

# *Grand Central Terminal*

Railroads, Engineering,  
and Architecture in  
New York City

KURT C. SCHLICHTING

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GRAND CENTRAL TERMINAL

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# TERMINAL

*Railroads, Engineering, and Architecture in New York City*

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*Frontispiece:* Grand Central Terminal from 42nd Street.

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TO

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## P R E F A C E

The story of my connection to Grand Central Terminal in New York begins at a very tender age, with fond memories of train trips to New York with a grandmother who worked as a clerk for the New York, New Haven, and Hartford Railroad. Naturally, the trip to New York ended majestically at Grand Central. Holding hands, we ventured across the floor of the Grand Concourse, engulfed by the hurry of New York. I clutched her hand tighter for fear of becoming parted and being carried away by the dashing crowd. When I became a little older, highlights of each summer in the mid-1950s were trips with my grandfather to Grand Central and then on to the Lexington Avenue subway to the Bronx and the Mecca for all ten-year-old boys—Yankee Stadium. My grandfather and I always stopped for lunch at Volks, a German restaurant close to Grand Central; the restaurant is long gone, a victim of the relentless development pressures in the area around 42nd Street.

For young people growing up in Fairfield County, a rite of passage became a trip alone, not with grandparents or parents but with friends, to “the city,” as everyone referred to New York. Viewing ourselves as quite sophisticated, we sauntered through Grand Central and then out onto the magical streets of New York. We might venture to a museum or, as we got older, to McSorely’s to test our “proof,” but as the day wore on we returned to Grand Central and the embrace of our commuter train for the trip home.

My true coming-of-age occurred when I moved to New York for

## *Preface*

graduate school at NYU. Grand Central remained the nexus for visits home or to friends who still lived in the distant suburbs. My first teaching position, at Queens College, involved the subway to Grand Central and then down to the Flushing line for the trip to Flushing in Queens and the bus to the campus.

This book began with research for a scholarly paper on social change in New York City at the turn of the century, including the construction of the “new” Grand Central Terminal, opened in 1913. A number of my sources cited the papers of William J. Wilgus in the manuscript collection of the New York Public Library. Examining the Wilgus papers, I realized what a treasure they represented. Wilgus, the chief engineer of the New York Central Railroad at the turn of the century, was a meticulous documenter. The papers recording his ideas for and work on Grand Central fill carton after carton. Here, in great detail, was the record of the creation of the magnificent terminal complex on 42nd Street. Several journal articles followed, but I also realized that the story of the construction of the Grand Central complex that we see today waited to be recounted. Wilgus’s notes and private records detail the complex engineering involved and also the human drama behind the creation of one of New York’s masterpieces. The Wilgus papers led me to the New York Public Library’s vast collection of the records of the New York Central Railroad and its brief successor, the ill-fated Penn Central. Two other pioneering electrical engineers, Frank Sprague and Bion Arnold, also left substantial collections of materials to the library, and these resources proved invaluable as well.

The story of the creation of Grand Central brings together a number of important themes of New York’s history: the forces for urban change, powerful individuals, brilliant engineers, and the dynamic influence of technology on history. Without the successful introduction of electricity to power the trains to 42nd Street, the building of the new terminal and an accompanying two-story underground train yard stretching many city blocks to the north would have been impossible. Grand Central, more than any other building complex in New York, captures the vibrant energy of the city and represents American drive and genius at its best.

## A C K N O W L E D G M E N T S

The effort to write this book involved the assistance of many people and institutions. Only with their help and encouragement was I able to complete the project.

The papers of William J. Wilgus, part of the manuscript collection of the New York Public Library, served as a major resource. Melanie Yules, senior archivist at the library, provided priceless support. Despite repeated requests for just one more box from the collection, she always maintained a smile, even as closing time approached. At the end of a long afternoon, as I prepared to leave the Manuscript Room, she asked in passing, “Have you looked at the ‘secret file’ about the Woodlawn wreck, in box 7?” This led to Wilgus’s private records concerning a disastrous wreck in the Bronx which occurred just as the new electric engines entered service. Ms. Yules also assisted with the New York Central Railroad materials as well as with the Frank Sprague and Bion Arnold archives. I owe the New York Public Library gratitude for its unceasing efforts to maintain its superb resources. The recent restoration of the main reading room makes a day at the library that much more rewarding.

The librarians and staff at the Fairfield University library also deserve my thanks. They patiently processed scores of interlibrary loan requests for journal articles from the turn of the century and before. No matter the number of requests, the staff always worked diligently to track down each journal or newspaper reference.

A number of research trips included visits to the Schenectady Museum

## *Acknowledgments*

in Schenectady, New York, which has a valuable collection of historical materials from the General Electric Company, which played a major role in the Grand Central electrification. John Anderson's assistance made my time there productive, and he helped select photos from the museum's collection. The librarians at the Pierpont Morgan Library in New York guided me through the syndicate books of J. P. Morgan and Company, who financed construction of the terminal.

The curators in the Library of Congress Prints and Photographs Division facilitated my locating photographs from the library's extensive collection recording the passage of American history. Mary Ison responded patiently to questions regarding permission to publish from the library's collection, and Kathryn Engstrom of the Geography and Map Division assisted in selecting the historic Sanborn insurance maps of the Grand Central area. Holly Hinmus at the New-York Historical Society served as a key resource in obtaining copies of the society's recently acquired photos of Grand Central's construction.

George Walker, superintendent of the Metro-North Commuter Railroad, and Dave Treasure graciously conducted a tour of the underground train yard, including a descent into the labyrinth of tunnels under the terminal. Mr. Walker's insights into the challenges Metro-North faced with the Grand Central renovations were valuable in filling out the story of the terminal's rebirth. Frank English, Metro-North's talented photographer, helped select the photos from the railroad's collection which grace the text. Mr. English took most of those photographs.

The Alfred P. Sloan Foundation of New York provided financial support for completion of the book. Doron Weber, senior officer, maintained a steadfast belief in the project. A grant from the Sloan Foundation allowed me to take a sabbatical leave to complete the manuscript. The grant also paid for reproduction of the photographs in the book, which come from the collections of the Avery Architectural Library, Columbia University, the New-York Historical Society, the Library of Congress, the New York Public Library, the Museum of the City of New York, and the Schenectady Museum. Many of the photographs have never been published before.

Bob Brugger, my editor at the Johns Hopkins University Press, worked with me from my initial contact through to the completion of the book.

His patience and strong sense of the shape of the story proved invaluable. Anne Whitmore's conscientious manuscript editing contributed enormously. Melody Herr and Martha Farlow, the art director at the press, kept track of hundreds of details. Any errors or omissions in this book are solely mine.

On a personal level, I have many others to thank. During my education I encountered a number of wonderful teachers. In particular, Arthur Anderson and Leo Fay from my undergraduate days at Fairfield University and Richard Maisel at New York University made indelible impressions on me. It is difficult to find the proper words to thank my most loyal supporter and most insightful critic, my wife, Mary. She read every word of every version of the manuscript and her counsel proved always to be wise. I know at many stages I tried her patience. Mary's most difficult task was to occupy our daughters, Kerry and Kara, who never could understand why I had to spend so much time at the computer or days at the library in New York. Mary's own experience served her well. Completing her Ph.D. in English at New York University, she wrote her dissertation after the birth of our daughters and earned a special distinction—Ph.D. with twins. Finally, I owe a debt of immense gratitude to my wife's parents and especially to my parents, who conveyed to me the gift of imagination. I hope that this book reflects that imagination.



GRAND CENTRAL TERMINAL





## *Prologue*

Few buildings capture the public imagination as does Grand Central Terminal, the very mention of whose name brings to mind Beaux-Arts magnificence on 42nd Street in New York City. Standing in the heart of midtown Manhattan, the terminal serves as an urban crossroads. Thousands pass through the Grand Concourse every day. Commuters hurry by. Visitors pause in the city's great public square. For millions, even for those who have never visited the terminal, Grand Central remains a symbol of New York and its power, instantly recognizable for what it is and nearly as familiar as the soaring skyline of Manhattan Island.

Not surprisingly, a great many New Yorkers gathered on October 1, 1998, to celebrate and rededicate the newly refurbished Grand Central. "Once threatened with demolition, gnawed by decades of urban grime, obscured by ungainly advertising, corroded by roof leaks and just plain unloved by the 500,000 people who sprint through its cavernous halls each day on the way to somewhere else," observed the *New York Times*, Grand Central reopened as an illustrious place—"a destination in its own right." With sunlight piercing its windows and skylights and matching marble staircases gracefully drawing attention to a platform of notables on the east side of the main concourse, the eighty-five-year-old structure was "once again so imposing that it dwarfed those who came to praise it during the spirited rededication ceremony."<sup>1</sup> Cynical New Yorkers

Image not available.

