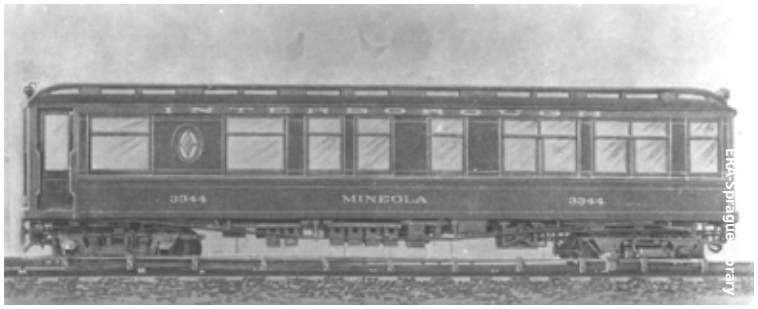
Steinway motor 4733 at 207th Street Yard.

Interior of a 4700-series Steinway car.

The interior of Lo-V 5239 in later years.

A southbound train of Lo-Vs approaches the 167th Street-Jerome Avenue station.

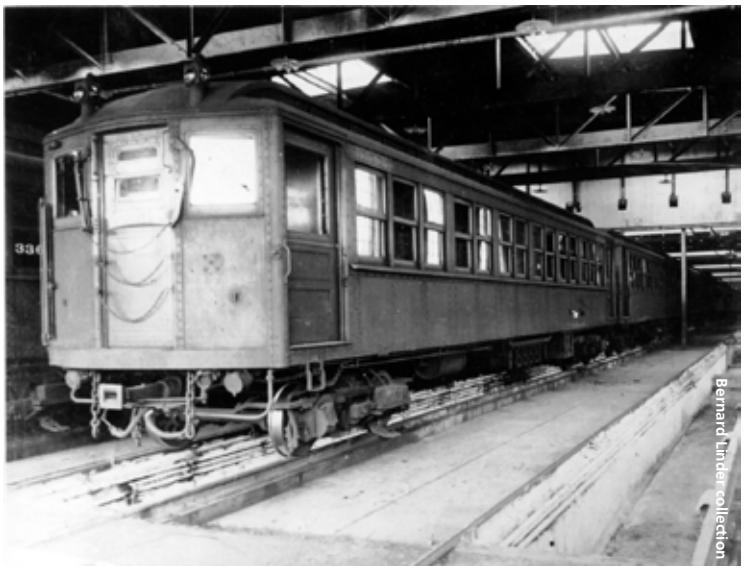
inch asbestos transite board covered the complete underside of the car. Also, above the motor truck, steel plates protected the underside of the floor framing and one-quarter inch thick fire-felt. A layer of asbestos was on the outside of all wires, which were carried in ducts also molded into asbestos. Switches, fuses, and high-voltage cables were located in an undercar steel compartment. The cars were nicknamed “coppersides” because the sides of the cars had copper sheathing, but some cars had this removed around World War I.



Car 3344—*The Mineola*.

completed in 1910, as shown in the table in the article entitled “Alterations to the Original Cars” in this issue, there were only 124 composite motors.

The composite cars featured "Manhattan"-type seating, i.e.; they had longitudinal seats except four seats across the aisle, two of which faced each other. The cross-seats were located in the center of the car. They were converted to all-longitudinal seating when the center doors were added in 1912. When the flivver class cars were built in 1916, some equipment on the composite cars was used on the flivvers. These cars originally had wooden lattice floors, similar to other Manhattan Division elevated cars.



A Gibbs car as built, before the center door was added.

By 1916, most composite cars were transferred to the Manhattan Division for use on the elevated lines. However, a few composites remained until the 1915 high voltage trailer cars and 1916 low voltage motor cars were delivered. The composite cars were used on shuttle trains on lightly used outer portions of branch lines in the Bronx, Manhattan, and Brooklyn.

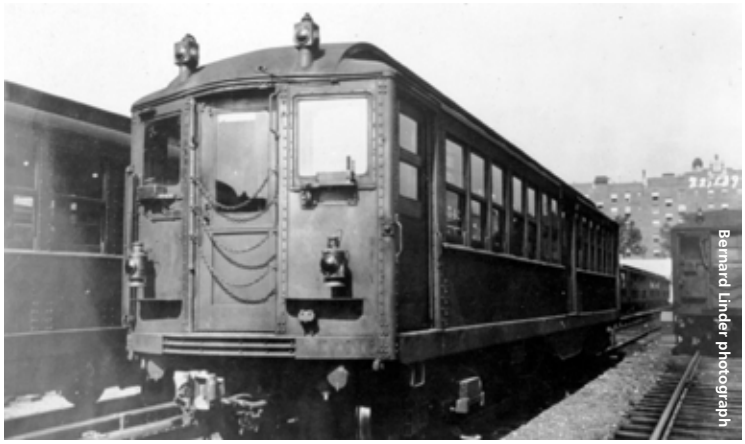
The 1904 Director's Car — *The Mineola* — Car 3344

Wason Car Company built "The Mineola," August Belmont's private car, in 1904. The car was built of wood to the IRT elevated system's clearance envelope, except for the height, which was the same as the standard composite cars. This allowed "The Mineola" to operate in the subway. It had Van Dorn couplers and elevated-type trucks but no multiple-unit connections. It featured a unique fourteen-point master controller. The ends of the car were glass-enclosed to give an excellent view of the tunnels and rights-of-way.

The car's exterior was finished in glossy maroon paint with gold leaf striping and lettering, while the interior trim was of natural mahogany. There was a completely equipped steward's gallery on board, as well as a lounge, lavatory, and office area with Mr. Belmont's famous roll top desk. The car was also equipped with broadloom carpeting.

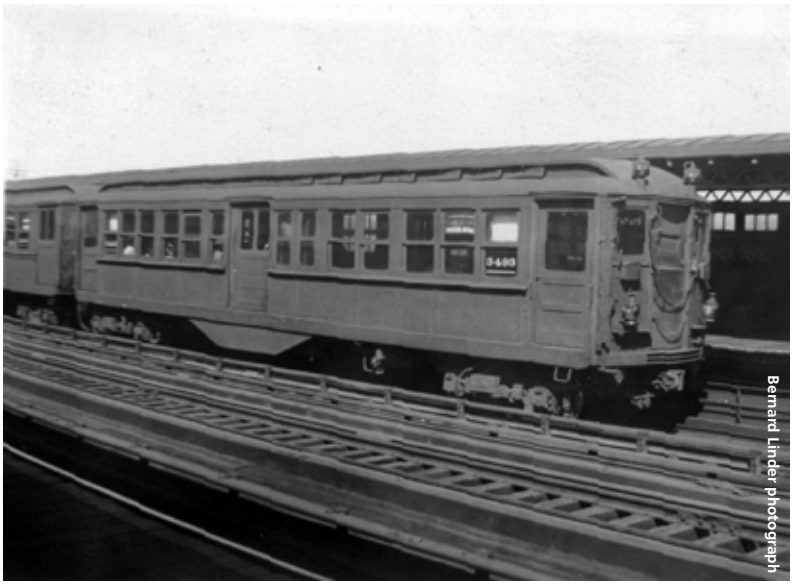
"The Mineola" had two General Electric Model 66 traction motors and was 45 feet long, 8 feet 9½ inches wide, and 12 feet high. Thus this car was within the clearance envelope of both the Subway and Manhattan (Elevated) Divisions.

At the time the four car orders were placed, it was anticipated that two-thirds of the fleet would be motor cars and one-third trailers. As a result, the motor cars were numbered 3000-3339 and the trailers numbered 2000-2159. Please remember that the usual practice was that the carbuilders would construct only the bodies and the trucks. The Car Equipment personnel at IRT Company shops installed underfloor equipment. The IRT's car engineers felt they needed a 3:1 motor-to-trailer ratio. But the 674 steel cars that were delivered between 1904 and 1910 altered the motor-trailer ratio because they were all motors. Therefore, 78 composite motors were equipped as trailers when they were received from the builders. When this conversion was



A Gibbs car after modification for Multiple Unit Door Control (MUDC) in 1936.

When The Subway opened in 1904, "the Mineola" was operated as a single car. As traffic increased, August Belmont became concerned about the possibility of a collision, especially after the delivery of the first steel subway cars. He eventually decided to couple a supply car at the rear of his train for protection. After it was sold for scrap in the late 1940s, the car survived several adventures and is now at the Shoreline Trolley Museum at East Haven, Connecticut. It is believed to be the only private subway car ever built.



Gibbs cars at the Pelham Line's Whitlock Avenue station on April 28, 1946.

First All-Steel Cars: The Gibbs Cars — The "Merry Widows"

While the IRT had compromised on the concept of running the system with an all-steel fleet, it did not give up on the idea that it wanted steel cars in The Subway. The order for 500 composite cars, spread among four carbuilders, alleviated the urgency of acquiring cars, but the car engineers persisted in designing the type of car they thought suitable for their needs.

The first all-steel car was built by the Pennsylvania Railroad in 1903 at its Altoona Shops under the guidance and design of its Chief Engineer, George Gibbs, and numbered 3342. Basically, this design was meant for the Pennsy's use in the Pennsylvania Railroad tunnels into Manhattan. The car had Manhattan-style seating and was tested on the Second Avenue Elevated Line in 1904. It was determined that the car was too heavy for use in The Subway and was converted into a pay car after the experiments; it lasted until 1956.

George Gibbs and the IRT engineers went back to the planning tables and developed what is known as the Gibbs car, a high voltage car without center doors and with manually operated end doors. The IRT placed an order for 300 of these all-steel cars to supplement the 500 composites. The American Car & Foundry Company built them in 1904-05 and they were numbered 3350-3649.

In 1912, the Gibbs cars were rebuilt with a pneumatically-operated center door, but retained the manual end doors in the earlier group. In 1936, cars 3514 and 3517-3649 were converted to MUDC. Thus, after then the cars with manual end doors ran at the ends of trains, while Gibbs cars with MUDC features could run in any position in the train. Remember that a Conductor was always positioned between the first and second cars in the train. Trains longer than seven cars had a Rear Guard (Trainman) between the last two cars in the consist.

Gibbs cars had exposed beamed ceilings. Originally, like the composite cars, they had four cross-seats on each side of the aisle, which were removed when the center doors were added in 1912. They also featured leather hand straps, Van Dorn couplers, wooden lattice floors, and no anti-climbers. Unfortunately, all Gibbs cars were scrapped except one, with the delivery of the R-17 cars to the Lexington Avenue Local-Pelham Bay Park Line in 1955-1956.

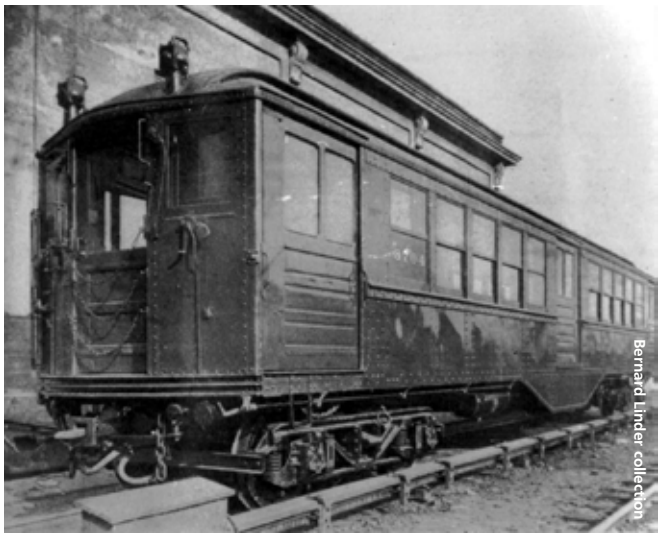
Car 3352 is the only car remaining. It is at the Seashore Trolley Museum in Kennebunkport, Maine.

Another view of a Gibbs car, this time 3623, taken on December 26, 1955.

1907-1908 ACF Deck-Roof Motor Cars - "The Battleships" (3650-3699)

In conjunction with the extension of the Broadway Line into the Fort Washington tunnel in Upper Manhattan, fifty additional high voltage motor cars with deck roofs were bought from the American Car and Foundry Company in 1907 and 1908. They were numbered 3650-3699. Originally, these did not have center doors, but they were added three years later. They were always kept as modified cars and never received MUDC features. They could be found on the ends of the Broadway-Seventh Avenue Expresses and Lexington Avenue Locals with other MUDC high voltage cars in between. When delivered, these cars had Van Dorn couplers and wooden lattice floors, with

longitudinal seating except two seats across the center aisle which faced each other and were located at the center of the car. When the center doors were added in 1912, the cars were modified to have all longitudinal rattan seating, J-type couplers (standard on all subway cars), and Westinghouse AMRE brakes (standard on all Hi-Vs) with Westinghouse ME-19 brake valves. After modification in 1912, the added center door was pneumatically operated, while the end doors remained a manual operation. Because of this, they remained in operation only at the ends of trains, principally on the Broadway-Seventh Avenue Express.



"Hedley motor" 3704.

Remarkably, one Deck Roof car remains (number 3662) at the Shore Line Trolley Museum, East Haven, Connecticut.

Four-Door Car Experiment

There were several noticeable mistakes when "The Subway" was planned. One of them was that the number of passengers was greatly underestimated. The thinking of the time before operation commenced was that it would be "moderately patronized." Once opened, it became very apparent that this was incorrect and that many more passengers had to be accommodated. Most critical was the need to improve traffic flow and to relieve long dwell time by allowing quicker boarding and alighting.