*A statue of Mercury  
tops the 42nd Street  
facade of Grand Cen-  
tral Terminal, the  
gateway to the greatest  
city in the world*

remarked that the Metropolitan Transportation Authority (M.T.A.), the public agency responsible for Grand Central's rebirth, might have saved the money it spent that day on a laser light show and the Big Apple Circus; at one point a trapeze artist dangled from the ceiling of the concourse, more than one hundred feet above the floor, as the sounds of Gershwin's *Rhapsody in Blue* echoed through the building.

Yet voices of approval reigned. One speaker on the platform, Virgil Conway, chairman of the M.T.A., declared, "We put the *grand* back into Grand Central," and no one disputed him. "We have not just brought back the historic grandeur," added the governor of New York, George Pataki; "We have prepared it for the twenty-first century."<sup>2</sup> John F. Kennedy Jr. accepted a plaque honoring the role his mother, Jacqueline Kennedy Onassis, had played in saving Grand Central from destruction. "If the city could be characterized by one building, it would be Grand Central," reflected a leading paper in nearby Connecticut. "Gleam on, Grand Central. You look like the grand dame of American landmarks."<sup>3</sup> The architecture firm of Beyer Blinder Belle was responsible for the overall restoration, earning the role based on its success with earlier his-

Image not available.

*The Grand Concourse, New York's civic cathedral, ca. 1925*

*Prologue*

*One of the constellations in the restored ceiling of the Grand Concourse*

Image not available.

Image not available.

toric preservation projects that included the renovation of Ellis Island and the South Street Seaport Museum in New York. Speaking for the firm, John Belle summed up the reaction of many visitors: “I can’t tell you what it does to an old architect’s heart to stand in the main concourse and see how much people are enjoying that space and responding to it. This classic building is New York for New Yorkers.” He judged Grand Central among the greatest buildings in the United States.<sup>4</sup>

No praise seemed adequate to capture Grand Central’s rebirth. Perhaps the exuberance stemmed from the realization that, except for a fortuitous chain of events in the late 1960s and early 1970s, the terminal’s glory could have vanished. Just a little south and west, on 34th Street, Madison Square Garden stands where once one could find New York’s other monument to rail travel, Pennsylvania Station. Penn Station’s destruction in 1965 registered a singular failure of public imagination, the weakness of

*The waiting room,  
Vanderbilt Hall,  
restored*

## *Prologue*

public support for the cause of preserving New York's architectural heritage. "Now," commented Fred Koetter, former dean of the Yale School of Architecture, "they are recognizing the value of a place like Grand Central. This means that public consciousness of the city has come a long way."<sup>5</sup>

Always more than a mere railroad terminal, Grand Central represents a triumph of imagination and daring. In 1903, when construction began, only thirty-eight years had passed since the end of the Civil War, and yet the country had experienced vast changes. Technology had transformed daily life for many Americans, who had witnessed extraordinary demographic change, as well. In 1890 the Census Bureau reported the closing of the American frontier; ten years later, almost as many Americans lived in cities as on farms. Supplying a good example of urban American confidence and exuberance, Grand Central marked the emergence in America of a distinctive building art—a combination of imaginative architectural design and innovative engineering. To some of the people living through these changes, their impact seemed ominous. Henry Adams, a Harvard professor and the grandson and great-grandson of presidents,

*Eagles from the 1898  
Grand Central being  
moved to the new  
Lexington Avenue  
entrance*

Image not available.

had traveled to Chicago in 1893 to visit the Columbian Exposition, where no one could doubt America's coming-of-age. "One lingered among the dynamos," Adams later wrote, "for they were new, and they gave history a new phase." It was being declared that this new age required new men, and to Adams no one better exemplified these "new men" than the professional engineers and managers who had built and were building the country's far-flung railroads, and no place better demonstrated the physical effects of such change than New York. Returning in 1905 after a long absence, he compared the city with the New York he remembered from 1868: "The outline of the city became frantic in its efforts to explain something that defied meaning. Power seemed to have outgrown its servitude and to have asserted its freedom. The cylinder had exploded, and thrown great masses of stone and steam against the sky."<sup>6</sup>

Along with Edison's practical electricity, Bell's telephone, the first skyscrapers, the city subway system, and the Brooklyn Bridge, Grand Central symbolized the era that historian and critic Howard Mumford Jones called simply the "Age of Energy."

## CHAPTER ONE

### *The Commodore's Grand Central*

During the first half of the nineteenth century, New York grew at a frenzied pace, with residential and commercial development continuing a relentless march up the island of Manhattan. New Yorkers once considered Canal Street the city's northern border; later Houston Street and then 14th Street came to be regarded as the northern limit. A new form of transportation appeared in the teeming city when, on November 26, 1832, the Harlem River Railroad began rail service in lower Manhattan. It ran at grade level in the middle of the street. First horse-drawn cars and later steam-powered trains thundered up and down Fourth Avenue, and as New York grew at a breakneck pace, the public increasingly objected to the disruption caused by the Harlem's trains traveling on city streets. Once the railroad switched to steam power, public criticism only magnified. While steam engines seem now to evoke a sense of romance and nostalgia, in reality they generated clouds of steam, soot, and gases, which the public, in a crowded city like New York, objected to in the strongest terms.

The Harlem's original charter prohibited the railroad from operating steam locomotives south of 14th Street. As the Harlem's traffic grew, the company needed an additional station, so, working within the limitation placed upon it, in 1845 the railroad built a station at 26th Street on Fourth (now Park) Avenue (later the site of the first Madison Square Garden).

The station consisted of two parallel wings separated by a covered platform area. Because the steam trains could not proceed below 14th Street, they waited at 26th Street for the horse-drawn cars coming up Fourth Avenue from the south. Passengers then transferred to the steam-powered train for the rest of the run northward to Harlem, the Bronx, or eventually into Westchester County.

As the city grew northward, the area around the Harlem's 26th Street station developed. As more people and businesses moved to the immediate area, public objections to steam operations at 26th Street followed. In 1859, the City of New York placed further limits on the Harlem and required the railroad to move its steam operations farther north. This time the city prohibited the operation of steam trains on the city's streets below 42nd Street. Bowing to public pressure, the Harlem relocated its rail facilities to property it owned on 42nd Street. Soon, a domineering figure entered the affairs of the Harlem River Railroad; as Cornelius Vanderbilt assembled his railroad empire, he set in motion the forces that led to the building of Grand Central Terminal on the Harlem's property at 42nd Street.

### *Cornelius Vanderbilt, "The Commodore"*

Cornelius Vanderbilt's life began inauspiciously. Born to Jacob and Phoebe Van der Bilt, as the family then spelled their name, in May of 1794, Cornelius spent his childhood on the family farm on Staten Island. Apparently he finished an indifferent schooling at the age of eleven; for the rest of his life he remained an atrocious speller and read little but the daily newspapers. Vanderbilt began his working career operating a sail-driven ferry between Staten Island and Manhattan. Ever ambitious, he acquired larger and larger boats and eventually expanded to carrying freight along the Atlantic Coast and Long Island Sound.

Vanderbilt's fortunes grew dramatically during the gold rush to California in 1849, when he successfully organized a combined sea and land route from New York down to Central America, across Nicaragua, and then up the California coast to San Francisco and the gold fields beyond. Early in 1853, Vanderbilt boasted to a friend that his fortune exceeded \$11,000,000. Even greater triumphs followed during the Civil War, when

*Cornelius Vanderbilt,  
"The Commodore"*

Image not available.

the Union navy contracted to lease Vanderbilt's growing fleet of ships to supply Union forces blockading the South. Vanderbilt earned handsome fees for leasing his ships to the Northern cause, and after the war President Grant awarded him a medal for his contributions to the Union victory. Vanderbilt also enjoyed great success with his Hudson River steamboats, which operated between New York and Albany carrying the lucrative passenger and freight trade moving over the Erie Canal to the Midwest.

Vanderbilt's fortune placed him among the wealthiest individuals in the country by the time he reached his late sixties. At an age when many would have considered a leisurely retirement, he began a new career—railroading. With his characteristic drive and ruthlessness, in a stunningly brief period of time, Vanderbilt assembled an extensive railroad empire and in the process became the wealthiest man in the United States—some

claimed the wealthiest in the world. Vanderbilt's railroad empire started modestly when he began to increase his holdings in the Harlem Railroad in 1862.

### *The New York and Harlem Railroad*

Although the New York and Harlem Railroad's main line tracks never extended more than 132 miles from New York City, the Harlem possessed one asset of immense value: the right of direct rail access to the east side of Manhattan Island. In 1831, the company received a franchise to build a railroad from lower Manhattan to the village of Harlem on the northern tip of the island. Legislation passed by New York State on April 25, 1831, gave the Harlem broad discretion as to the location of the rail line, giving it "power to construct a single or double railroad or way from any point on the north bounds of Twenty-third Street to any point on the Harlem River between the east bounds of Third Avenue and the west bounds of the Eighth Avenue with a branch to the Hudson River between One Hundred and Twenty-fourth Street and the north bounds of One Hundred and Twenty-ninth Street, to transport, take and carry property and persons upon the same by the power and force of steam, or animals or any other mechanical or other power, or any combination of them which the said company may choose to employ."<sup>1</sup>

The Harlem chose to construct its rail line, linking Harlem to lower Manhattan, down Fourth Avenue, later to become the world-famous Park Avenue. At first the tracks consisted of strips of wood with iron strapping nailed on top; passengers rode in open carriages pulled by teams of horses. With less than a mile of track, the first section of the Harlem, from Prince Street on the Lower East Side to Union Square at 14th Street, opened on November 26, 1832, with a one-way fare of one cent. It took an additional two years for the Harlem to reach Yorkville, the neighborhood at 86th Street, four and a half miles north of Prince Street. Finally, in October of 1837, the Harlem Railroad's track arrived at the village of Harlem, long delayed by the hard rock of Observation Hill, near 96th Street, which required the blasting of a tunnel at great expense. Harlem, a farming community first settled by the Dutch, served as a location for the estates of prosperous New Yorkers who retreated there

during the sweltering summer months. Before the arrival of the railroad, a stagecoach line on Third Avenue and a ferry from 125th Street provided transportation to and from the city.

After successfully petitioning the state legislature to extend its rails north into the Bronx and Westchester County, the Harlem opened service to White Plains on June 1, 1844, and further north to Dover Plains in December of 1848. Tracks finally reached Chatham, in Columbia County, in January of 1852. At Chatham, 132 miles from Manhattan, the Harlem Railroad connected with the Boston and Albany Railroad. Now a traveler could leave lower Manhattan, ride the Harlem to Chatham, switch trains, and continue on to Albany or Boston.

By the 1850s the Harlem operated three types of service: intracity travel for passengers traveling from lower Manhattan to Yorkville or Harlem, suburban commuter service to White Plains and the eastern portion of Westchester County, and through service to Chatham with connections to Albany and Boston. In addition, the Harlem signed an agreement with the New York and New Haven Railroad in 1848 allowing the New Haven joint use of its tracks and terminal facilities from Woodlawn in the Bronx to lower Manhattan. Since the agreement with the New Haven extended for four hundred years, this second railroad played a role in Grand Central's history.

The Harlem deliberately chose an inland route from the Hudson River, so as not to antagonize the powerful Hudson River steamboat companies. Before the Civil War, steamboat lines, including Commodore Vanderbilt's, dominated travel between New York and Albany, providing fast, efficient, and inexpensive service. The Harlem Railroad wisely chose not to compete with the Hudson River steamboats and built its line to serve the inland portion of Westchester, Putnam, Dutchess, and Columbia counties, which were rural and agricultural. Little industry ever developed there, and to this day the area remains pastoral, populated by wealthy suburbanites and a few dairy and apple farms. Even as late as the 1890s, the Harlem ran only three passenger trains and one freight train each day between New York and Chatham. Service to rural Pawling, Millerton, or Boston Corners hardly made for a great railroad empire.

When the Harlem introduced steam locomotives to New York in 1837, it had required a facility in Manhattan to service the steam engines.

The company chose 42nd Street as the location for a maintenance barn and fuel lot. The earliest accounts of the Harlem Railroad record a number of property transactions, totaling \$56,262, for the land between 42nd and 43rd streets on the west side of Fourth Avenue. As the Harlem's steam operations in New York expanded, the railroad acquired additional land around its original 42nd Street property, purchased during the 1830s and 1840s. In 1859, it bought the land between 42nd and 43rd streets east of Park where Grand Central Terminal now stands. In May of 1860, the Harlem paid \$5,957 for an "engine house, filling up lots, laying tracks etc." on the site. Later expenses involved construction of a new facility to service wood-burning steam locomotives and cars as they replaced horse-drawn rail cars. The Harlem's books showed the value of the real estate where Grand Central now stands as \$2,379,414.95. Ultimately the railroad bought eleven parcels of land in the area from 42nd to 48th streets between Lexington and Madison avenues. This land comprised the Harlem's second precious asset: property in midtown Manhattan that eventually became among the most valuable real estate in the world.<sup>2</sup>

The Harlem Railroad's rapid expansion up Manhattan Island into the Bronx and beyond to Westchester County and north Chatham required significant expenditure and the company's debts mounted. While passenger traffic in Manhattan grew substantially, the railroad's freight business north of the city languished; the Hudson River steamboats continued to transport the bulk of the freight traffic between New York and Albany. In 1863, the Harlem could not afford to pay any dividends and its stock declined to a low of \$9 a share before recovering somewhat as summer approached. Quietly, Vanderbilt began to purchase more Harlem stock, acquiring 55,000 shares in 1862, and he hatched a complicated plan to improve the fortunes of the railroad and make himself a substantial gain. With Vanderbilt's guidance, the Harlem petitioned the Common Council of the City of New York for a franchise for a streetcar line up Broadway. With the franchise in hand, the company's money problems would disappear, he thought.

Vanderbilt did not account for the deviousness of the members of the Common Council and his numerous enemies, who included Daniel Drew. An illiterate former cattleman, Drew had held a deep-seated animosity toward Vanderbilt from the time he started his own Hudson River

### *The Commodore's Grand Central*

steamboat line in 1834 in direct competition to Vanderbilt's steamboats. Their relationship worsened after Drew became a director of the Erie Railroad in 1857. As the vote of the Common Council on the Harlem's street franchise neared, in the hot summer of 1863, Drew and his allies planned to sell their Harlem stock short as the stock rose in anticipation of the new franchise. With the Common Council suitably bribed, Drew eagerly awaited a sharp drop in Harlem stock once the council voted to deny the railroad its franchise for a street railway on Broadway.

Just as Drew planned, on June 25, the Common Council denied the Harlem Railroad the new franchise and its stock dropped from \$110 to \$72. However, Drew and the corrupt politicians on the council underestimated Vanderbilt. The Commodore, along with family, friends, and stockbrokers, continued to buy Harlem stock and, as Drew and the astounded councilmen looked on, Harlem stock leveled off and then began, slowly, to rise. Vanderbilt committed a major part of his fortune to the Harlem, and soon the price moved past par and quickly spurted to \$125 and then \$150, to the dismay of the short sellers who had guaranteed to deliver—at \$110. Vanderbilt held the stock in his safe and demanded a king's ransom—\$180 per share. Drew and his greedy friends on the council lost \$70 on each share they sold short. Vanderbilt made yet another fortune from the “Harlem corner,” and he gained control of his first railroad. As the Commodore's first biographer, William Croffut, observed in 1886, this was the venture that would lead him to the greatest fortune in the world.<sup>3</sup>

### *The Hudson River Railroad*

The Hudson River Railroad formed the second piece of Vanderbilt's rail empire. As with many railroads, the Hudson began with the dreams of a group of local businessmen and boosters in a small city, Poughkeepsie, New York, located on the east bank of the Hudson River fifty miles north of New York City. The Hudson River steamboat lines made stops at Poughkeepsie but provided limited service, preferring to concentrate their energies on the much more lucrative traffic between New York City and the state capital, Albany; and during the winter months the steamboats suspended service, virtually cutting off the city. Poughkeep-

sie's leaders reasoned that if a rail line linked Poughkeepsie to New York their city would prosper.

In 1846, the New York State legislature passed a law incorporating the Hudson River Railroad and granting it a franchise to construct a rail line along the east bank of the Hudson River, entering Manhattan at Spuyten Duyvil, at the northern tip of the island, and then running along the west side to lower Manhattan. Offering direct rail access into Manhattan, the Hudson River Railroad's franchise represented as valuable an asset as the Harlem's. However, the Hudson's franchise restricted it to the west side of Manhattan, while the city's residential growth remained concentrated on the east side. As New York's population expanded up the island, fashionable residential development characterized the east side while the west side evolved as more industrial, especially with the shipping businesses along the piers lining the Hudson River. The Hudson Railroad's freight business proved to be very lucrative; a major share of the country's international trade crossed the piers lining the Hudson River, served by the tracks of the railroad.

The original backers of the Hudson River Railroad encountered much higher construction costs than they anticipated when building the line from Poughkeepsie to New York City, and the tracks did not reach Canal Street, in lower Manhattan, until 1847. Despite the fact that traffic remained below projections, the Hudson River Railroad kept extending its line, north of Poughkeepsie, until in 1851 it reached East Albany, directly across the Hudson River from Albany. With the expansion to the Albany area, the railroad ran for 155 miles along the east side of the Hudson River, from Chambers Street in lower Manhattan to East Albany. By that time, construction costs had consumed all of the original capital and the railroad slid into debt. Despite the income from its freight business, during the 1850s the company fell into poor financial condition, ripe for a takeover.