The first attempt to improve traffic flow was in the redesign of the door area in the second group of subway cars ordered. The original composite subway cars and the Gibbs cars had 39-inch-wide doors that were only positioned at the ends of the car. When the deck roof cars were ordered, the doors were fifty inches wide, but even that was insufficient.

Bion J. Arnold, famous Special Consulting Engineer, was contracted by the Public Service Commission to study the entire subway operation problem and make recommendations in October, 1907. In his report in February, 1908, Mr. Arnold proposed a modification of the cars already in service. He recommended two pairs of doors at each end of the car, two marked "Entrance" (closest to the car ends) and two marked "Exit" (closest to the car centers) over each door to improve passenger flow. As a result, eight cars were modified by the IRT in February, 1909. However, there were performance difficulties with their operation, and no other cars were rebuilt with four doors per side.

About the same time of these tests, a second experiment was conducted with the installation of a single center door exactly midway between the end doors. This modification decreased the space between doors from 40 feet to 18. It allowed more seats to be retained. Another eight cars were modified for this second experiment. The result was that this eight-car train outperformed the eight-car train of Mr. Arnold's design. Consequently, all subsequent IRT car orders came with this three-door design.

A Motorman at the controls of a train of Hi-Vs.

1909 High Voltage Motor Cars — The "Hedley Motors"

In 1909 an order for 325 high voltage motor cars was made, and these cars were numbered 3700-4024. There were 59 modified high voltage motor cars that were not converted to MUDC (3700-3756, 3815, and 3915). Cars 3700-3756 were built by American Car and Foundry, car 3815 by the Standard Steel Car Company, and car 3915 by the Pressed Steel Car Company. Cars 3730 and 3748 were the first IRT cars to be equipped with electric ceiling fans.

Also in 1909, 266 unmodified high voltage motor cars were ordered from three car builders. Cars 37573809 were built by American Car and Foundry. Standard Steel Car Company built cars 3810-3814 and 3816-3849, while cars 3850-3914 and 3916-4024 were built by the Pressed Steel Car Company. In total, there were 325 high voltage motor cars known as "Hedley Motors". All of them had AMRE brakes, J-type couplers, ME-19 brake valves, and 200-horsepower Westinghouse Type 577-R1 traction motors. These cars were converted to MUDC in the early 1920s.

The First Steinway-type Motor Cars — "The Boilers"

On April 3, 1913, the City of New York took ownership of the Steinway Tunnels and the IRT was selected as the operator of the line. The Steinway Tunnels were double-track trolley tunnels built by the New York & Long Island Railroad Company between Lexington Avenue/E. 42nd Street, Manhattan, and Van Alst Avenue, near the present Hunter's Point Avenue station, in Long Island City, Queens. After a brief consideration of the resumption of trolley service, the IRT concluded it was best to convert the

Hi-V trailer interior.

Lo-Vs at 181st Street-Broadway, October 1956.

line to a heavy rapid transit style of operation. In order to have the tunnels in service as quickly as possible, only the reconstruction necessary for temporary rapid transit operation was carried out prior to the official opening. More extensive projects, such as platform lengthening, replacement of the old Van Alst Avenue trolley loop, and the extension to Queensboro Plaza, were completed later.

Standard IRT cars were impractical because of the steep grades in the tunnel. IRT car engineers redesigned the standard car with a slightly lower weight and a gear ratio better suited for operation in this environment. These cars were classified "Steinway-types" and were not operated either in the same consist with standard IRT cars or with trailers because of these differences. Twelve cars were required for the initial subway service, which began on June 22, 1915 between Grand Central (formerly Lexington Avenue) and Jackson Avenue (now, Vernon Boulevard-Jackson Avenue). These twelve cars, built in 1915 by the Pressed Steel Car Company, were quite distinct from other Steinway-types and all standard low voltage and high voltage cars that followed.

Six of the cars, 4026-4028 and 4031-4033, had General Electric PC-10 controllers, with GE 259-A traction motors, two per car on the #2 truck. The remaining six cars, 4025, 4029, 4030, and 4034-4036, had Westinghouse 302-F traction motors. Car 4035 had a Westinghouse 214-B controller and the other five cars had a Westinghouse 214 controller.

1915 Flivver Class Cars — An IRT Hybrid: Motors 4037-4160, Trailers 4161-4214

From the start of service on The Subway until 1915, all cars had high voltage control equipment. It was state-of-the-art at that time. Frank Julian Sprague discovered that several motors could be turned on, accelerated, and turned off simultaneously from a single source. This was the basis for the first multiple unit electric rail car, and most rapid transit cars followed this concept until 1915. By then it was discovered that battery power could be used to send electric impulses between the master controller in the cab and the underfloor controller and that acceleration of traction motors could be achieved automatically. This concept was first used by the IRT in its next group of subway cars. This new generation was known as the "flivver" class.

The flivvers were true hybrid cars. They had all the pneumatic equipment used by the high voltage cars until that time, but in a low voltage configuration. The braking system was Westinghouse's Triple-R braking using its ME-21 brake valve. The master controller and control box were similar in outward appearance to the Hi-Vs, but operation was quite different. High voltage cars had manual acceleration; there were ten points of power in the master controller — five in series, five in parallel. In addition, a heavy duty spring prevented the motorman from accelerating too quickly. The flivver's controller had only three points of

Lo-V 5651, laid up on the Third Avenue "L" at 204th Street.

World's Fair Steinways headed north on the Third Avenue "L" at 204th Street.

power as the automatic accelerator relay accelerated the cars to the proper switching, series, or parallel speeds.

Because of these differences, flivvers could not normally be operated in trains with other car classes. All 178 cars were built by Pullman and delivered in 1915. They ran until 1962, mostly on the Seventh Avenue Express, when they were removed from passenger service. None survive today.

Steinway-type Motor Cars Converted from Other Car Classes, 1915-1916

The IRT Company was noted for its frugal operating practices, which were made necessary by ever-increasing costs and refusal by municipal government administrations to increase fares. Traffic on IRT lines in Manhattan, the Bronx, and Brooklyn grew slowly because the areas they served were already developed. However, traffic on the Flushing and Astoria Lines skyrocketed between 1917 and 1929 because of the construction of apartment houses, particularly in Jackson Heights.

Faced with overcrowding on those trains and a lack of money to buy additional equipment, the IRT converted eight flivver trailer cars (4215-4222) and 22 low voltage trailers (4555-4576) to Steinway motor cars in 1929. The flivver trailers were built by the Pullman Company in 1915 and the low voltage trailers were also built by Pullman, but in 1916. To differentiate these cars for shop and transportation personnel, a red line appeared beneath the exterior car number after cars were transferred to the main lines from Flushing. Many high voltage cars had a similar line in white. The white indicated these cars had MUDC, which was not compatible with other high voltage cars.

Both types of converted Steinway cars had General Electric PC-10-K-1 controllers, with General Electric 240 or 259-D motors, two per car on the #2 truck, as usual. These Steinway-type motor cars had Westinghouse ME-30 brake valves.

1915 High Voltage Trailers and 1916 Low Voltage Motors

In order to provide for increased riding, extensions of IRT lines into the Bronx and Brooklyn, and longer trains, high voltage trailers 4223-4514 were built by Pullman in 1915. When these cars were delivered, the composite cars were beginning to be transferred from the Subway Division to the elevated lines. In 1952 and in 1955 several high voltage trailers were converted to "blind motors," that is, they had motors and other equipment from retired Gibbs cars installed, but had no master controllers, brake valves, nor Motorman's cabs. These were used to give additional power to Broadway Seventh Avenue Express trains.

In 1916, the Pullman Company built 40 low voltage trailer cars once again to provide for increased riding, extensions of lines into the Bronx and Brooklyn, and longer trains. These 40 trailer cars supplemented low voltage motor cars already in service.

1916 Pullman Steinway-type Motor Cars

On June 22, 1915, the Queensborough Subway opened between Manhattan and Queens, the first subway service connecting the two boroughs. It ran between Lexington Avenue (now Grand Central) and Jackson Avenue (now Vernon Boulevard-Jackson Avenue). After this line opened, the IRT pushed to rebuild the Steinway trolley tunnels for rapid transit use and to extend the line to Queensboro Plaza, which occurred on November 5, 1916. However, work was already in progress on even further extensions. The first was to Ditmars Avenue (now Boulevard) in Astoria and the second to 104th Street-Alburtis Avenue (now 103rd Street-Corona Plaza) in Corona. These opened on February 1, 1917 and April 17, 1917 respectively.

In order to provide equipment for service for these extensions, the IRT Company ordered 71 Steinway-type motor cars from the Pullman Company in 1916 in addition to other standard low voltage motor and trailer cars for the mainline extensions in the Bronx and Brooklyn. These 71 Steinway-type motor cars were numbered 4700-4770 (later, 4700-4771 except 4719) and had Westinghouse ABF control groups with model 214-B controllers, Westinghouse 302 traction motors, ME-23 brake valves, and CJ-131-8 master controllers.

These 71 motor cars were insufficient for the traffic requirements of the Astoria and Corona Lines as ridership far exceeded the IRT's first estimates. By 1923, 10-car trains were possible because of the elimination of the barriers separating the IRT and BMT portions of stations on the Astoria and Corona extensions and the lengthening of subway station platforms in the Steinway Tunnel. In order to provide for 10-car train operation, 22 low voltage trailer cars, also built by Pullman in 1916, were converted to Steinway-type motor cars along with eight flivver trailers.

Pullman Low Voltage Motor Cars 4577-4699, 4719, 4772-4810, 4966-5302, and 5403-5502; Pullman Low Voltage Trailer Cars 4811-4825, 4826-4965, and 5303-5402

Desperate need for additional equipment arose during the expansion years wherein the IRT extended service farther into the Bronx, Manhattan, and Brooklyn. Six hundred low voltage-type motor cars were ordered. Five hundred came from the Pullman Company in 1916 and 1917 and 100 from American Car and Foundry in 1924. Additionally, Pullman built 255 trailers in three groups. There were 15 in 1916, 140 in 1917, and 100 in 1922.

Of the cars in the 1916 group, low voltage motors 4577-4699, 4719, and 4772-4810 as well as low voltage trailers 4811-4825 were similar to previous orders. However, low voltage motors 4966-5301 and low voltage trailers 4826-4965 in the 1917 group incorporated some changes. These included brass window sashes, masonite ceilings, and carbody modifications that gave more window space. The cars were considered by some to be cleaner in appearance, as they did not have the customary row of lights down the center of the car. They were used for the extensions of the Jerome Avenue, White Plains Road, and Pelham Bay Park Lines to their current terminals. The last car in the series, 5302, was built as a revenue collection car. It had wooden sashes similar to the 1916 low voltage cars, but had no center door. This car was designed to look as much as possible like other IRT subway cars for security reasons and ran for many years until scrapped in 1979.

In 1922 the IRT Company placed its final order for low voltage trailers. There

were 100 cars built by the Pullman Company and numbered 5303-5402. The cars were fitted with traditional wooden sashes as an austerity measure as well as the center row of lights down the middle of the car body. Seventy-five of the cars had Westinghouse D-2-F compressors, the only trailer cars on the IRT so equipped. This was to provide additional air brake reliability.

In 1924, the next-to-last order for low voltage motor cars was placed with the American Car and Foundry Company for 100 cars, which were numbered 5403-5502. These were built for even more service needed on the last extensions built during the IRT Company years, the Nostrand Avenue and Livonia Avenue Lines. These cars, too, reverted back to the traditional wooden sashes and other austerity measures that were incorporated in the 1922 Pullman Company trailer cars.

It must be remembered that on the IRT system, trailers were run in trains of motor cars. Generally, they operated three trailer cars in a ten-car train. Trailer cars were usually placed as the second, ninth, and usually the fourth car calculated from the north end of the train. This was because if the train was cut for operation during the overnight hours, it would be uncoupled to form a five-car consist. Alternate trains would be laid up. The trains running in the midnight hours would have four motor cars and one trailer, while the other would have three motors and two trailers.

Beginning after World War II, seven-car consists became the norm in off-peak periods, so that two motor cars plus one trailer would be cut to make the seven-car consist. In order to understand this practice more clearly, it must be remembered that the labor agreement with the Transport Workers Union required a second Conductor for a ten-car train. The Conductors were positioned between the first and second cars and between the ninth and tenth cars. There was no additional cost, except the cost for mileage, to run a seven-car consist versus a five-car train. Both could operate with one Motorman and one Conductor. As a bit of trivia, the Conductor (second position) was known as the "Rear Guard". The practice of running trains of shorter length trains during off-peak periods, weekends, and overnight (midnight) hours continued well into the 1960s.

As a general rule, low voltage cars were assigned to the Seventh Avenue Express, the Lexington-Jerome Avenues Express, or the Lexington-White Plains express. These cars rarely were operated in local service, except in the midnight hours and on weekends, when there was a completely different service pattern.

The low voltage cars were considered safer because they employed battery power in the master controller and brake valve, while the high voltage cars used 600 volts direct current for the master controller and brake valve. In fact, there was no high voltage (600 volts d.c.) in the Motorman's cab of low voltage cars. Knife switches with high voltage wiring were located in the cabinet opposite the Motorman's cab. Low voltage cars used the 32-volt battery circuit for the master controller and brake valve, which sent battery circuit power to operate the 600-volt d.c. group switches and brake equipment underneath the car, thus reducing the possibility of injury to train crews in the cab.