At the same time that Vanderbilt gained control of the Harlem Railroad, he turned his eyes on the Hudson and quietly began to acquire its stock as well. He used profits made from leasing his steamships to the Union navy during the Civil War to buy additional shares of the Hudson; by the winter of 1863 he controlled the railroad. The Commodore stood poised to dominate rail service to New York; his Harlem road held the

exclusive right to the east side of the city and the Hudson to the west side. Competing railroads, the Pennsylvania and the Erie among them, operated at a severe disadvantage. Their tracks approached New York City but reached only as far as the New Jersey side of the Hudson River; they lacked the all-important direct rail access to Manhattan. Passengers and freight arriving in Jersey City or Hoboken had to be loaded onto ferries for the remaining part of the journey to New York. Vanderbilt, although approaching his seventieth birthday, had shrewdly pulled off a great triumph: he alone controlled direct rail service to the preeminent city in the land.

To increase efficiency, Vanderbilt planned to merge the Hudson with the Harlem. For this he needed enabling legislation from New York State, and the Commodore again found himself enmeshed in politics and embattled with Daniel Drew. Vanderbilt traveled to Albany in 1864, with plenty of money to secure the necessary votes from the politicians in the legislature. Drew, seeking revenge for the “Harlem corner,” decided to bribe the politicians himself, prevent the merger bill from passing, and sell Harlem stock short for a second time.

Once again Vanderbilt faced ruin at the hands of Drew and a group of corrupt politicians. Persuaded by Drew’s money, the legislators, sure that Vanderbilt was in no position to fight back, sold Harlem stock short, risking as much as each dared. Then they voted down the consolidation bill. The price of Harlem stock had risen to \$150 in anticipation that the merger would lead to increased earnings. After the legislative defeat, it dropped to \$90.

Just as in the Harlem corner, the Commodore fought back tenaciously, eventually acquiring every share of Harlem stock available on Wall Street. Left with no stock of their own, the short-sellers came to Vanderbilt and asked what price he wanted for his shares. Without hesitation, he demanded \$1,000 per share, sending a shudder through Wall Street; many speculators faced utter ruin. In the end, Vanderbilt agreed to sell Harlem shares for \$285, saving a number of Wall Street brokerage houses. But many corrupt legislators in Albany who, along with Daniel Drew, had sold Harlem short, suffered heavy losses. Vanderbilt’s profit totaled \$25,000,000.

Although the Commodore won the second Harlem corner, he failed

to obtain the necessary legislation to merge his two railroads. Unfazed, he decided to operate them as if they constituted a single line, and he set out to improve both railroads. At this time, William Henry Vanderbilt, the Commodore's oldest son, entered the management of the expanding railroad empire, becoming president of the Hudson River Railroad.

Fresh from his two victories over Daniel Drew and the politicians in New York City and Albany, Vanderbilt sought to expand his railroad holdings further. He turned his attention to the New York Central Railroad in upstate New York. If he gained control of the Central, his railroad empire would extend from New York City to Buffalo. From there he could look westward to the great city rising on Lake Michigan—Chicago—the goal for all major eastern railroads.

### *The New York Central*

The mighty New York Central Railroad started life quite modestly, in the middle of the nineteenth century, as a series of small railroads in upstate New York linking Albany and Buffalo. These small railroads, their names long forgotten by most people, followed the route of the famous Erie Canal, built by the State of New York and completed in 1825.

Between Albany on the Hudson River and Buffalo on Lake Erie lies a geographical feature significant to the entire North American continent. From Alabama north to Newfoundland stretch the Appalachian Mountains, separating the East Coast from the rest of the country. Only one location offers a wide, water-level gap in the Appalachian Mountain chain—upstate New York.<sup>4</sup> The passageway follows the Hudson River north from New York City to Albany, then west up the Mohawk River Valley to Syracuse, and finally over gently rolling countryside to Rochester and Buffalo. Providing the easiest route between the middle and northern Atlantic states and the Midwest, this gap, known as the “water level” route, played a prominent role in the early settlement of the territory beyond the original colonies, in Ohio, and beyond to Chicago and St. Louis.

After the United States completed the Louisiana Purchase in 1803, debate ensued over the question of “internal improvements” to provide communication between the thirteen original states and the vast new

territory beyond the Appalachian Mountains added by the Purchase. At the beginning of the nineteenth century, "internal improvements" meant roads and canals. In 1808, Albert Gallatin, Thomas Jefferson's secretary of the treasury, published "Report on Roads and Canals," in which he urged the federal government to take the lead in financing national roads and canals to link the East with the new territory. A fierce debate ensued over whether the federal government had the power to finance these internal improvements or whether they must be left to private enterprise or the individual states. No clear consensus emerged on the national level regarding federal financing of roads and canals, so private enterprise and the states seized the initiative and created the much-needed communication links with the far-flung regions of the country.

New York, under the farsighted leadership of Governor DeWitt Clinton, undertook the greatest internal improvement of the age, a canal from Albany to Buffalo using the water level route along the Mohawk River Valley west to Lake Erie. In the spring of 1817, the State of New York appropriated the first funds and, after a prodigious effort, the canal opened in 1825. At the time the longest canal in the world, stretching for more than 363 miles, it proved an immediate success. Transportation costs from the Midwest to New York City declined dramatically, and the volume of goods shipped over the canal exceeded all expectations. Once the canal opened, the cost of shipping a barrel of flour from Ohio to New York declined from \$12 to \$1. By 1840, New York handled more of the nation's grain than did New Orleans, at the mouth of the Mississippi River. Making superb use of the Appalachian Mountain gap, the Erie Canal ensured the emergence of New York City as the greatest port in the country. In the space of a few years, the Erie Canal succeeded beyond the dreams of even its most ardent backers and solidified New York state and city's leading role in the economic life of the country.

Despite its success, the Erie Canal suffered from a number of limitations. In the first place a canal could not operate year-round. In the winter months, all transportation on the canal ceased. Although the canal was never intended to be primarily a means of transporting people, the passengers it did carry found the trip slow and uncomfortable. Erie Canal barges became notorious for their filth and the slovenliness of their bargemen.

Almost as soon as the Erie Canal opened, the development of the first

practical steam locomotives inspired businessmen in upstate New York, led by George Featherstonhaugh from Duanesburg, New York, near Albany, to dream of a railroad paralleling the route of the canal. A railroad would provide year-round service and promise passengers a quicker and more comfortable form of transportation. Featherstonhaugh, aware of the rapid progress of steam railroads in England, secured the backing of Stephen Van Rensselaer, a powerful figure in New York State politics; and together they planned to build a railroad between Albany and Schenectady, a distance of only sixteen miles. The mighty New York Central, eventually the cornerstone of the Vanderbilt railroad empire, began with Featherstonhaugh and Van Rensselaer's modest rail line, the first in the series of railroads along the water level route from Albany to Buffalo.

On December 19, 1825, Featherstonhaugh and Rensselaer petitioned the state legislature for a charter to incorporate the Mohawk and Hudson Rail Company to construct a rail link between Albany and Schenectady. Five years later, the first passenger trip drawn by a steam locomotive in New York State, appropriately named the "DeWitt Clinton," took place, on August 9, 1831. By 1834 the Mohawk and Hudson advertised five departures daily from Albany, at 9:00 and 11:00 A.M., and 3:00, 5:00, and 9:00 P.M.; with three return departures from Schenectady, at 12:00, 3:00, and 8:30 P.M. Passengers paid a one-way fare of fifty cents.

The next link in the chain to Buffalo covered a substantially longer distance than the Mohawk and Hudson's sixteen miles. On August 29, 1833, the Utica and Schenectady Railroad secured a charter to provide passenger service between those two cities, a distance of seventy-eight miles. However, the power of the Erie Canal interests remained vigilant, and the state legislature prohibited the new railroads from carrying "property of any description except the ordinary baggage of passengers."<sup>5</sup> Not until 1844 did the railroads finally obtain permission to carry freight, and then only when the canal closed down for the winter.

The Utica and Schenectady carried its first passengers on August 1, 1836. A line between Syracuse and Utica opened in 1839, as did the Auburn and Syracuse Railroad further to the west toward Buffalo. The next line west, the Auburn and Rochester, chartered in 1836, began service in 1841. Four other small railroads followed, completing the links to Buffalo in 1843; it now became possible to travel the entire distance

from Albany to Buffalo by rail. The trip took thirty hours over seven separate railroads, required changing cars more than six times, and carried a one-way fare of between eight and ten dollars. Despite the inconvenience of changing railroads, passenger traffic between Albany and Buffalo grew phenomenally, because even thirty hours with six changes represented a vast improvement over the ten or more days aboard a foul-smelling barge on the Erie Canal.

Both management and investors in the new railroads recognized the logic of consolidation. Increased traffic would follow if a single railroad provided direct service; ticketing, billing, and convenience for the traveling public would improve significantly. At a meeting in Albany in February of 1851, representatives of all the railroads gathered to discuss a merger. After some tough bargaining, they agreed to petition the New York State legislature for enabling legislation to merge the separate lines into a single railroad between Albany and Buffalo. The New York legislature authorized consolidation on April 2, 1853.