Standard equipment on all low voltage motor cars were rattan longitudinal seats, J-type couplers, either 195-horsepower General Electric type 260 traction motors or 200-horsepower Westinghouse type 577 traction motors, and Westinghouse type ME-23 brake valves (with the ME-30 valve as an exception). Originally, cars with center doors had drop seats, but these were removed between 1942 and 1948.

1925 ACF Low Voltage Motor Cars (5503-5627)

The IRT Company purchased 150 motor cars from the American Car and Foundry Company of Berwick, Pennsylvania in 1925. Of these, 25 were of the Steinway-type configuration and 125 were of the standard low voltage design. These cars were purchased to provide the additional cars needed for the expansion of the IRT subway system. Until 1925, composite cars were operated as shuttles on the lightly used portions of the outer ends of the system. The Livonia Avenue Line was nearing completion to the New Lots Avenue terminal, and these ACF low voltage cars were used on that extension and also to provide through service to all IRT terminals.

These cars had General Electric PC-10-K-1 controllers with General Electric model 260-D traction motors, two per car, on the #2 truck, as was the case on all other IRT cars. The 125 Lo-Vs had Westinghouse ME-30 brake valves, as well as Westinghouse D-3-F compressors. This was the first use of this type of brake valve, but it could also be found on the 25 Steinway-type cars that were purchased in conjunction with this order.

The 1925 low voltage cars had window sashes made of wood. It was discovered that it was more costly to maintain the brass window sashes on previous orders than the wooden sashes. When the specifications were drawn for these cars, it was decided to use wooden sashes.

All standard low voltage cars were interchangeable. They could be and were operated that way. Ten-car trains were run with seven motor cars and three trailers. On weekends, when seven-car trains were operated, trains consisted of five motor cars and two trailers. These cars normally ran on both Lexington Avenue Express lines (Jerome Avenue and White Plains Road). The 1925 low voltage motor cars were of the last low voltage IRT cars to be retired, lasting in passenger service until 1964.

Four cars of this class have survived. Cars 5443 and 5483 are part of New York City Transit's current Nostalgia Train, while 5466 is currently at the Shore Line Trolley Museum in East Haven, Connecticut and 5600 is with the Trolley Museum of New York at Kingston.

1925 ACF Steinway-type Motor Cars (5628-5652)

These 25 Steinways were a part of the 150-car order with American Car and Foundry in 1925. The cars were needed for the extension of the Corona line from 104th Street-Alburtis Avenue (now 103rd Street-Corona Plaza) to Main Street in Flushing and the westerly extension from Fifth Avenue to Times Square underneath W. 41st Street.

The cars featured PC-10-K-1 General Electric controllers with General Electric model 259-A traction motors, two per car on the #2 truck, as normal. They also had Westinghouse ME-30 brake valves, the first use of this type valve on the IRT. It must be remembered that these cars were the last to be built by the IRT to their standard car body design.

1938 St. Louis Car Company World's Fair Steinway-type Motor Cars (5653-5702)

In 1938, the IRT purchased its last passenger cars. This was because of the planned opening of the New York World's Fair and the proposed running of express service on the Flushing Line to handle increased traffic. Fifty motor cars were received from the St. Louis Car Company to operate interchangeably with existing Steinway cars.

Featured were a new door configuration and turtle-back roofs. While each car was a complete unit (they each had motors and controls), this equipment was located on only one end (#1 end) and the Conductor's controls were located at only one end (#2 end). With no cabs at the #2 end of the car, seating capacity was increased to 48 passengers, all on longitudinal seats. Another unusual feature was the two-line backlighted route and destination front roll sign, the only cars so equipped on the IRT system.

These cars also had Westinghouse ABF-UP-231-B control groups, Westinghouse XM-129 master controllers, AMUE brake equipment, and WABCO D-2-F compressors and ME-23 brake valves. Two 125-horsepower Westinghouse 336-A1 motors were on the #2 truck only, normal practice on the IRT system. Another feature was the 22-bulb, 30-volt light circuit, arranged in two 600-volt series circuits.

The cars ran on the Flushing Line along with other Steinway cars until 1950, when they were replaced by the R-15 class cars. All fifty World's Fair cars were then reassigned to the Lexington Avenue Local-Pelham Bay Park Line where they ran until they, in turn, were replaced by the R-17 class cars in 1955 and 1956. Once again, they were reassigned to the Seventh Avenue Express and the 42nd Street Shuttle. Finally, they moved to the Third Avenue elevated line, where they saw service between about February 4, 1962 and about November 3, 1969, twenty-nine years after the IRT Company turned its operations over to the City of New York on June 12, 1940. Car 5655 is the only IRT World's Fair car remaining, under restoration at the Coney Island Overhaul Shops.

Douglas Grotjahn photograph, Eric Oszustowicz collection

The arrival of R-15 cars in 1950 displaced the 1938 World's Fair Steinways from the Flushing Line (though seen here laid up at Burke Avenue on the White Plains Road Line)...

Douglas Grotjahn photograph, Eric Oszustowicz collection

while the arrival of R-17 cars in 1955-56 displaced them from the Lexington Avenue-Pelham Line (this photograph was taken on May 2, 1970, after the Brooklyn Bridge station had been modified and extended to the north and headlights and radio brackets had been added to the cars).

Work Equipment

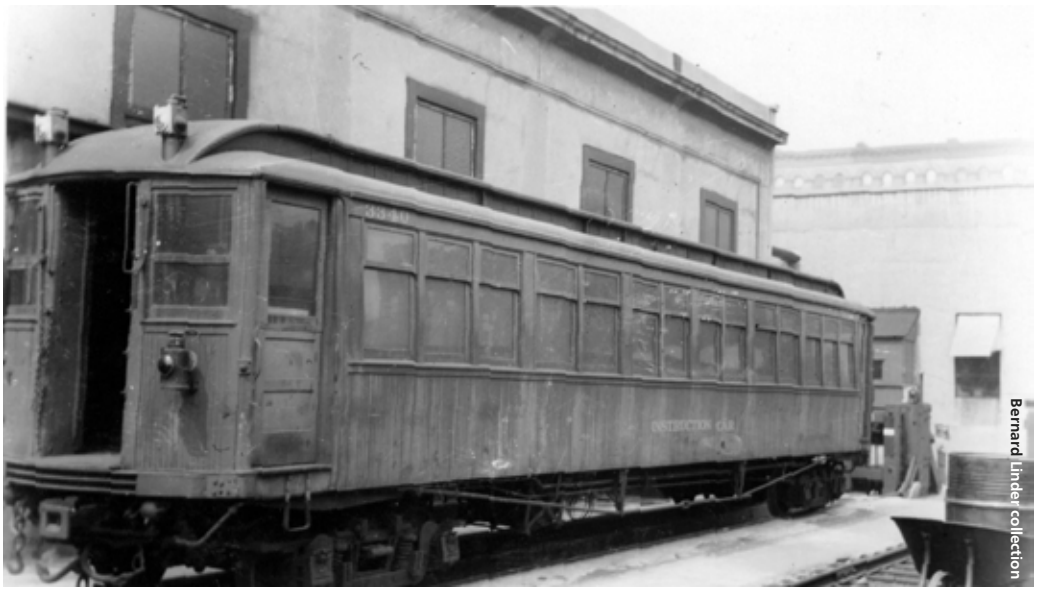
By Bernard Linder

This roster includes work cars delivered to the IRT for subway operation between 1900 and 1915. It does not include cars assigned to the elevated lines or cars transferred frequently between the subway and the elevated lines.

Car Numbers	Builder	Year Built	Type of Car
39-50	IRT	1903-04	Wooden Flat
51-62	Pressed Steel	1906	Steel Flat
63-68	IRT	1909-10	Wooden Flat
69-88	Ralston Steel Car Company	1911	Steel Flat
89-100	Magor	1914-15	Steel Dump

Car Numbers	Date Converted	Converted To
53	November 16, 1915	Steel Box Car
54	April, 1909	Motorized
58-60	May, 1909	Motorized
71	December 31, 1915	Steel Box Car
75	June 25, 1915	Automatic Dump Steel Hopper
79	August 16, 1911	Derrick
84	December 31, 1914	Derrick
87	January 18, 1916	Box
88	December 23, 1915	Box

Composite car 2135, destroyed by fire June 1, 1906, was rebuilt to pump car 03.



The *August Belmont*, car No. 1, had been converted to an instruction car and renumbered 3340 by the time this photograph was taken in 147th Street Yard on May 17, 1941.

Wages and Working Conditions

By Bernard Linder

A hundred years ago, employees earned less money and worked longer hours than they do today. These wages and hours are probably typical.

On May 12, 1912, IRT employees' salaries were increased as shown in the table below.

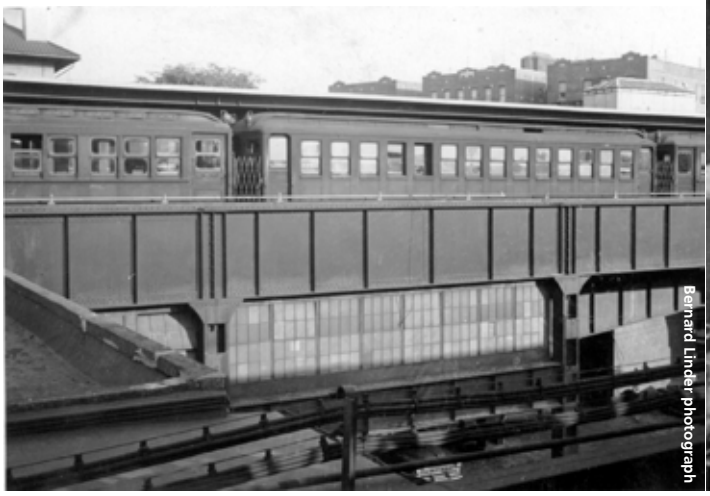
Occupation	Previous Daily Rate	Hours Worked	New Daily Rate
Conductor	$2.25-2.50	10	$2.35-2.60
Motorman	$3.00-3.50	10	$3.00-3.75
Porter	$1.50	10	$1.60
Towerman	$2.40-2.50	10*	$2.50-2.60
Train Clerk (Assistant Dispatcher)	$2.25-2.50	12**	$2.40-2.60
Agent	$2.00-2.30	12*	$2.00-2.40
Trackwalker	$2.35	N/A	$2.35-2.45
Electric Repairman	$2.50	N/A	$2.50-2.60
Laborer	$1.75	N/A	$1.75-1.85

*One day off per month with pay
**Two or three days off per month with pay

The minimum figure is the entrance salary. The average daily rate was increased by ten cents each year until the maximum was reached.

A Motorman receives instruction.

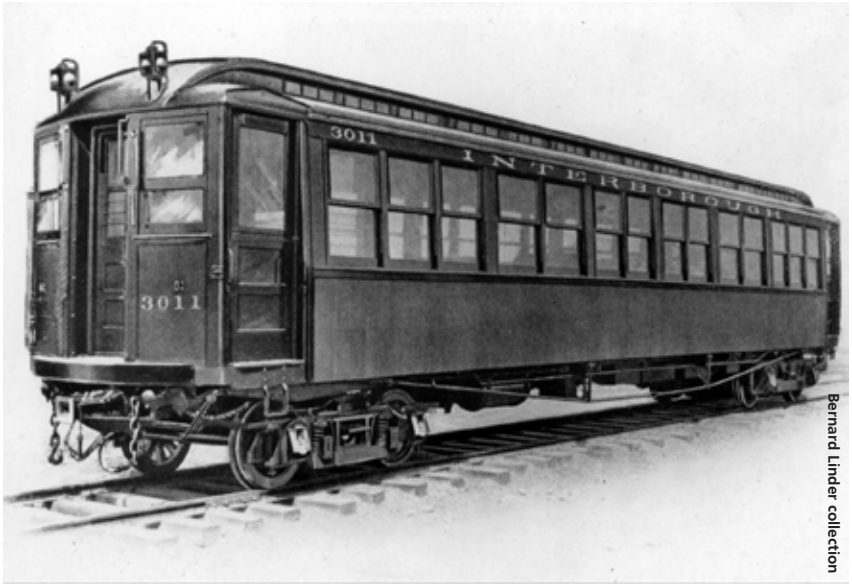
Pay car 3342 at E. 180th Street on the Dyre Avenue Line, June 29, 1955.



Alterations to the Original Cars

by Bernard Linder

Artist's rendering of a composite car.



Bernard Linder collection

3421, one of the 1909 "freaks."

Bernard Linder collection

The original cars, which were equipped with end doors and two pairs of cross seats, were slow loaders and had difficulty handling the crowds. Cross seats were removed from the composites and steel cars as shown in the table at the bottom of the next page.

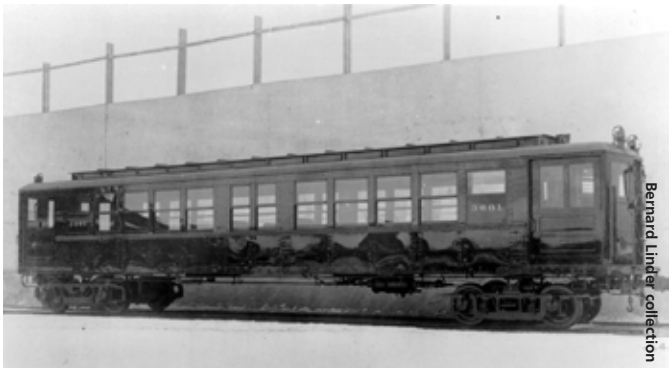
Rush hour trains must have been delayed by passengers attempting to squeeze through the narrow end doors of the original cars. To speed up service, the Public Service Commission ordered the IRT to install an additional door 3'9¾" from the original end door (four additional doors in each car). The end doors, which were to be used as an entrance, were controlled by the same levers while the new pneumatic doors were to be used as an exit. All doors were 3'2¾" wide. The first train was placed in service on February 16, 1909 and was still running on August 20, 1909. Two months after it was placed in service, General Manager Hedley said the cars were freaks and failures. He was unhappy that the IRT spent $150,000 because of "experts." The additional doors were eventually removed and replaced with center doors.

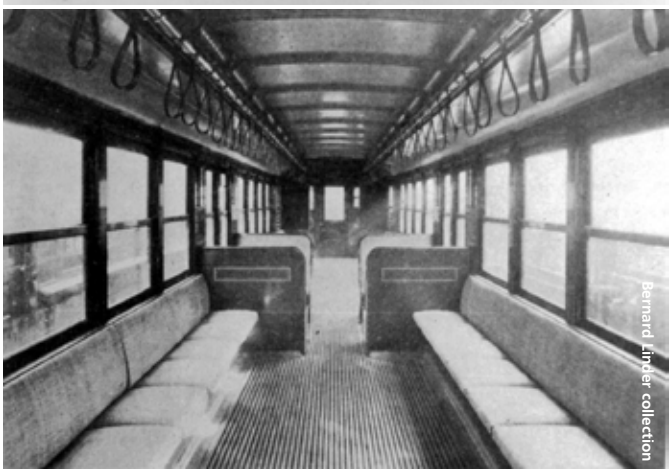
The first train with center doors was in service on April 26, 1909. Six center-door express trains were running in August, 1909 and twelve eight-car center-door trains were in service in December, 1909. The shop was producing 16 center-door cars per month and it expected to increase production to 25 cars per month. In January, 1910, the Public Service Commission ordered the IRT to open the center doors in non-rush hours instead of rush hours only. But it was allowed to keep the center doors closed when trains were on the structure in January, February, and March. On September 23, 1912, all cars were equipped with center doors. There was less congestion at Brooklyn Bridge, 14th Street, and other express stations. This alteration cost $2 million.

There were no fans in the original subway cars, which must have been extremely uncomfortable in the summer. Fans were installed in cars 3730 and 3748, which made their first trip on August 12, 1910. Each fan, whose diameter was 36 inches and whose blades were 4 inches wide, was rated at 1/12 horsepower at 230 RPM. Fans were in service on 50 cars on June 30, 1911 and were operating in all cars at the end of 1912.

Electro-pneumatic brakes were installed in 110 steel cars by June 30, 1910. All cars were equipped with EP brakes by end of 1912.

The June 30, 1911 report states that 469 cars were equipped with a new type drawbar and emergency lights were installed in 325 cars.





Deck Roof cars before center door was added...

The June 30, 1910 report informs us that anti-climbers were installed in 528 cars. Illumination was improved by replacing 10 candlepower lamps with 16 CP lamps. The June 30, 1912 report states that tungsten lamps replaced the latter (a hundred years ago, light bulbs were called lamps).

Shortly after the subway opened, several composite cars were involved in bad accidents and were destroyed. Composite cars 2037, 3015, 3154, 3221, and 3242 and steel car 3518 were damaged by fire at 168th Street and Broadway on March 29, 1905 and were scrapped. On June 1, 1906, two layups collided on the middle track at W. 107th Street and Broadway. The steel cars were repaired, but the composite cars 2135 and 3158 were almost completely destroyed. It was quite obvious that the composites were not as indestructible and fireproof as the designers predicted.

Steel and wooden cars were mixed in nearly every train. The Public Service Commission ruled that this practice was unsafe and ordered the IRT to transfer the cars to the elevated lines as soon as enough steel cars were available.

The remaining 476 composites were transferred to the elevated lines shortly after the flivvers and high-voltage trailers were placed in service.

In 1917, composites became frequent visitors to the "L" after they had been rebuilt as Lo-Vs for elevated service. The original trucks, which were too heavy for the elevated structure, had a concentrated load of two motors, probably 200HP each, on one truck and a lighter load on the trailer truck. They were replaced with special maximum traction trucks that distributed the load on the trucks, both of which were motorized with lighter 120HP motors. All cars were motorized because the large motors were replaced with smaller motors.

When the cars were operated in the

...and after

COMPOSITE CARS AVAILABLE						Six Months Ending:	Cars - Elevated	Cars - Subway*
				Destroyed During Year				
End of Year	Motors	Trailers	Total	Motors	Trailers			
1904	262	238	500			January 1, 1917	477	--
1905	185	310	495	4	1	June 30, 1919	476	--
1906	184	309	493	1	1	December 31, 1922	448	26
1907	184	307	491		2	December 31, 1924	452	24
1908	173	315	488	1	2	June 30, 1928	449	26
1909	173	309	482		6	June 30, 1929	475	--
1910	125	355	480	1	1	June 30, 1933	470	--
1911	125	354	479		1	December 31, 1938	401	--
1914	124	353	477	1	1	December 31:		
1915	124	352	476			1942	345	--
1916	124	352	476			1946	159	--
						1947	122	--
						1949	95	--
						1950	2	--
						1953	0	--

*Shuttles at end of subway lines

subway, the upper sash was the drop sash. To prepare them for elevated service, the windows were altered so that the lower sash could be raised. After the cars had been running on the "L" for a short time, the front platforms were altered by replacing the steel storm door by a sliding door with a window. The storm doors were rebuilt and fabricated into two-piece fold-back doors that formed the Motorman's cab. The inner sliding bulkhead doors were replaced by an open archway. When the cars left the subway, the fans were removed and metal discs covered each fan location. The cars retained the standard subway décor with white ceilings and green sidewalls and bulkheads.

The composites were still too heavy to be operated full-time on the latticework elevated structure. They were operated in rush hours only on the Third Avenue Through Express, occasionally on the Third Avenue Local-Express, and on the Freeman Street Second Avenue Express, whose express tracks were reinforced for heavier loads. Two-car composites were single-tracked between Kingsbridge Road and Woodlawn and between Pennsylvania Avenue and New Lots Avenue until construction was completed in 1924. Twenty cars, operated in five-car trains, provided shuttle service between E. 180th Street and 241st Street until through service was operated in 1929. Composites also operated between Fordham Road and 241st Street until through service began in 1937.

Composites on the Third Avenue "L," location unknown (2145 in the lead)...

...and north of Tremont Avenue.

Trains were single-tracked between Alburtis Avenue (103rd Street) and 111th Street, then Willets Point Boulevard, until construction was completed in 1928. When member Karl Groh told us that he saw a picture of composites in Corona Yard, we concluded that they must have been operating in Queens.

Just before the Ninth Avenue "L" ceased

SEATING ARRANGEMENT ALTERED

	Composite Trailers		*Composite Motors*		*Gibbs Cars 3351-3649*		*Deck Roof Cars 3650-3699*	
Six Months Ending	**All Longi-tudinal Seats**	**Longi-tudinal and Cross Seats**	**All Longi-tudinal Seats**	**Longi-tudinal and Cross Seats**	**All Longi-tudinal Seats**	**Longi-tudinal and Cross Seats**	**All Longi-tudinal Seats**	**Longi-tudinal and Cross Seats**
May 1, 1908								
January 1, 1909	--	315	--	172	--	299	--	50
July 1, 1909	--	309	--	172	--	292	8	42
January 1, 1910	--	309	--	172	--	292	8	42
July 1, 1910	127	75	--	154	98	194	50	--
January 1, 1911	N/A	N/A	--	N/A	181	111	50	--
July 1, 1911	238	116	--	124	N/A	N/A	50	--
January 1, 1912	228	71	--	124	196	96	50	--
July 1, 1912	300	37	60	64	292	--	50	--
January 1, 1913	all cars	--	all cars	--	all cars	--	all cars	--

operating in 1940, Karl Groh was surprised to see the composites transferred to the 155th Street Shuttle via the Ninth Avenue "L," where these cars were never allowed to operate because the structure was even weaker than the Third Avenue "L"'s structure. Composites continued operating on the 155th Street Shuttle until they were replaced by steel cars about 1949.

When the Board of Transportation attempted to replace the composites with Q-cars, it found that the latter were too heavy for the Third Avenue "L" structure. In 1950, it removed the Q-cars' trucks, which were equipped with two 200HP motors. They were replaced by the composites' trucks, which were equipped with two 120HP motors. Unfortunately, the cars were slower than all the other cars because two trailers were coupled in each six-car train set. Although the composites were scrapped, their motors and trucks were in service for nearly two decades until the Myrtle Avenue "L" finally quit in 1969.

This concludes the story of the cars the IRT ordered because it had no choice.

Q-cars with composite car trucks on the Third Avenue "L" at 204th Street, June 10, 1950.

Q-cars on the Third Avenue "L" south of the 133rd Street station, looking south.

SMEE Museum Cars in Action

As part of the celebration of the IRT's centennial, New York City Transit has been running excursions with museum equipment and has put the cars into passenger service at times. On August 30, 2004, in honor of the U.S. Open tennis tournament, NYCT operated post-World War II-vintage IRT cars, known as SMEEs because of the air brake equipment with which they were delivered. ERA member Ronald Yee was there for the festivities and took several striking photographs. We start with looks at different IRT SMEE cars when they were in everyday service, then we proceed to Ron's coverage of the museum fleet on the Flushing Line on pages 40 and 41.

Eric Oszustowicz collection

5980, one of the 100-car R-15 order delivered in 1950.

Eric Oszustowicz collection

R-12 5703, the first post-World War II IRT car, at the American Car & Foundry factory in Berwick, Pennsylvania. The 750 cars mentioned included 100 R-12s, 150 R-14s, and 100 R-15s for the IRT, and 400 R-10s for the IND.

Steve Zabel photograph, Eric Oszustowicz collection

R-22 7526, part of an order of 450 cars delivered by St. Louis Car Company in 1957-58, pauses at the 96th Street-Broadway station on January 2, 1971.

R-12 5760, sporting a U.S. Open banner, leads the way as the train approaches the 61st Street-Woodside station on its way to Flushing. The Flushing Line was the first assignment for the R-12 class.

Repainted into 1970s MTA livery, R-33s 9206/9207 take up the rear of the special train as it passes through the 61st Street-Woodside station. Note the Long Island Rail Road's Woodside station below.

On its way back, we find R-33 9206 in the lead on the middle track at 61st Street-Woodside.

Heading back toward Manhattan, we bid a fond farewell as the train approaches the 52nd Street-Lincoln Avenue station. For the record, the cars in the consist were R-12 5760, R-15 6239, R-17 6609, R-33s 9016/9017 and 9206/9207, and R-33S 9306. All cars except 9206/9207 were in their as-delivered paint schemes.

Tech Talk

By Jeffrey Erlitz

On Wednesday, September 15, at about 1:30 pm, the Track Geometry Car operated over the new switch from Track J1 to Track J4 south of the Canal Street station on the Nassau Street Line. It then proceeded to test Track J4 all the way up to Essex Street before returning to Canal Street. Northbound J, M, and Z trains started operating via Track J4 as of Monday, September 20.

The other big news during September was the cutover of the last interlocking on the 14th Street-Canarsie Line left to be done under contract S-32701. This was Eighth Avenue and was accomplished over the Labor Day weekend. This was historic as it was the very last BMT interlocking machine. Yes, purists will state that it was *not* actually a BMT plant since the Board of Transportation built it. And yes, it was a GRS Model 5 interlocking machine, not a typical BMT Model 2. Though the levers are no longer active, the contractor modified the model board to show all of the new signal and switch numbers. This was done because the Eighth Avenue Dispatcher is still located in the old tower room and will be for some time until the new Rail Control Center is activated.

A project I have not mentioned in a while is the Automatic Train Supervision system for the entire IRT (except for the Flushing Line). Work has been proceeding behind the scenes on this contract, S-32333, since at least November, 2001. Between April 12 and May 2, the ATS circuits were placed in service in the relay rooms on the Lexington Avenue Line. These included Brooklyn Bridge, 14th Street, Grand Central, 59th Street, 86th Street, and 125th Street. All of the new code systems were energized but the operation of these controls from the Rail Control Center is temporarily disabled. Starting on April 26 and running through July 3, the ATS circuits and code systems were placed in service on the Broadway and Seventh Avenue Lines at Chambers Street, 14th Street, Times Square, 72nd Street, 96th Street, and 137th Street.

Back on August 28, during the midnight hours, the Division of Car Equipment performed speed and grade testing on a set of R-142 cars on the Flushing Line from Main Street to Times Square.

Contract C-34756 calls for the partial restoration of the City Hall station on the IRT to prepare it for a commemorative re-enactment of the opening of the subway. One of the skylights was dismantled and removed by work train back in May. A new skylight was fabricated and delivered back in August.