Acting swiftly, the railroads met again on April 12th, to work out the details. Attending were representatives of ten separate railroads: Albany and Schenectady, Schenectady and Troy, Utica and Schenectady, Mohawk Valley, Syracuse and Utica, Syracuse and Utica Direct, Rochester and Syracuse, Buffalo and Rochester, Buffalo and Lockport, and the Rochester, Lockport, and Niagara Falls.<sup>6</sup> Formal incorporation of this conglomerate, the New York Central system, took place on July 6, 1853, after some hard bargaining among the ten railroads over the number of New York Central shares each would receive in exchange for their own shares. A number of the railroads, well built and quite profitable, demanded a premium in the exchange of stock.

Erastus Corning, the former mayor of Albany and president of the Utica and Schenectady Railroad, provided the driving force behind the consolidation and became the New York Central's first president. Corning, a long-time power in New York Democratic politics, maintained varied business interests, including the Albany Iron Works, which manufactured wheels and rails for the railroads he controlled. Like Commodore Vanderbilt, Corning never built railroads: he played the role of organizer and financier and left the difficult construction problems and day-to-day management to others.

Image not available.

The New York Central dominated railroading in upstate New York, but it faced competition for its market. One major competitor proved to be the Erie Railroad, whose name was synonymous with every kind of shady railroad dealing of the age. Its officers included Daniel Drew and two other of the most notorious of Wall Street manipulators, Jay Gould and Jim Fisk. Begun in 1832 as an alternative link between New York City and Lake Erie, the Erie Railroad lacked access to Manhattan or, initially, even to the Jersey side of the Hudson River. The Erie's tracks ran through the hilly regions of northern New Jersey and the less populated southern part of New York State. Because its first eastern terminus was in tiny Piermont, on the west bank of the Hudson, some ten miles north of New York City, passengers and freight were transferred to a ferry to complete the trip down the Hudson River to the city. For the western end of its line, the railroad selected Dunkirk, New York, on Lake Erie south of Buffalo. Dunkirk proved to be a poor choice, given that the Erie Canal had already established Buffalo as the major eastern terminus for Great Lakes shipping. The Erie eventually bought track rights into Buffalo but remained the weakest of the trunk lines between the East Coast and the Midwest. Drew, Fisk, Gould, and other Erie investors focused their energy on stock manipulation and raids on the railroad's treasury rather than on the more mundane day-to-day world of railroading. They readily initiated rate wars to win a greater share of the lucrative through traffic, even at the cost of further weakening the Erie by diverting revenue

*Map of the Water Level Route from Albany to Buffalo, showing the Erie Canal and railroads that merged in 1853 to form the New York Central*

Image not available.

*Currier and Ives cartoon of Commodore Vanderbilt racing Jim Fisk of the Erie Railroad, 1870*

from needed improvements. The line remained in precarious financial shape, even after creeping closer to Manhattan by securing track rights to Jersey City, but that did not stop Drew and company from further fiscal machinations. Despite its lesser status, the Erie created problems for the New York Central for decades.

As business prospered in the 1850s, the Central's management faced a crucial decision: whether or not to expand westward to capture a share of the lucrative Great Lakes traffic between Chicago and Buffalo. While the managers were pondering this, the Central's chief rival, the Pennsylvania, led by a true railroad builder and innovator, J. Edgar Thomson, continued track construction past Pittsburgh toward Chicago and elsewhere in the Midwest. For the eastern railroads, expansion to the Midwest proved crucial to financial survival. Chicago, by 1850 the fastest-growing city on the face of the earth, emerged as the great metropolis of the American heartland. The railroad that established the most efficient rail link to Chicago and the other major cities beyond the Appalachians stood to prosper. All four major trunk lines, the Central, the Pennsylvania, the

Baltimore and Ohio, and the Erie, sought to dominate this major transportation market.

Despite the growing competition from the dynamic Pennsylvania, Corning and New York Central moved cautiously. Tentatively, the railroad began to purchase some stock in railroads to the west, including the Great Western Railroad, which ran from the Central's bridge over the Niagara River at the falls, across the southern tip of the Province of Ontario, to Detroit. The railroad also purchased stock in the Michigan Central Railroad, building across Michigan from Detroit toward Chicago. Even given these cautious expansion moves, under Corning's leadership the New York Central remained very much an upstate New York railroad. Further, the Central still did not offer service into New York City. At Albany, passengers and freight transferred to the Hudson River steamboat lines for the ninety-mile trip down the river to New York. The New York Central would have to wait for the leadership of Cornelius Vanderbilt and his son William Henry Vanderbilt before it would possess the energy and imagination to go head to head with the Pennsylvania to dominate the rich Midwest market.

### *The Commodore Gains Control*

Cornelius Vanderbilt played no role in the earliest years of the New York Central Railroad. He began to buy New York Central stock in 1865, in the midst of the second Harlem corner and, by 1866, owned more than \$2,500,000 worth of Central stock. Vanderbilt's interest stemmed from his frustration as he watched Corning's New York Central send a growing volume of passengers and freight down the Hudson River by steamboat while the trains of his Hudson River Railroad stood waiting just across the river. Only in the winter, when the Hudson froze, did the Central use the Hudson River Railroad to get its passengers and freight to New York City. To increase Vanderbilt's anger further, the Central favored the steamships of the People's Line, owned by his archrival Daniel Drew. If, instead, the Central were to construct a bridge across the Hudson to connect with Vanderbilt's line, his Hudson River Railroad would enjoy a dramatic increase in year-round traffic.

The Commodore's competitive nature demanded action, and with his purchase of a major share of the Central's stock, he expected a seat on the board of directors. Corning and the other upstate businessmen who dominated the board refused; they remained determined not to let Vanderbilt gain a foothold in their railroad. In time, a number of the directors of the Central expressed strong dissatisfaction with Corning's timid leadership, and in 1863 a group of Central shareholders, led by Thomas Olcott of Albany, mounted a challenge to Corning, with Vanderbilt's tacit support. Corning realized that he lacked the support to keep Vanderbilt at bay and decided instead to cooperate. He agreed to step down from the presidency of the Central but remained on the board of directors. Dean Richmond of Buffalo became president and immediately obtained board approval to build a bridge over the Hudson, establishing a direct rail link with Vanderbilt's Hudson River Railroad. With the completion of the bridge, the volume of traffic over the Hudson River Railroad increased dramatically.

Not satisfied, Commodore Vanderbilt and William Henry Vanderbilt, who by now had become a full partner in his father's railroad interests, began discussions with the Central toward a formal merger with their Hudson River Railroad. As talk of the merger spread, the stock of both companies rose. All seemed to be moving smoothly ahead when, once again, Daniel Drew entered the picture. Drew's steamboat line stood to lose a great deal of business if the merger of the two railroads proceeded, and he itched to get back at the Commodore for outfoxing him in the two Harlem corners.

Daniel Drew and William Fargo, a founder of Wells, Fargo and Company and a board member and major stockholder in the Central, decided to mount another short-selling raid, this time against the stock of the Central. Two other legendary Wall Street manipulators, LeGrand Lockwood and Henry (The Silent) Keep joined Drew and Fargo in the scheme. Lockwood and Keep, like Drew, held longstanding grudges against Vanderbilt from earlier railroad deals in which the crafty Commodore had gotten the best of them.

The conspirators hatched a simple plan. Fargo would use his power on the Central board to kill the merger with the Hudson River Railroad. Before the news became public Fargo, Keep, Lockwood, and Drew would

sell Central stock short and garner a fortune as the stock declined. Once again, Vanderbilt learned of the scheme and plotted a countermove.

First, the Commodore quickly sold 60,000 shares of his Central stock before the price went down. His next move required the assistance of weather. January 15, 1867, dawned cold and blustery; the frozen Hudson River prevented any shipments from Albany to New York City via the river. Drew's steamboats could offer no further assistance to the Central until the river thawed in the spring. Vanderbilt placed advertisements in the major Albany and New York City newspapers announcing that the Hudson River Railroad would no longer accept transfer passengers or freight from the New York Central. The advertisement closed with the statement: "By the above notice passengers will observe that the ERIE RAILWAY is the only route by which they can reach NEW YORK from Buffalo without CHANGE of coaches or RECHECKING of baggage."<sup>7</sup>

Desperately, the Central attempted to organize another route for its traffic to New York via the Boston and Albany, Stockbridge, Housatonic, and New Haven railroads. For three days passengers and freight piled up at Albany; the alternative route proved much too complicated. In the state legislature calls rang out for action to force Vanderbilt to reopen the link between the two railroads. The stock of the Central plummeted before Drew, Fargo, Keep, and Lockwood could sell, and they all lost a great deal of money. As soon as the stock bottomed out, Vanderbilt bought back the original 60,000 shares he had sold earlier.

Public outcry, as well as pressure from the Central's own stockholders, forced the directors of the Central to deal with Vanderbilt. The Commodore agreed to restore the free flow of traffic between the Central and the Hudson railroads, Central stock shot back up, and Vanderbilt collected yet another fortune. By 1867, he completed his conquest of the Central by assuming the office of president. Fargo, Keep, and their supporters departed, replaced on the board of directors by Vanderbilt family members and close associates. William H., the Commodore's heir apparent, became vice president.