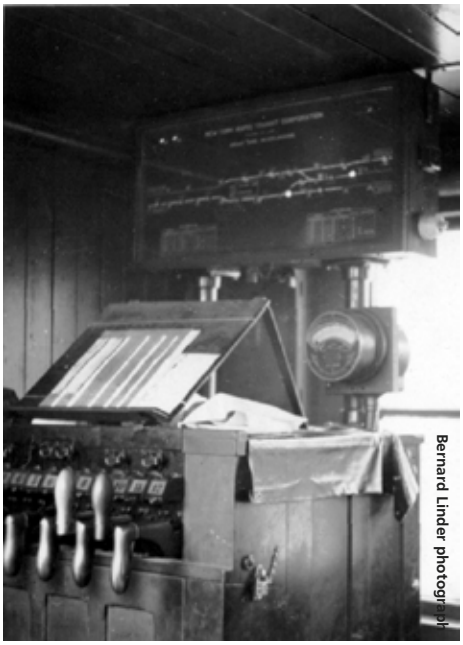
The Simpson Street station on the Lenox Avenue-White Plains Road Line is undergoing a historic restoration under contract A-35953. M.

The Grant Avenue station on the Fulton Street "L."

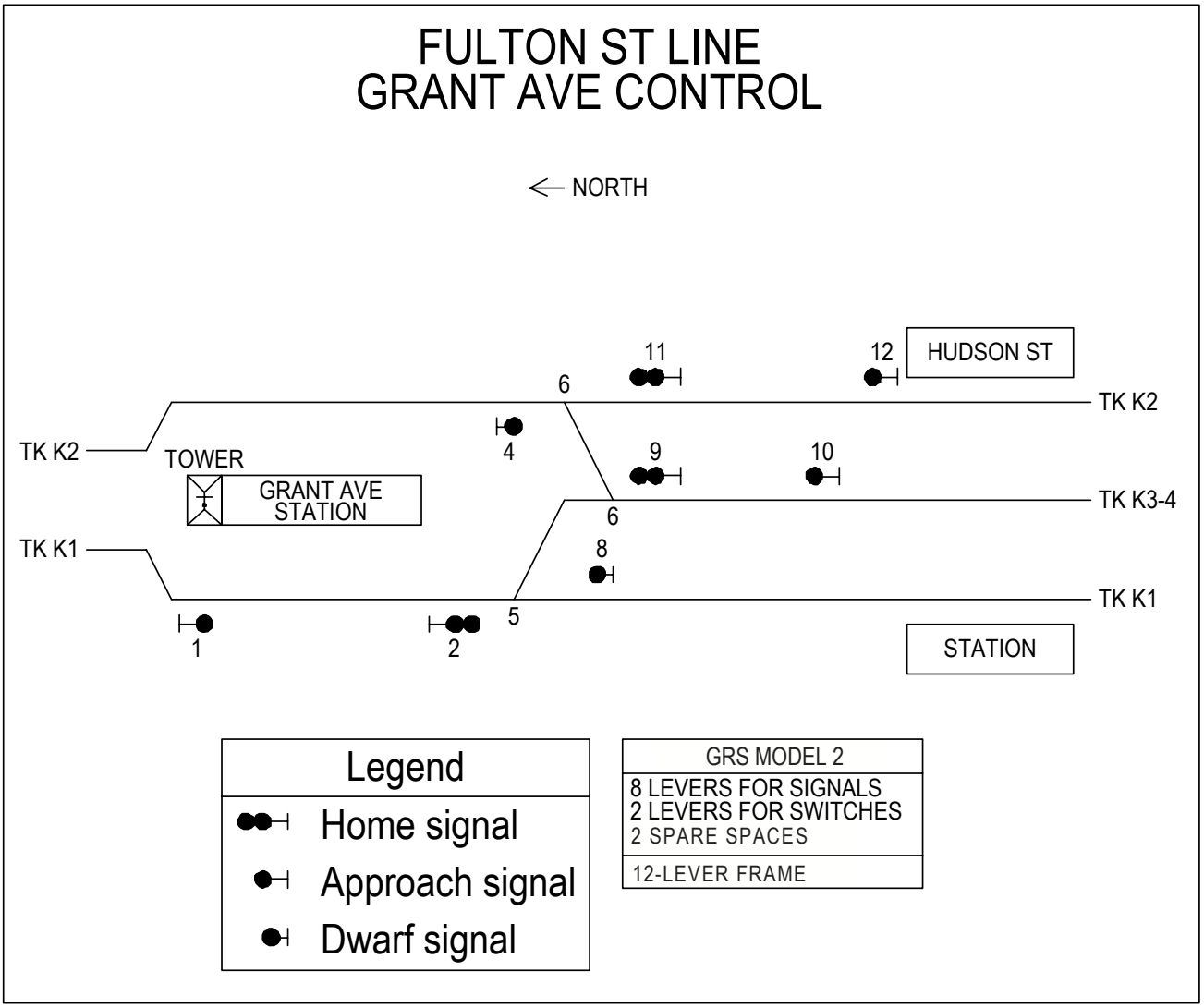
Bernard Linder photograph

A. Angeliades is the contractor for this $13.5 million project, which started on December 26 last year and is currently forecast to be substantially complete by June 25 of next year. All existing station elements are to be restored in compliance with State Historic Preservation guidelines. The entire mezzanine will be restored or replaced (roofs, walls, floors and rooms) as well as the wood canopies over the platforms and stairways. The existing cast iron low railings will be restored and replicated light posts will be included. The control house was closed off on July 6.

The next historic interlocking diagram in my current series is Grant Avenue on the (BMT) Fulton Street Line. The BMT was predominately a GRS (General Railway Signal Company) shop but there were several Union Switch & Signal Company (US&S) interlockings and 14 of them were originally mechanical with pipe-connected switches and lower-quadrant semaphore signals. When the BMT was ordered to equip their non-signaled tracks with full signal protection, the signal contracts all (apparently) went to GRS. This is why all of the interlockings that had US&S interlocking machines were equipped in the field with GRS switch machines and color light signals. I believe Grant Avenue was no exception. This station was, until the Dual Contracts extensions, the end of the Fulton Street elevated line and was originally named City Line, being at the edge of the City of Brooklyn. I believe that by the early 1950s, the era of the diagram below, all of the semaphore signals had been replaced with color lights and the original US&S interlocking machine was replaced with a 12-lever GRS Model 2 interlocking machine. My reference for



Grant Avenue Tower's interlocking machine.



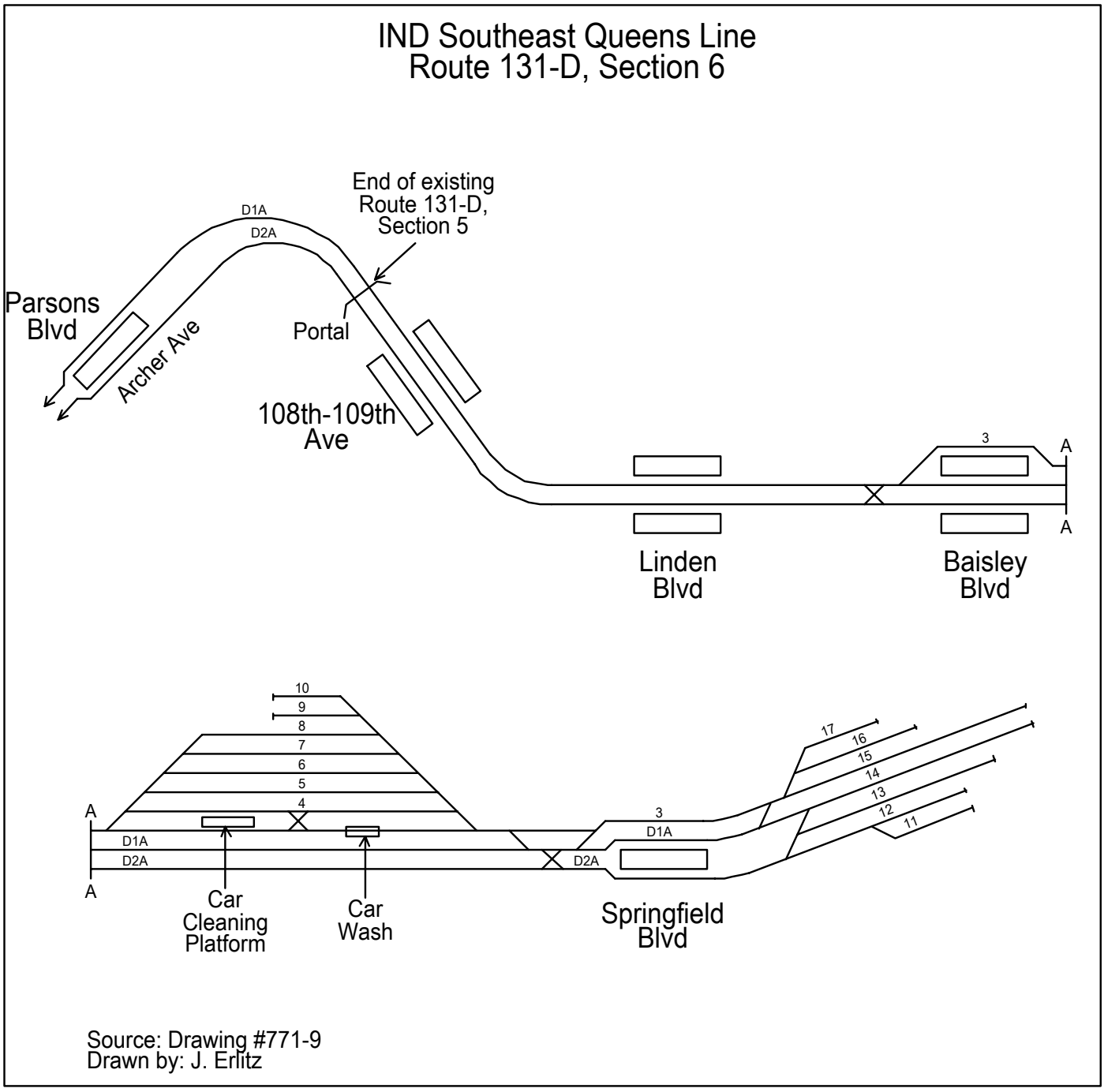
this diagram was a photograph of the actual model board in the tower, not an official signal print.

Next month, we will take a look at Lefferts Avenue Interlocking on the Fulton Street Line and see what it looked like just before the end of BMT operation in April, 1956.

Continuing with my series of track diagrams of subway lines not built, this month we take a look at one of the versions of the Southeast Queens Line, Route 131-D, Section 6. The drawing for this does not have a date but it is probably from the 1971-2 period. This subway line would have taken over the Long Island Rail Road's Atlantic Branch from south of Jamaica Station through Cedar Manor, Locust Manor, and Laurelton, ending up in Rosedale. The existing Archer Avenue Line ends at a bulkhead just short of the proposed tunnel portal.

Next month we will take a look at the Queens Super Express Bypass, Route 131-B.

Jeff may be contacted via e-mail at jbe456@optonline.net.



Commuter Rail Agencies in North America

VRE control cab V907 at the Broad Run/Airport station on April 27, 2001.

by Randy Glucksman

AGENCY/ OPERATOR NAME	POPULAR NAME/ ABBREVIATION	AREA	STATIONS	LINES	MILEAGE	DAILY RIDERS	LOCOMOTIVES			COACHES / CARS		NOTES
							Electric	Diesel	Dual-Mode	Electric	Diesel	
San Joaquin Regional Transit Commission	Altamont Commuter Express (ACE)	Stockton - San Jose CA	10	1	86	3,000	0	9	0	0	11	
Agence Métropolitaine de Transport	AMT	Montreal QC (Canada)	49	5	100	59,000	0	15	0	58	93	1
Peninsula Corridor Joint Powers Board	CalTrain	San Francisco - Gilroy CA	34	1	77	27,000	0	29	0	0	107	
North Coast Transit District	Coaster	San Diego - Oceanside CA	8	1	43	13,000	0	7	0	0	26	
Connecticut Department of Transportation	Shore Line East	Old Saybrook - Stamford CT	9	1	51	1,655	0	6	0	0	20	
Greater Toronto Area	GO Transit	Toronto ON (Canada)	53	7	224	145,000	0	45	0	0	362	1, 3
Maryland Rail Commuter Service	MARC	Maryland, West Virginia	42	3	220	27,000	10	26	0	0	129	1
Massachusetts Bay Transportation Authority	MBTA	Boston MA	119	12	368	130,000	0	83	0	0	378	1
Northeast Illinois Regional Commuter Rail Corporation	METRA	Chicago IL	224	11	495	292,000	0	151	0	165	683	1