Once Vanderbilt gained control of the New York Central he proceeded toward a formal merger of the Hudson River and Central railroads. Merging the two lines would smooth the flow of traffic from Buffalo, through Albany, to New York City. In 1869, the railroads were

### *The Commodore's Grand Central*

combined under the name New York Central and Hudson River Railroad. With track stretching from New York City to Buffalo, it became the second largest railroad in the country; only the Pennsylvania rivaled the Central.

An immensely complicated business emerged. Suddenly freight volume and ticket sales in Buffalo became crucial pieces of information to the railroad's senior management in New York City, hundreds of miles away. Elaborate schedules demanded standardized track maintenance so that a train dispatched from New York arrived on time in Buffalo.

If a manufacturer in the Midwest shipped goods by train to Manhattan via the Central for loading onto a ship bound for Europe, the railroad needed proper paperwork to bill the manufacturer and, simultaneously, ensure that the goods reached the wharfs lining the Hudson River. A new system for managing routine activities like billing and routing guaranteed that they occurred regularly—not just at the station of origin, but at every station—not just once, but every day. Such a system demanded not just the efforts of one or two trained individuals but of thousands. All of this routine repeated each day, each week, each year. The world of modern business arrived with the consolidation of Vanderbilt's railroads.

In the space of six brief years, beginning with the purchase of the Harlem Railroad in 1863 and concluding with the merger of the Central and Hudson in 1869, Vanderbilt assembled a sprawling railroad empire. With this stunning achievement, he became one of the most powerful figures in American railroading. His personal fortune reached a stupendous level, and all of this wealth and power had been accumulated by a man approaching seventy-five years of age.

### *To Chicago*

As Cornelius Vanderbilt neared the end of his life, the expansion of his railroad system to Chicago and the rest of the Midwest continued and involved the acquisition of the Michigan Central Railroad and the Lake Shore and Michigan Southern Railroad. William H. was assuming a greater role in the management of the family railroad empire, and he executed an agreement that expanded the Central westward. In 1870, he established a "community of interest" with the Michigan Central Rail-

road and with the Great Western Railroad, which ran across Ontario, Canada, north of Lake Erie, connecting Detroit directly with Buffalo. By this "community of interest" agreement, the Michigan Central shipped all of its through traffic to New York via the Great Western and the New York Central, guaranteeing the Central substantial traffic from the Midwest. In turn, the Central pledged to use the Michigan Central and the Great Western for its traffic to Detroit and beyond to Chicago.

With this extension of rail service came innovations in passenger travel. Modern rail passenger service began in 1870 when William H. forged the agreement with the Michigan Central. For the first time, one railroad offered through service from the East Coast to the Midwest. With comfortable sleeping cars, a passenger could ride on the "Vanderbilt System" the nine hundred miles from Manhattan to downtown Chicago, quickly and in relative comfort, without changing trains.

A formal merger of the Michigan Central and the New York Central never took place. In the meantime, the Vanderbilts moved to acquire another railroad that would strengthen ties to the Midwest. The Lake Shore and Michigan Southern Railroad, built along the southern shore of Lake Erie, provided an alternative link between Buffalo and Detroit. Serving the booming industrial cities of northern Ohio, the Lake Shore, well built and crossing the flat land of Ohio and Indiana, could be a money-making machine. Eventually extending to Chicago, the rails literally followed a water-level route; and with no serious grades to overcome, its speedy trains carried passengers and freight at low rates and yet generated strong profits. The Lake Shore would add immeasurably to the Vanderbilt system, especially since the Pennsylvania Railroad's trunk line, already past Pittsburgh, was marching on toward Chicago.

Cornelius Vanderbilt's old enemies from the New York Central merger, LeGrand Lockwood and William Keep, controlled the Lake Shore and refused to consider any accommodation with the Vanderbilts. William H., backed by his father's fortune, set about buying shares in the Lake Shore in early 1869 and awaited an opportunity to strike. That opportunity arose on "Black Friday" in September of 1869, when Jim Fisk and Jay Gould attempted to corner the gold market and failed, ruining many speculators, including LeGrand Lockwood. Desperate to raise money, Lockwood, the principal shareholder, agreed to sell his shares in the Lake

Image not available.

*The Vanderbilt System, stretching from New York to Chicago, Cincinnati, and St. Louis*

Shore for the bargain price of \$10 million. With the acquisition of the Lake Shore, the Vanderbilts completed their trunk line system to Chicago and other critical points in the Midwest.

As expansion of the Vanderbilt system continued over the next thirty years, New York Central's organizational chart became increasingly complicated. The Central expanded by leasing railroads, as in the case of the Boston and Albany, or through majority stock ownership, as with the Lake Shore. All of the newly acquired railroads remained independent corporate entities with separate management. The Vanderbilts and their allies controlled these railroads through their positions on the boards of directors and through their choice of senior managers. On a day-to-day basis, the individual railroads did not coordinate operational efforts. Each railroad in the Vanderbilt system managed its own operations and kept separate books. Contributions to the overall finances of the Central came through remission of revenue and payment of stock dividends. Revenue generated by the leased or controlled lines, recorded as nonoperating revenue, formed an important component of the Central's overall financial resources.

An alternative would have been to absorb the new railroads directly into the New York Central and operate them as additional divisions. The Pennsylvania Railroad proceeded in this fashion. As the Pennsylvania

acquired new lines, they became part and parcel of the overall system under direct control of central management in Philadelphia.

Failure to consolidate remained a serious problem into the next century. At a meeting of the executive committee of the board of directors in December of 1903, William K. Vanderbilt, grandson of the Commodore, complained, "The New York Central has a large interest in Lake Shore, Michigan Central, Cleveland, Cincinnati, Chicago and St. Louis. . . . as matters now stand these companies are managed, both in relation to their finances and operation, in many aspects as if the New York Central was without interest in them. . . . the New York Central finds itself unable to formulate a comprehensive plan for the operation of all lines in its system." He suggested that a committee of the board of directors be formed "with a view of formulating a plan for the closer relations of the companies forming the New York Central System."<sup>8</sup>

The task before the committee was a daunting one; the Vanderbilt system formed a complex and unruly monster. Moody's railroad manual, a contemporary guide to the industry, detailed the complexity: The parent New York Central leased twenty-five lines including the Boston and Albany, Mohawk and Malone, Harlem River, Rome, Watertown and Ogdensburg, West Shore, and Lake Shore, to name a few. In turn the Lake Shore and Michigan Southern Railway leased or controlled eight additional railroads, among them the Cincinnati, Indiana and Southern Railroad. Next on the list, the Cleveland, Cincinnati, Chicago and St. Louis Railroad, nicknamed The Big Four, ran extensive operations in the Midwest. In total, Moody's credited the Vanderbilt system with 12,300 miles of track and a gross business of \$240,000,000 in 1907.<sup>9</sup> Yet the New York Central itself and the lines it directly controlled accounted for only 3,484 miles of track, less than one-third of the system's total, by virtue of legal intricacies. For example, the Harlem Railroad retained a separate corporate identity after the New York Central leased the railroad, for a period of 401 years, in 1873. The Vanderbilts completely controlled the Harlem and operated it as an integral part of the Central's operations in New York. By the time the Grand Central project commenced, the railroad referred to the New York and Harlem Railroad as simply "the Harlem Division."

## *The Commodore's Grand Central*

While assembling his great railroad empire, Commodore Vanderbilt decided that the Vanderbilt system, among the largest business enterprises in the country, needed an appropriate passenger terminal in the heart of New York. He envisioned a terminal with style and panache, proclaiming to all New York the power and might of his vast rail empire.

Vanderbilt chose to unify the passenger operations of his railroads in the city at the Harlem Railroad's property on 42nd Street. Even Vanderbilt's supporters cautioned him that the 42nd Street area "was still well outside the city"; in the 1870s, 42nd Street lay north of the city's main commercial and residential areas. Also, at the time, the spot did not seem the proper environment for a passenger station. On one side of 42nd Street the engine house, where the Harlem serviced its steam engines, sent up a pall of smoke; on the other, gangs of horses worked in treadmills cutting wood for hungry fire boxes. Historian Edward Hungerford described the reaction to the Commodore's plans: "People would never come up to Forty-second Street . . . they all told Commodore Vanderbilt that."<sup>10</sup> Vanderbilt ignored the warnings and, in his typical fashion, pushed forward. He realized that his Hudson River Railroad's passenger terminal on the west side of lower Manhattan at St. John's Park occupied the wrong location. The west side of Manhattan had evolved as a more commercial than residential area and the Hudson's tracks on the west side primarily served the growing volume of freight carried to the businesses and piers lining the Hudson River.

Since the Hudson River Railroad's tracks crossed the Harlem River onto the west side of Manhattan at Spuyten Duyvil, Vanderbilt needed a link from Spuyten Duyvil to the Harlem line at Mott Haven. In 1869, he incorporated the Spuyten Duyvil and Port Morris Railroad and constructed a rail line along the north bank of the Harlem River to Mott Haven, where the Port Morris tracks joined the Harlem's. Once Vanderbilt completed the new line, passenger trains of the New York Central and Hudson River Railroad could switch at Spuyten Duyvil, travel the five miles to Mott Haven, and then continue down the tracks of the Harlem to Midtown.

The new passenger terminal at 42nd Street would serve three railroads: the New York Central and Hudson River, the Harlem, and the New York, New Haven and Hartford. The New Haven provided commuter service to lower Fairfield County in Connecticut and long-distance trains to New England. In 1845, before Vanderbilt entered the picture, the Harlem had signed a four-hundred-year lease with the New Haven allowing joint use of the Harlem's Fourth Avenue tracks and guaranteeing the New Haven's passenger trains joint use of its station facilities in Manhattan.

Commodore Vanderbilt's intentions for a new passenger terminal at 42nd Street ran to the palatial; he commissioned architect John Snook and engineer Isaac Buckhout to design a structure to celebrate his triumphs in assembling a railroad empire. The design they produced set out to awe the traveler and the casual visitor with the power and glory of the Vanderbilt railroad empire. Formally called Grand Central Depot, the structure included an imposing station building at the front and an arched train shed in the rear. When completed in 1871, Grand Central Depot was the largest rail facility in the world, larger even than London's St. Pancras Station. Like the present Grand Central, it served as more than a terminal; it symbolized the power of Vanderbilt's railroads and the role they played in the life of New York City, the state, and the country.

During the Age of Energy, architects and the powerful clients they served sought an architectural style to express the power and might of the new business enterprises, railroads foremost among them, that were re-shaping American society. Vanderbilt's vision for the first Grand Central station began an association with the French Classical style which continued with the second Grand Central. Lewis Mumford, the famed social critic, referred to the building sarcastically as an "Imperial Facade."<sup>11</sup>

Forming an L shape, the classical terminal building, bearing a striking resemblance to the Louvre in Paris, ran along 42nd Street for 370 feet, and then turned up Vanderbilt Avenue on the west side of the Harlem's property for a depth of almost 700 feet. The three railroads using the facility occupied separate sections of the building, each with its own ticket, baggage, and waiting rooms. Railroad offices occupied the second and third stories.

In the rear, the train shed comprised the most impressive part of the

Image not available.

*The first Grand Central, from Vanderbilt Place and 42nd Street, 1871*

new terminal, concealed from view along 42nd Street by the L-shaped station building. Inspired by London's Crystal Palace, the train shed consisted of an immense arched structure constructed of iron trusses, imported from England, more than 200 feet in width, creating the largest interior space in America. The arched roof rose to a height of 100 feet above the tracks and the entire shed ran over 600 feet in length. A lattice work of iron with glass panels, the roof enclosed seventeen tracks, twelve for outgoing trains and five for incoming trains.

Using the width of the train shed as a measure, the next largest train station in the country was the second La Salle Street Station in Chicago (built 1868–72), which spanned 186 feet; Park Square Station in Boston (1872–74) had a train shed measuring 128 feet across.<sup>12</sup> Not until 1888 did the Pennsylvania Railroad's massive station in Jersey City eclipse Grand Central in size and scale, spanning 252 feet.

With an iron and glass train shed and classical station building, Grand Central Depot represented a tension inherent in the use of the classical style for railroad stations during the Age of Energy. Railroads embodied the modern, the mechanical, and the application of the newest technology to solve transportation problems. Fabricated in England, the soaring iron arches supporting the train shed constituted the largest arches erected in the United States to date. By contrast, the station building, with its stone and brick ornamentation and the mansard roof with five domes, mirrored the classical tradition, particularly the classicism of the Second Empire of Napoleon III. The juxtaposition of the classical and the machine age created a stark contrast. Approaching Grand Central Depot, the traveler confronted a classical building, in this case a building modeled after the Louvre in Paris, which provided no hint of the function hidden behind its “Imperial Facade,” to use Mumford’s term. Passing through the waiting room to the train shed, the traveler entered a great space created without a trace of the classical. Inside it, the new machine age, filled with

*The first Grand Central, from Park Avenue and 42nd Street, with streetcar tracks in foreground, ca. 1884*

Image not available.

*The Commodore's Grand Central*

the sights and sounds of the railroad, ushered in the change from the ancient to the modern. This juxtaposition remains in the present Grand Central, but in order to view it one must descend to the platforms and peer into the darkness of the underground tracks and train yard supported by a massive steel structure enclosed in concrete. By contrast the Grand Concourse remains firmly anchored in the classical.

In Europe, where train travel remains a major mode of transportation, a number of terminals retain the flavor that was found in Grand Central Depot. St. Pancras in London, and the Gare du Nord and the Gare de Lyon in Paris, all combine classical terminal buildings with iron and glass train sheds in the rear. Approaching these stations, the visitor views a classical building with a facade similar to a museum or government office building. Behind the facade stands the great train shed covering the platforms. At the Gare du Nord the train shed soars overhead in a great arch as did the shed at Grand Central Depot. Today electric and diesel engines operate where steam engines once ruled, but the space, with cast-iron columns and soaring arches, still conveys a sense of the beginning of the machine age.

*The train shed in rear of the terminal building, looking south from 44th Street and Lexington Avenue*

Image not available.

Image not available.

Grand Central Depot was a terminal, referred to as a “head house,” as opposed to a side station or through station where platforms lined the tracks and trains stopped briefly to discharge or board passengers. The tracks literally ended there. Grand Central marked the end of the line, the final destination. Once a train reached a head house terminal, train crews shunted the engine and cars to make up outgoing trains. This switching necessitated a great deal of moving cars and engines back and forth, and a head house terminal required a large train yard for the servicing engines and cars and the assembling of outgoing trains. Beyond the train shed, the railroad built a vast rail yard, running north to 58th Street and stretching from Lexington almost to Madison Avenue, creating an impenetrable barrier in midtown Manhattan for almost twenty blocks.

All of this activity contributed to making major terminals and train yards such as Grand Central immensely complicated to design and manage. Busy train yards needed numerous storage tracks, switches, and signals to control incoming and outgoing trains and switching operations,

*Interior of train shed,  
looking north from  
second-floor balcony*

Image not available.

*Interior of train shed,  
looking north from  
concourse*

as shuttle engines moved back and forth to assemble new trains. Signaling and control became a major science for the American railroads, and the New York Central established a separate division for the planning, construction, and operation of its signaling system at 42nd Street and throughout its entire system.

Massive new railroad facilities like Grand Central demanded precision, routine, and rigid operating procedures. Employees who worked the trains, signal, and switching systems found themselves part of an elaborate machine the work of which was governed by a strict set of rules and regulations. Individual initiative found little place in this new system of work. Adherence to the established procedures remained an absolute necessity, for reasons of safety and efficiency. With the railroads came the modern industrial world of work where the individual performed routine tasks day in and day out. In the case of the railroads, without strict procedures to control train operations, chaos would ensue. Such a complicated system could only have been the product of the modern world,

with its notions of systematization, clearly spelled-out rules and regulations, and a work force accustomed to the machine and the system.

At Grand Central the “flying switch” provides an example of the precision of the signal and control system. Before development of the flying switch, trains arrived at the platforms in a head house terminal like Grand Central with their engines in the front of the train, a railroad worker uncoupled the emptied passenger cars, and a yard engine hauled them away. Then the engine backed away to a turntable in preparation for departure. All of this activity required numerous shunting movements and contributed to the overall complexity of a busy train yard.

To minimize the number of train movements, the railroads using Grand Central perfected the flying switch. As a train emerged from the Park Avenue tunnel at 56th Street, approaching Grand Central, it accelerated; and the brakeman, perched precariously over the coupler linking the engine to the first passenger car, tripped the coupler and freed the engine, which continued to accelerate. In the control tower, the switchman pulled the proper lever to send the engine onto a siding and then immediately threw the switch back so that the passenger cars continued on toward the

*Train yard during the days of steam, looking south toward Grand Central from 48th Street*

Image not available.

### *The Commodore's Grand Central*

train shed. As the passenger cars moved under the train shed and alongside the platforms, now traveling on their own momentum, the brakemen scrambled to the hand brakes and, turning the brake wheels furiously, brought the passenger cars to a halt in their proper position next to the platform so that passengers could exit the train. The flying switch saved a great deal of time and switching. Obviously, it required split-second timing and great skill on the part of the railroad employees, but the railroads used this procedure until work on the new Grand Central began, without a single mishap, a testimony to the elaborate system of signaling and control perfected by the railroad.