AGENCY/ OPERATOR NAME	POPULAR NAME/ ABBREVIATION	AREA	STA-TIONS	LINES	MILE-AGE	DAILY RIDERS	LOCOMOTIVES			COACHES / CARS		NOTES
							Elec-tric	Die-sel	Dual-Mode	Elec-tric	Die-sel	
MTA Long Island Rail Road	Long Island RR	Nassau & Suffolk Counties NY	124	10	320	274,000	0	61	23	1042	134	1
MTA Metro-North Railroad	Metro-North	Westchester, Putnam, Dutchess Counties NY, CT	119	3	339	248,000	0	22	31	725	189	1, 2, 6, 7
MTA Metro-North Railroad	Metro-North	Rockland, Orange Counties NY	11	2	70	9,100	0	11	0	0	67	5
Northern Indiana Commuter District	South Shore	South Bend IN - Chicago IL	20	1	90	13,000	0	0	0	58	0	
New Jersey Transit	NJ Transit	New Jersey, New York, Philadelphia PA	160	8	542	244,000	61	78	0	230	682	1, 5
New York, Susquehanna & Western Railway	On-Track	Syracuse NY	4	1	4	N/A	0	0	0	0	7	
Southeastern Pennsylvania Transportation Authority	SEPTA	Philadelphia PA - West Trenton NJ - Newark DE	151	7	298	103,000	8	5	0	304	45	1
Railtran	Trinity Railway Express	Dallas - Ft. Worth TX	10	1	34	8,000	0	6	0	0	27	4
Sound Transit	Sounder	Seattle - Tacoma WA	9	2	73	2,800	0	11	0	0	58	
South Florida Regional Rail Authority	Tri-Rail	West Palm Beach - Miami FL	18	1	72	10,000	0	11	0	0	26	1, 3
Virginia Railway Express	VRE	Washington DC - Virginia	18	2	90	16,000	0	22	0	0	119	
TransLink	West Coast Express	Vancouver BC (Canada)	8	1	42	8,300	0	5	0	0	28	
TOTALS			**1253**	**88**	**4150**	**1,672,255**	**79**	**641**	**54**	**2582**	**3334**	

Notes: 1- Equipment on order or planned
2 - Connecticut DOT (CDOT)-owned equipment
3 - Leased cars (Lessee or Lessor)
4 - Includes 13 RDCs
5 - Assumes delivery of all Comet Vs
6 - Includes CDOT-owned cars used in New Haven/Grand Central Terminal service

North American Electric Coach Rosters

Metra Electric *Highliner* 313.

by Randy Glucksman

AGENCE METROPOLITAIN DU TRANSPORT

CAR NUMBERS	CLASS	TYPE	BUILT	MANUFACTURER	NOTES
400-456	MU Coach	Motor	1994 - 1996	Bombardier	2
401-449	MU Coach	Trailer	1994 - 1996	Bombardier	1
481-487	MU Coach	Control Trailer	1994 - 1996	Bombardier	1

Notes:
1. Odd numbers
2. Even numbers

NJ TRANSIT

CAR NUMBERS	CLASS	TYPE	BUILT	MANUFACTURER	REBUILT	TOILET	NOTES
500 - 533	Arrow I	Single	1968	St. Louis Car Company	1983 - 84	Y	1, 2
1234 - 1303	Arrow II	Married Pair	1975	General Electric	1983 - 84	Y	3
1304 - 1333	Arrow III	Single	1977	General Electric	1993 - 94	N	4
1334 - 1533	Arrow III	Married Pair	1976 - 77	General Electric	1993 - 94	N	4

Notes:
1. Originally numbered 100-134. Not all cars were renumbered into the 500-series (May, 1993 New York Division ***Bulletin***)
2. 30 cars rebuilt and renumbered 5155-5169 (cab cars) and 5220-5234 (trailers)
3. Rebuilt by Morrison-Knudsen. Retired 1998
4. Rebuilt by ABB

METRA

CAR NUMBERS	CLASS	BUILT	MANUFACTURER	NOTES
1501-1630	Highliner	1971-1972	St. Louis Car Company.	1, 2
1631-1666	Highliner	1978-1979	Bombardier	2
(26)	Highliner	(2004 -)	Sumitomo	3

Notes:
1. 1509 retired due to accident October 30, 1972.
2. Overhauled by Morrison-Knudsen 1993-1996
3. Order placed in October, 2002

MTA METRO-NORTH RAILROAD

CAR NUMBERS	CLASS	TYPE	BUILT/ REBUILT*	MANUFACTURER	OWNER	NOTES
1100-1125	ACMU	Single Motor	1983-85*	Morrison-Knudsen*	MN	1, 4
1126-1152	ACMU	Single Motor	1983-85*	Morrison-Knudsen*	MN	2, 4
1153-1186	ACMU	Single Motor	1983-85*	Morrison-Knudsen*	MN	3, 4
4000-4179	M-7A	Married Pair	2003-	Bombardier	MN	
8000-8141	M-3A	Married Pair	1983-85	Budd	MN	4
8200-8279	M-1A	Married Pair	1971	Budd/General Electric	MN	4
8280-8327	M-1A	Married Pair	1972	Budd/General Electric	MN	5
8328-8377	M-1A	Married Pair	1973	Budd/General Electric	MN	5
8400-8451	M-2	Married Pair	1973	General Electric/Canadian Vickers	MN	4
8452/8470	M-2A	Married Pair	1974	General Electric/Canadian Vickers	MN	4, 5
8453/8471	M-2B	Married Pair	1974	General Electric/Canadian Vickers	MN	4, 6, 7
8500-8551	M-2	Married Pair	1973	General Electric/Canadian Vickers	CDOT	5, 11
8552/8570	M-2	Married Pair	1973	General Electric/Canadian Vickers	CDOT	5, 5
8651/8669	M-2	Married Pair	1974	General Electric/Canadian Vickers	CDOT	5, 6, 8
8700-8749	M-2	Married Pair	1975-76	General Electric	CDOT	5
8800-8849	M-2	Married Pair	1975-76	General Electric	MN	4, 9
8900	M-4A	Triplet	1987	Tokyu Car Company	MN	4
8901	M-4B	Triplet	1987	Tokyu Car Company	MN	4
8902/8922	M-4A	Triplet	1987	Tokyu Car Company	CDOT	5, 5
8903/8923	M-4B	Triplet	1987	Tokyu Car Company	CDOT	5, 6
8924/8934	M-4A	Triplet	1987	Tokyu Car Company	MN	4, 5
8925/8935	M-4B	Triplet	1987	Tokyu Car Company	MN	4, 6
8951	M-4D	Triplet	1987	Tokyu Car Company	MN	4
8953/8973	M-4D	Triplet	1987	Tokyu Car Company	CDOT	5, 6
8975/8985	M-4D	Triplet	1987	Tokyu Car Company	MN	4, 6
9000/9018	M-6A	Triplet	1994-1995	Morrison-Knudsen	CDOT	5, 5
9001/9019	M-6B	Triplet	1994-1995	Morrison-Knudsen	CDOT	5, 6
9051/9069	M-6D	Triplet	1994-1995	Morrison-Knudsen	CDOT	5, 6
9020/9030	M-6A	Triplet	1994-1995	Morrison-Knudsen	MN	4, 5
9021/9031	M-6B	Triplet	1994-1995	Morrison-Knudsen	MN	4, 6
9071/9081	M-6D	Triplet	1994-1995	Morrison-Knudsen	MN	4, 6

Notes:
1. Pullman-Standard (1962) - NYC 4600-4625, Penn-Central 1100-1125, Conrail same numbers. Retired
2. Pullman-Standard (1965) - NYC 4700-4726, Penn-Central 1125-1152, Conrail same numbers. Retired
3. Pullman-Standard (1965) - NYC 4750-4783, Penn-Central 1153-1186, Conrail same numbers. Retired
4. Owned by Port Authority of New York & New Jersey
5. Even numbers only
6. Odd numbers only
7. Former Metro-North bar cars converted into coaches 1985. Ex-8601/8619
8. Café cars. Arranged 8651-8550 though 8669-8570
9. 8516-8841, mis-mated. Original mates wrecked

M-1A through M-7A classes have toilets in the odd-numbered car

M-N: MTA Metro-North Railroad

CDOT: Connecticut Department of Transportation

NORTHERN INDIANA COMMUTER DISTRICT

CAR NUMBERS	CLASS	BUILT	MANUFACTURER	NOTES
1-30	MU Coach	1982-1983	Nippon-Sharyo	
31-38	MU Coach	1982-1983	Nippon-Sharyo	1
39-44	MU Coach	1982-1983	Nippon-Sharyo	
17, 26, 41	MU Coach	1992	Nippon-Sharyo	2
45-48	MU Coach	1992	Nippon-Sharyo	
101-110	Trailer	2000	Nippon-Sharyo	

Notes:
1. Owned by Metra
2. Replacements for originals that were wrecked/destroyed

MTA LONG ISLAND RAIL ROAD

CAR NUMBERS	CLASS	TYPE	BUILT/ REBUILT*	MANUFACTURER	NOTES
9001-9012	M-1	Married Pair	1968	Budd	1
9013-9174	M-1	Married Pair	1969	Budd	1
9175-9176	M-1A	Married Pair	1972	General Electric	2
9177-9240	M-1	Married Pair	1969	Budd	1
9241-9270	M-1	Married Pair	1970	Budd	1
9271-9476	M-1	Married Pair	1970	General Electric	
9477-9620	M-1	Married Pair	1971	General Electric	
9621-9770	M-1A	Married Pair	1972	General Electric	
9771-9944	M-3	Married Pair	1985-1986	Budd-Thyssen	
9945-9946	M-1A	Married Pair	1985-1986	Budd-Thyssen	3
7001-7192	M-7	Married Pair	2002-	Bombardier	4
(7193-7292)	M-7	Married Pair		Bombardier	5
(7293-7644)	M-7	Married Pair		Bombardier	6

Notes:
1. Owned by Port Authority of New York & New Jersey
2. Replacements for original pair, which were destroyed by fire
3. Renumbered from 9891-9892 in 1994
4. Original contract
5. First option cars
6. Second option cars

Many cars removed from roster. Replaced by M-7s.
M-1 to M-7 classes have toilets in the odd-numbered car

SOUTH EASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY

CAR NUMBERS	CLASS	TYPE	BUILT	MANUFACTURER	NOTES
101-188	Silverliner IV	Married Pair	1975-1976	General Electric	
201-219	Silverliner II	Single Car	1963-1964	Budd	1
220-239	Silverliner III	Single Car	1967	St. Louis Car	
246-250	Silverliner I	Single Car	1958	Budd	2
251-269	Silverliner II	Single Car	1963-1964	Budd	
270-303	Silverliner IV	Single Car	1975	General Electric	3
304-399	Silverliner IV	Married Pair	1976	General Electric	
400-416	Silverliner IV	Single Car	-	General Electric	3
417-460	Silverliner IV	Married Pair	-	General Electric	4
9001-9017	Silverliner II	Single Car	1963	Budd	
9018-9031	Silverliner IV	Single Car	1974	General Electric	1
(104)	Silverliner V				5

Notes:
1. 210 and 9020 retired
2. Originally PRR 150-154; Penn-Central 294-298. Retired
3. Some cars renumbered from 270-303 and 9018-9031 after PCB transformers were replaced with silicone transformers
4. Some cars renumbered from 101-188 and 304-399 after PCB transformers were replaced with silicone transformers
5. Order pending

Commuter and Transit Notes

by Randy Glucksman

MTA Metro-North Railroad (East)

At about 8:30 AM August 16, unusually heavy rains caused a washout of a 25-foot section of track at MP 44, between Peekskill and Manitou. Two trains were trapped north of the area, and rail service was suspended. Shuttle buses were used between Peekskill and Garrison, and because of several road closures, there were reports that the trips required 40-50 minutes. Trains normally require about half an hour. Normal service was resumed the following morning. Amtrak also suspended *Empire Service* between NY Penn and Albany. Thanks to member Josh Weiss for the report.

By now, the ACMUs should be a part of the rich railroad history of the metropolitan area, having faithfully served riders for over forty years. It was anticipated that all would have been removed from service between mid-to-late September. The first of what would ultimately be 87 cars were delivered (in three groups) to the New York Central beginning in 1962 (please see roster on page 42). By late August, only 3 sets were scheduled each day, two on the Hudson Line (#720/775 and #726/763) and one on the Harlem Line (#528/2523); the latter was a deadhead equipment move to North White Plains during the AM peak. M-7As, which were their replacements, will now go after the M-1As, just six years younger than the newest ACMUs.

Metro-North has a telephone number for passengers to call in cars with air-conditioning problems. That number is 1-800-RAIL-HOT.

MTA Metro-North Railroad (West)

Seat drop notices detailing the service changes for west-of-Hudson riders and summarizing what NJ Transit had provided the previous week, were distributed one week prior to the Republican National Convention.

The roster of Metro-North Comet Vs that appeared in the June ***Bulletin*** was incorrect, and is being reprinted below.

CAR NUMBERS	TYPE
6700-6714	Cab (with toilet)
6750-6754	Trailer with Toilet
6755-6799	Trailer

MTA Long Island Rail Road

The first phase of the Queens Interlocking project has been completed and work on the next phase of this project will take place next summer. New timetables under General Order No. 104 went into effect as of 12:01 AM September 7, and schedules were issued for all lines. For a three-week period after September 7, ties were replace between Sunnyside and Bayside (Port Washington Branch) during middays. Also for a three-week period that was to be announced, one track was removed on the Main Line through Mineola for unspecified work. There will also be platform repairs at Seaford, which will take one track out of service between Wantagh and Amityville on the Babylon Branch. The next set of timetables will be issued on November 16.

For the U.S. Open Tennis Tournament, held between August 28 and September 6, the LIRR (as usual) produced a special timetable for the Port Washington Branch.

A Family Guide to the Long Island Rail Road was published. Inside are explanations of how to buy tickets, and the various types of tickets that are available: Family Fare, Off-Peak Ten Trip, Senior, and Senior Ten Trip. On the back cover are the railroad's promotions: Manhattan Getaways, Long Island One Day Getaways, and other packages and discounts.

NJ Transit

After the September issue went to press, additional temporary RNC (Republican National Convention) service notices were published for the Montclair-Boonton and Main/Bergen/Port Jervis and Pascack Valley Lines. To NJ Transit's credit, substitute trains in the approximate time slots were designated to stop at Secaucus for those *Midtown Direct* trains that were routed to Hoboken.

On an Arrow III car that I rode in a week ahead of the RNC, the trash receptacles were removed from the ends of the car, in addition to the one located next to the center door being sealed, as was reported in last month's ***Bulletin***.

Beginning Monday, August 30, the area inside and around Pennsylvania Station took on the look of a militarized zone. There were dozens of police officers, mostly NYPD, in groups of three to four. ***The New York Times*** reported that 10,000 officers were involved in convention security. One morning as I walked to the 34th Street exit, from a distance I observed a pair of soldiers wearing steel helmets (similar to what I wore when I served in the U.S. Army), but as I got closer I found that those were not soldiers, but, rather, NYPD personnel, and they were armed with M-16s at the ready. Outside, there were piles of steel gates that could be assembled in a short amount of time and several portable lights. NJ Transit's K-9 corps of six dogs was augmented by an additional 54. They were on loan from other law enforcement agencies.

On the first day of the RNC, television news reporters interviewed commuters about how their trip had been, and most said that it was uneventful. One of my fellow commuters told of a delay of several minutes at Secaucus in the morning while teams of police officers boarded and searched the train. He also told me that he observed that the overhead racks were empty. NJ Transit had notified riders that these racks could not be used during that week. While the morning trip in to New York may have been relatively delay-free, this was certainly not the case for commuters who rode trains out of Hoboken that evening. What was described as a suspicious package, and was later determined to be harmless, caused the police to evacuate the terminal for 45 minutes. One of my friends reported that the Pascack Valley Express (Train #1629) was the first train on the line to leave from Hoboken, and it made all local stops, arriving in Nanuet 90 minutes late. A few Main/Bergen Line trains were turned at Secaucus Junction. NJ Transit reported that ridership was off by 30%, LIRR was down 10-15%, and Metro-North was off slightly. But, the last week of August is

traditionally a lower ridership period.

The reason that the Morris & Essex Lines received a new timetable on August 22 was to restore weekend service due to completion of installation of concrete ties between Milburn and Summit on Track 1. North Jersey Coast Line schedules will not change until October 31.

In September, three new timetables were available for the Main/Bergen, Pascack Valley, and Northeast Corridor Lines. For the first two, "Revised September 2004" was added, while the effective date for the Northeast Corridor Line was September 11, 2004.

Joe Malinconico, transportation reporter for the ***Star-Ledger***, in a column that was published just days before the start of the RNC, provided some statistics about NJ Transit's service plan for the week. 95 *Midtown Direct* trains were rerouted to Hoboken. Those trains typically carry 18,000 passengers. Add this to the 254 trains carrying 17,000 passengers that operate in and out of Hoboken each day, and it can add up to some serious congestion. During the AM peak period, the number of trains was increased from 69 to 80, and during the PM peak, 67 to 77. To handle this, 24 trains were canceled (please see September ***Bulletin*** for details of some of these cancellations) and the station dwell time (time that trains remain on the platform between runs) was reduced from 20-25 to 12-20 minutes. Upon arrival at Hoboken, riders found a number of alternatives, including PATH (which had increased service on its 33rd Street Line), NY Waterway Ferries, which tested a new route to W. 38th Street, and the bus lines to the Port Authority. For holders of NY Penn tickets, the rides were free.

For a few months, in addition to NJ Transit rail tickets, the ticket windows at Hoboken have been selling monthly passes for HBLRT, Bus Route 126 (Hoboken to Port Authority Bus Terminal), and Intrastate Zones 1 and 2.

Students at Seton Hall University, Montclair State College, Drew University, Rutgers-Camden, Rutgers-New Brunswick, Rutgers-Newark, and William Paterson University got one week of free riding on NJ Transit buses, trains, and LRVs from September 8-15. These schools are participating in a program whereby their students are eligible to purchase already discounted monthly passes for an additional 25% savings. Previously, this discount was only applicable to monthly rail tickets. NJ Transit plans to open the program to all colleges and universities in the state next year.

In preparation for the startup of revenue service (which began on September 7), as of Saturday, August 21, non-revenue service was begun to the Lincoln Harbor station from Hoboken Terminal. Trains were to reverse at Pershing Interlocking in what would remain a non-revenue move. Two trains were scheduled, operating 15-minute headways from 5:30 AM (the usual one hour later on weekends) continuously, until the final departure from Hoboken at 1 AM, seven days a week. No through service from Lincoln Harbor to points south of Hoboken is planned during this interim period prior to full build-out to Tonnelle Avenue. South Line schedules remained largely unchanged, with the exception that certain *Bayonne Flyer* trips in the AM peak were extended to Hoboken Terminal to give riders greater flexibility and to also provide additional reverse commute capacity for NJT rail commuters to reach the financial district, which is growing rapidly with the addition of jobs moving to the new Goldman Sachs building at Essex Street. The new extension to Lincoln Harbor was originally to be to Port Imperial Ferry, but Weehawken officials were concerned about the traffic impact. The line is essentially finished to Port Imperial Ferry, with only final touches required to the station. Test trains have operated to that point since March. It appears now that the next extension will be to Tonnelle Avenue by the fall of 2005, which will include the deep tunnel station at Bergenline Avenue, which is well along in construction.

Port Authority of New York & New Jersey

When the Fulton Street Transportation Center is built, it will include a portion of the original World Trade Center station pavement. This 66-foot long travertine-paved section is still used on a daily basis by commuters walking between the temporary World Trade Center station and the NYCT Eighth Avenue Line's World Trade Center subway station. ***The New York Times*** reported that the Port Authority indicated that it would also salvage a fluorescent orange memorial marking the stairwell from the underground garage, uncover the remaining steel stubs of the twin towers' perimeter columns, and mark the edge of the north tower outline on a PATH platform that will one day cover one corner of the tower's footprint.

Port Authority Trans-Hudson Corporation

PATH had been designated as an alternative service to Manhattan during the RNC (August ***Bulletin***) and there was a modification to the stations that would accept NJ Transit (NY Penn) rail tickets in lieu of fare payment. The initial announcement only included (the temporary) World Trade Center, 33rd Street, and Hoboken, but then 23rd Street, 14th Street, 9th Street, and Christopher Street were added. At the latter two, this policy was in only in effect from 6-10 AM and 4-8 PM. At all other stations the hours were 6 AM – midnight. No doubt PATH had employees there to permit riders to by-pass the turnstiles and also to count those riders so that they could send a bill to NJ Transit. In order to accommodate the anticipated additional ridership, PATH operated five-minute headways between Hoboken and 33rd Street – the frequency that was in effect prior to this past May. Current schedules call for six-minute headways on this route.

Metropolitan Area

As promised in last month's ***Bulletin***, here are the details of the ***Don't Get Stuck in the Dark*** brochure that was distributed several days before the first anniversary of the "Great Northeast Blackout." It was published by an organization that calls itself Trans-Hudson Partners, which includes NJ Transit (the lead agency), the Port Authority of New York & New Jersey, Amtrak, NY Waterway, Academy Bus, Coach USA, NYCDOT, plus several police departments and the U.S. Coast Guard. Several scenarios are presented, and in each one are the transportation alternatives that would be available if

either or all of the following were closed: Penn Station, Port Authority Bus Terminal, PATH, or World Trade Center, World Financial Center & Wall Street areas. The telephone numbers of each transportation provider was also included. Also distributed were blue plastic flashlights (with two extra L736 batteries) which when turned on, emit a small red glow. They also had a whistle and were sponsored by WCBS-880.

Amtrak

Because of Hurricane Bonnie and Tropical Storm Charley, which struck Florida and the Eastern U.S. on August 12-14, Amtrak canceled its Florida services. The metropolitan area was spared the worst of these storms. History repeated over Labor Day weekend, when, because of Hurricane Frances, service was once again canceled and remained suspended through mid-week.

Amtrak's three rebuilt Turboliners have been put into storage. According to a report in the ***Albany Times-Union***, the main reason is that the air-conditioning system is "weak". These trains, which also have higher fuel costs and limited seating, have not been favorites of Amtrak. They were a part of a $185 million project to bring high-speed rail service to upstate New York. NYSDOT is suing Amtrak for "foot-dragging and other failures." The rebuilding of seven turbo trains plus a double-tracking of the line between Albany and Schenectady were also part of this project. Earlier this year, Amtrak and NYSDOT had agreed to scale back the project, by rebuilding only four sets of Turbos but adding an additional coach to each train set. This project now appears to be dead for the time being. Thanks to member Bob Kingman for sending this report.

Miscellaneous

Many times in the past, the question about what type of third rail shoes were on the New Haven Railroad FL-9s has come up, and all that I could say is that I heard that it was a "flippable" type, capable of operating on the New York Central's under-running third rail, and the so-called conventional type used by the Long Island Rail Road, PATH, and NYCT, among others.

Member David Klepper, an Electrical Engineer, provided the more precise answer. He wrote that in 1918, the New Haven had electric locomotives that were equipped with cam-operated third rail shoes (which permitted pickup from both types of third rail), which it used until the Pennsylvania Railroad's 11,000-volt AC electrification was extended north from Trenton to Sunnyside Yard in 1934. This same type of shoe was also found on the EP-5s, or "Jets," as they were more commonly known. However, due to some electronic interference they created, both the Pennsylvania and the Long Island banned them from Penn Station. This problem was solved by either modifications to the EP-5s or the electronic equipment. The FL-9s, however, were equipped with centered double-sprung shoes that also allowed operation on both types of third rail. "With good maintenance of both shoes and third rail, they did run into Penn Station and, on occasion, on third rail power. I was told that this was a matter of luck, but never believed that story. I think EMD simply did a good job of engineering."

My wife found an article from the Travel Section of ***USA Today*** (September 3, 2004) entitled, *"10 Great Places to Get Off on Subway Art."* There were excerpts from an interview with David Bennett, author of a new book, ***Metro: The Story of the Underground Railway*** (Octopus Publishing, $29.95). Mr. Bennett found that around the world there are more than 200 cities that have underground railways. His "Top 10" list for their artwork is: Prague, Brussels, Moscow, Toronto, Munich, Stockholm, Los Angeles, Washington, D.C., London, and Singapore.

Other Transit Systems

Boston, Massachusetts

When the Democrats departed from Boston after their national convention, law enforcement officers stopped randomly checking the bags of passengers, because it was hard to justify this when there was no major event. This policy had been challenged in court by various legal and civil liberties groups.

The first inklings of a proposed $160 million automatic fare collection system have been publicized, and it appears that it may take the form of a debit-like card that passengers would swipe through a slot. The "T" is also in the market for a catchy name, and its consultant held a focus group for Silver Line riders, who will get to test it at the end of this year. $29,000 will be spent to market this scheme, which is expected to be implemented system-wide by 2006. Among the names that have been rejected are "T-Liberty" and "T-Hub." Still in the running were, "T-Go," "Charley Card," "T-Plus," and "T-Vantage." Member Todd Glickman, who contributed these reports from ***The Boston Globe***, likes "Charley Card," because if you are short one nickel, you cannot get off, a reference to the Kingston Trio's 1959 hit song. (If you are interested, the complete lyrics can be found at several websites including http://www.newbury-st.com/HTML/Charlie.htm.) When automatic fare collection is fully in effect, you can expect the token to become a part of Boston's transit history, and the MBTA would also consider a higher fare structure during peak hours.

Todd forwarded a summary of the Breda Type 8s on the MBTA, as provided by NETRANSIT (http://members.aol.com/netransit).

- January 31, 1998: Pilot car 3800 delivered; non-revenue tests began 03/02/98
- March 24, 1999: Enters revenue service on Riverside Line
- November 21, 1999: Removed from service because of poor braking performance; the active fleet consisted of 5 cars at the time
- April 27, 2000: Returned to revenue service on the Riverside, Commonwealth, and Beacon Street Lines
- July 12, 2000: Removed from service following several derailments on Riverside Line; the active fleet consisted of 7 cars when the fleet was withdrawn
- April 26, 2001: Returned to service on Commonwealth Avenue Line following track improvements
- August 20, 2001: Removed from service following three derailments (two in the subway, one on Commonwealth Avenue); the active fleet consisted of 17

cars when the fleet was withdrawn

- March 22, 2003: Returned to service on Commonwealth Avenue following additional track improvements and changes to both wheel and track profiles
- May 31, 2003: Removed from service following derailment of 3846 at the Hynes Convention Center station. Type 8s, however, returned to service the following Monday (June 2). Media reports indicated a washer, part of the stub-axle assembly on the center truck, was loose, resulting in the wheel of the right #3 axle of 3846 leaving the rail. Type 8 fleet returned to service on June 2 after inspections, and "only" two other cars were found to have the same problem. By Friday, June 6, additional inspections took place and there were no Type 8s spotted in service on Friday, June 6 or Saturday, June 7. Cars were back in service on June 8
- December 11, 2003: Revenue operation of Type 8s on Beacon Street resumed for first time since July, 2000
- August 20, 2004: Type 8s began operating to North Station and began operating in revenue service for the first time in E/Heath Street-Huntington Avenue service. Cars can now operate in regular service on all lines except D/Riverside. Operation of Type 8s on D/Riverside will require the completion of additional track repair work. Cars can make non-revenue moves between the Reservoir and Riverside car houses
- August 22, 2004-Cars 3806 and 3841 derailed at Northeastern outbound. All trucks on both cars left the rail. The center truck of the lead car (3806) came onto the platform. Derailment occurred after only 2.5 days of Type 8 operation on the Huntington Avenue Line

Philadelphia, Pennsylvania

From ***Cinders***: Work began in July to add two passing sidings on the R8/Fox Chase Line. Upon completion SEPTA trains will be able to operate in both directions on Track 1. Track 2 will then be for the exclusive use of CSX freight trains. In last month's ***Bulletin***, I reported that SEPTA, in its service plan proposal for this year, would like to increase the threshold for abandoning lightly used rail stations from 50 to 75 riders. Although SEPTA says it has no immediate plans to close any stations, there are currently 14 stations (not identified) that would fall into this category. With the cancellation of the contract to purchase Silverliner Vs, SEPTA is now in the midst of another effort to procure these cars and was set to release a new RFP. This time, the winner will be determined through a negotiated bid as opposed to the lowest bid. Damaged Silverliner IV 155 will be rebuilt by the Delaware Car Co. at a cost of $773,000. The car received collision damage at Suburban Station on January 27, 2004. Ex-NJ Transit Arrow II 1267, which was acquired for use on the SEPTA wire train, has been overhauled and renumbered 601. It (and it mate) are probably the sole surviving Arrow IIs, and replaces Blueliner 9125 as the rider car.

A solution to the Route 15/Girard Avenue LRT problem may be at hand. A plan has been developed which would involve tearing up two blocks of existing track on 59th Street and building a new track on the northbound side of the street. It was hoped that work would be completed by late November or December, coinciding with the delivery of the last of the 18 rebuilt PCCs from Brookville Manufacturing. Just before the streetcars were supposed to return, local residents protested to their elected officials about the loss of parking, and the project was put on hold. As it happened at almost the eleventh hour, schedules had already been published announcing the rail service. Details were reported in the July, 2004 ***Bulletin***. New schedules went in to effect on September 5 on SEPTA's City Transit Division. Some of the changes include a return to the normal routing for Subway-Surface Route 11, as track work has been completed. Because of heavier riding, AM peak hour Subway-Surface Route 36 service now has been improved with cars operating about every three minutes from 73rd Street &

MUNI double-ended PCC outbound passing thru Mission Dolores Park. This is one of four cars MUNI pulled out for the ERA during the 2004 ERA National Convention.

Elmwood Avenue to 13th & Juniper Streets from 7:10 to 7:41 AM. Thanks to member Lee Winson for these reports.

SEPTA is just one of many transit agencies in Pennsylvania that have no dedicated source of funding. That could change as a result of Transit Funding bills that were/will be submitted to the Pennsylvania Legislature by State Senator Stewart J. Greenleaf and State Representative John J. Taylor. Their legislation would lift a $75 million cap and dedicate and additional 3.2184% of the existing sales tax to benefit transit. Expectations are that this could generate approximately $282 million in this fiscal year.

The ***Delaware Valley Rail Passenger***, which is published by the Delaware Association of Rail Passengers, reported that the $567 million reconstruction of the western end of the Market-Frankford Elevated Line is being delayed. Some of the reasons are caused by the magnitude of the project, which has thousands of pages of drawings and specifications. There are also some conflicts in design, survey problems, ongoing design changes, and disputes among the various contractors, just to name a few. When completed, 11,000 feet of the current "L" support structure will be replaced. Trains will ride on new welded rail, two new crossovers will be constructed, and there will be new stations at 46th Street, 52nd Street, 56th Street, 60th Street, 63rd Street, and Millbourne. At those stations, passengers will find elevators, escalators, new waiting facilities, and art installations. As of August, the project was 500 days behind schedule and work was not expected to begin until next spring, by which time it could be 700 days. So far the only significant work that is evident is the new single-column structural support bents down the middle of Market Street, and the off-street construction of the new stations at 46th, 56th, 60th, and 63rd Streets.

Baltimore, Maryland

On June 7, MTA-MD restored service between North Linthicum and Hunt Valley. The service plan also provides for service to operate to Penn Station. This was possible due to completion of another section of the double-tracking project. Passengers must still utilize shuttle buses between North Linthicum and Cromwell (stopping at Ferndale) and North Linthicum/BWI Airport. It was anticipated that service would be fully restored this fall. This project, which began on February 28 (March, 2004 ***Bulletin***), will double-track 9.4 miles of the line. All work is scheduled to be completed in 2006.

Washington, D.C. area

In late August, Virginia Railway Express notified its passengers that it would soon be instituting random checks of trains by detection dogs. These visits by specially trained canines from a variety of federal, state, and local sources would be unannounced. The dogs will board, check one, two, or maybe all cars, and deboard. These inspections will not delay the train but a few minutes. Although there were no implied threats, VRE decided to take these measures as part of its ongoing security efforts.

A few days before the Labor Day weekend, VRE, as it usually does, notified riders that it would not be running trains on Labor Day. It did provide information on the Amtrak trains that would be operating on the Fredericksburg Line. Using its knowledge of ridership patterns, train consists were temporarily swapped for the Friday evening commute to provide more seating earlier in the afternoon.

Southwest Florida

Seminole County officials have hired a consultant to determine the feasibility of commuter rail service along the Seminole Gulf Corridor from North Naples to Arcadia in Lee and Collier Counties. The Seminole Gulf Railway would be the operator, using Colorado Railcar-type equipment. Thanks to member Dennis Zaccardi for the report from the ***Naples News***.

New Orleans, Louisiana

Members Bob and Judy Matten visited New Orleans and enjoyed riding on all of the streetcar lines, including the new Canal Street Line. Bob wrote that he was unable to find a map or timetable for this service. Even a visit to the New Orleans RTA headquarters produced no maps listing the streetcars, only the bus lines.

Chicago, Illinois

The biggest revision in a number of years has been made to Metra's UP-Northwest (Harvard) Line, in the timetables dated August 15. The primary change is to the Saturday service. Member Jim Beeler wrote that generally the schedule has a pretty good memory pattern. However, there were some unusual timings as a result of the service to Lake Geneva, Wisconsin which was discontinued in 1977, but those timings have remained. Who says railroads are slow to change? Off-peak outbound trains usually leave Chicago at :30; however, there were a 1:10 and a 5:20 PM express on Saturday (formerly Lake Geneva trains) plus a 5:05 PM local. The 1:10 has been moved to 1:30, the 5:20 express has been eliminated, and the 5:05 local has been moved to 5:30. There are now hourly Saturday outbound trains from 12:30 to 6:30 PM. The change Jim appreciates the most is the addition of a 10:30 PM outbound on Saturday. Previously there were an 8:30 PM and a 12:30 AM, which made going into Chicago for dinner or a play tough on a Saturday night. There is quite a bit of riding from the suburbs into Chicago on Saturday due to all the events in Chicago - most suburban people just do not want to drive. With the $5 weekend pass (good for both Saturday & Sunday) it is quite a bargain, and easy for the Conductors to sell since almost all suburban stations are closed on the weekend. (Ed. Note – that $5 pass has to be one of the best transit bargains around.)

When I visited Chicago two years ago, although it was during weekdays, this line was the only one that I did not ride because trying to ride it just did not fit in with all of the others that I rode. It remains the one I need to do the next time I get to Chicago.

Minneapolis, Minnesota

Member Neil Carlson, a long-time Minneapolis resident, wrote the following comprehensive report about his city's new light rail line. "One of the main reasons for the great success has to be the frequent service. The line started off not being timid, with service every 7½ minutes during both rush hours, every 10 minutes between rush hours, and 15 minutes before AM and after PM rush hours. Weekend service is every 15 minutes morning and

evening, every 10 minutes from 9 or 10 AM to 6 or 7 PM.

"Another reason for the success is that quality people that have been involved with the start up, such as Joe Marie. All transit professionals - no political appointees. Quite amazing they were able to attract the out-of-town rail transit professionals when you consider there is zero permanent transit funding for the Minneapolis-St. Paul area.

"The line has received lots of publicity in the press, mostly favorable. People (who) work in downtown Minneapolis are using the line to try new restaurants for lunch. They know if they miss the car, there will be another one in just 10 minutes. Quite a few restaurants along the line already reported a substantial increase in lunch business. In early August, there was a good article in the weekly Taste section of ***The Minneapolis StarTribune***, which reported about location, menu, and price at restaurants and taverns within a couple of blocks of the light rail line. So, their business is going to increase some more.

"I recently rode the line with a friend from Norwegian State Railways. We were driving from downtown Minneapolis towards Fort Snelling along Hiawatha Avenue. All the downtown-bound cars had standing loads at 6:30 PM, more than likely people headed to the baseball game. The parking lot at Fort Snelling (currently the farthest operating station from downtown) was full at 7 PM. Metro Transit had a 2 person temporary booth with people selling tickets because the machines can't put out the tickets fast enough (and there are not enough machines). We caught the 7 PM car, which had a lighter load (the baseball game began at 7:05 or 7:10 PM).

"The line currently serves one of the biggest traffic generators in the Minneapolis-St. Paul area, downtown Minneapolis. Target Center, which has the Timberwolves games and various concerts, is one short block from the first station. The Humphrey Metrodome, which has the Twins baseball, Vikings football, and University of Minnesota football, has the 4th station next door.

"When the line is in full operation (supposedly by December—maybe sooner) it will serve the 3 biggest traffic generators in the metropolitan area: downtown Minneapolis, MSP airport (somewhere between the world's 7th to the world's 12th busiest airport, depending on whose figures you use), and the Mall of America (the USA's largest shopping center; the 2nd largest shopping center in the world)."

"Our current Governor, who was anti-transit, has now changed his mind. He has even arranged for money to get the next project started, commuter trains on the former Northern Pacific (now part of Burlington Northern Santa Fe) from Big Lake to Minneapolis. The Lieutenant Governor, who was rabidly anti-transit, has not been heard from since the light rail line opened. Possibly she has a piece of crow stuck in her throat. This is some of the best service the Twin Cities have had since the heyday of Twin City Rapid Transit (the private company). I hope it can last."

Neil also wanted to correct something that appeared in the September ***Bulletin***, regarding the switches being one block away. "The line runs along 5th Street and the last station is between First Avenue North and Hennepin Avenue (which is named for Father Louis Hennepin – a French explorer, who reached what is known as Minneapolis in 1680). There are two crossovers (not diamonds) between Hennepin and Nicollet Avenues which are one block apart. If the outbound track at the last station is clear, the inbound train uses the westerly crossover to enter the station on the outbound track. If not, it will enter the station on the inbound track and depart using the easterly crossover. Trains on both tracks do not have to enter the terminal on the same track. The line is double track all the way from Ft. Snelling to the station between Hennepin/First Avenue North."

Salt Lake City, Utah

Metra has been getting rid of its older gallery cars as new cars enter service. The latest "customer" is the Utah Transit Authority, which acquired 30 of them starting in July. They would be used on the commuter rail route between downtown Salt Lake City and Ogden, which is tentatively scheduled to open in about three years. Although the 30-year-old cars came at no cost (just $1,600 each for shipping), UTA will have to spend between $500,000 and $750,000 per vehicle for overhauls and upgrades to make them ADA-compliant. However, noted UTA commuter rail project manager Steve Meyer, they are in relatively good condition. "These were in service a month an a half ago," Meyer told the ***Deseret News*** on July 29. "This is an opportunity to have these cars. Granted, they aren't the new beauties, but we can fix them up."

San Juan, Puerto Rico

It has been a long time since there has been news about *Tren Urbano*. One of our members reported that the system was to be tested for seven days beginning August 19. A part of this test required trains to operate at two-minute headways.

From the History Files

20 Years Ago: On October 10, 1984, NFT Metro in Buffalo started service to six stations between Auditorium and Theater, a distance of 1.2 miles. Over the next two years the system reached its current length with extensions to Amherst and South Campus. Plans for other expansions have gone nowhere due to lack of funding.

10 Years Ago: On October 7, 1994, Denver RTD initiated service on its first light rail line, between I-25/Broadway and Downing. There were 15 stations on this 5.3-mile line. Extensions were added in the following years, and more routes are planned. Denver's first streetcar era ended on July 3, 1950. ***Headlights*** for July, 1950 reported that with the abandonment of the narrow-gauge Denver Tramway's last car line (Colfax), Ft. Collins got the distinction of being Colorado's only trolley system. Ft. Collins held that title for almost a year before it, too, ended service on June 30, 1951. In 1985, the Ft. Collins Municipal Railway Society, a non-profit group, began operation of a 1.5-mile-long line using cars that previously ran in Ft. Collins.

News items and comments concerning this column may be emailed to NYDnewseditor@aol.com.

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For general inquiries, contact us at era@inch.com or by phone at (212) 986-4482 (voice mail available). ERA's website is: www.electricrailroaders.org

Editorial Staff:
Editor-in-Chief: Bernard Linder
News Editor: Randy Glucksman
Contributing Editor: Jeffrey Erlitz

Production Manager:
David Ross

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