### *A Symbol of the Age*

Vanderbilt's new 42nd Street terminal became a major tourist attraction, primarily because of the train shed; many New Yorkers could not understand how the arched structure stood, seemingly without support. "New York opened its eyes and gasped," the *New York Times* later recalled. "Nothing like it had ever before been seen. It had fifteen tracks in its train shed. Some folks said that Commodore Vanderbilt was in his dotage. Others explained the great depot by saying that the Commodore was simply building a terminal that would last for all time."<sup>13</sup>

On October 7, 1871, the first train departed from the new terminal and the facility proved to be an immediate success. During the first year of operation, the three railroads ran an average of 88 scheduled trains a day and more than 4,000,000 passengers passed through its gates.

Grand Central Depot heralded a new era in train travel to and from New York City. The new terminal consolidated, in one location, the passenger operations of the railroads serving New York. In addition to extensive commuter service to Westchester and Fairfield counties, the lines provided long-distance service to New England, upstate New York, Cleveland, Detroit, Chicago, St. Louis, and to thousands of points in between. As soon as the new depot opened, the New York Central's timetable for through service highlighted the fact that the establishment of the Vanderbilt system eliminated the necessity to transfer trains at Buffalo. A bold headline read: "No More Transfer at Buffalo!" In 1872, the timetable listed six daily trains that provided service to upstate New

York and on to Midwest cities: Cleveland, Toledo, Detroit, Columbus, Cincinnati, Indianapolis, Louisville, St. Louis, and Chicago.

A trip from New York to Rochester, in upstate New York, took twelve hours, while the daily train to Chicago left New York at 10:30 A.M. and arrived in Chicago the following day at 8:00 P.M. In subsequent decades, the Central reduced the travel time to Chicago significantly, especially after the introduction of its world-famous Twentieth Century Limited. Thirty-three and a half hours may seem an eternity today, but in the 1870s to travel such a distance in so short a period of time seemed miraculous.

The New York Central's schedule reminded the traveling public of the prime advantage the railroad offered—direct rail access to midtown Manhattan: “This is the only line landing passengers in the city of New York within ten minutes of the principal hotels and is not impeded by Ferry transfers.” All of the Central's competitors terminated at points across the Hudson in New Jersey. To complete the journey to Manhattan, their passengers had to board a ferry to cross the Hudson River. For good measure, the Central advertised that the absence of a ferry ride combined with the railroad's luxury sleeping cars: “renders a journey upon it a pleasant pastime rather than a distasteful necessity.”<sup>14</sup>

Vanderbilt intended his new Grand Central Depot as a fitting stage for a journey to Rochester, Buffalo, Cleveland, Detroit, and Chicago. Since the New Haven Railroad shared facilities at the 42nd Street terminal, trains also served Boston, the rest of New England, and Canada. Grand Central followed logically from the growth of Vanderbilt's huge railroad empire. Even at a cost of \$3 million for the building and train shed and an additional \$3 million for the expanded train yard, the Commodore raised no objections; the depot provided the monument he wanted.

The great rail terminals of the era stood literally at the end of the “metropolitan corridor,” the end of the journey between rural and urban America. An article published in *Century Magazine* portrayed the great urban terminal as the port of entry to the city: “The gate-way of the city marks the beginning and end of many things. Here the traditional young man from the country is confronted by a confused view of the city he has come to conquer. . . . Here again, after conquering, or being conquered he slowly retraces his youthful steps, to retire upon his farm—or the

### *The Commodore's Grand Central*

county's."<sup>15</sup> A powerful image in American letters depicts a youth moving from a rural farm or small town to the big city, seeking fame or fortune or just a change from the boredom and sheer hard work of life on the farm. This journey of adventure, or perhaps desperation, ends in the great terminal in the heart of the metropolis. As the train arrives, the protagonist confronts the energy and chaos of the new urban society. In the end, the journey results in either great triumph or great tragedy, as the author of the *Century* article suggests. Great railroad terminals like Grand Central provided the stage for this unfolding drama, as a rural, agrarian society urbanized. In 1897, as a new century dawned, the editor of the *Commercial and Financial Chronicle* summed it up: "The fact is the railroad revolutionized everything."<sup>16</sup> No aspect of American life remained unaffected by the railroads in the period after the Civil War; the railroad ushered in America's modern age.

### *William H. Vanderbilt Assumes Control*

Soon after Grand Central Depot opened and as his son and heir apparent, William Henry, continued to expand the Vanderbilt system to Chicago and St. Louis, the Commodore entered the twilight of life. His health deteriorated and his behavior at times seemed bizarre. His first wife, Sophia, died in 1868, in the midst of the battles for his railroad empire. After his wife's death, the old man became obsessed with the occult and consorted with a number of "mediums" in attempts to contact Sophia and his long-dead mother and father. In his dealings with the occult he crossed paths with Victoria Woodhull and her sister, Tennessee Claflin, two mediums with questionable reputations and unlimited ambition, who set out to ensnare the Commodore and his fortune.

Woodhull and Claflin remain larger-than-life characters in the drama of the Gilded Age. Born in Tennessee to a drunkard and wastrel father, they survived and even flourished on their beauty, wit, and charm. Woodhull, in addition to a career as a medium, became the first woman to address a joint session of Congress, served as the editor of her own weekly newspaper, *Woodhull and Claflin's Weekly*, which championed women's rights, free love, and the suffragette movement, and, with Vanderbilt's help, opened a stock brokerage company. Woodhull ran for pres-

ident of the United States against Ulysses S. Grant and Horace Greeley and became involved in one of the most notorious scandals of the time—Henry Ward Beecher's affair with Elizabeth Tilton. Finally, after a number of tumultuous years in New York, Victoria and Tennessee decamped to England, where they married into the British nobility and retired to the English countryside, rich and somewhat infamous.

As Vanderbilt's relationship with the sisters deepened, his family became alarmed. Victoria and Tennessee became part of the Commodore's household; he called Tennessee "my little sparrow." Sordid details of his relationship with Tennessee later emerged, during the bitter contest over Vanderbilt's will. Just a few short months after his wife's death, he had announced to his stunned family that his "little sparrow" would soon become his new wife. This William Henry and the Commodore's daughters refused to accept. In late fall of 1868 they arranged for Vanderbilt to meet a much more suitable candidate, Miss Frank Crawford of Mobile, Alabama, a distant cousin. With the family's approval, the two began a whirlwind courtship. Frank Crawford, twenty-nine years old, married the seventy-four-year-old Vanderbilt a year later and remained with him for the last seven years of his life.

Commodore Vanderbilt died on January 4, 1877, after a long illness. At the time of his death, many assumed Vanderbilt to be the richest man in the country, and intense speculation swirled through society about his will and the division of the fortune between his two living sons, William Henry and Cornelius Jeremiah. His remaining children, all daughters, in an age when women were still excluded from business, could not expect to inherit the Commodore's railroad empire.

Vanderbilt left almost his entire fortune to William. Inheriting over \$90 million, including all of the Commodore's railroad stock, William Henry found himself rich beyond imagination and in sole control of the New York Central Railroad, the centerpiece of the Vanderbilt empire, and of the Commodore's magnificent terminal on 42nd Street. The elder Vanderbilt had believed in only one way to preserve his railroad empire: leave it all to his most promising heir. Cornelius, the other surviving son, had proved a great disappointment to his father. A gambler and wastrel, he had been exiled to a farm outside of Hartford, Connecticut, where the Commodore hoped he would reform. When Cornelius continued to

drink and gamble, his father left him out of the major portion of the fortune, providing Cornelius with only the income from a trust fund of \$200,000 administered by his brother.

A bitter battle ensued over the will. Cornelius joined his sisters in a lawsuit to overturn the will; the Commodore had left each daughter just \$250,000. Obviously the daughters expected much, much more. The future of the Vanderbilt railroad empire stood in the balance. If Cornelius and his sisters won the lawsuit and the millions of dollars they demanded, William would have no recourse but to sell his controlling interest in the New York Central. William faced two choices: win the lawsuit or make a deal with Cornelius and his sisters.

In November of 1877, the trial began; it lasted for a year and a half. William sat in court and listened as the sordid details of his father's last years became public. Newspaper sales soared as the press detailed the Commodore's relationship with Tennessee Claffin. After eighteen months, William decided to end the lawsuit rather than wait for the court's decision: he gave Cornelius an extra \$200,000 in cash and a trust fund of \$400,000 in addition to the income from the \$200,000 trust fund he had received under the will. William gave each of his sisters the same settlement. Compared to the fortune of \$90 million he had inherited, these sums pale. William Henry preserved the Commodore's railroad empire. He retained 87 percent of the shares of the New York Central Railroad, the parent company of the Vanderbilt system, and emerged from the battle with his siblings the richest man in the United States.

Sadly, Cornelius J. Vanderbilt's life did not improve, even with the additional money the settlement provided. On April 2, 1882, after a night of gambling, Cornelius returned to his hotel in New York City and killed himself with a pistol.

William H. Vanderbilt continued his active interest in the affairs of the New York Central and its subsidiary lines. Less flamboyant than his father, still he moved quickly when he perceived a threat to the Vanderbilt system. In October of 1882, he purchased the Nickel Plate Railroad, built by a group of speculators to parallel the Lake Shore from Buffalo to Chicago. Cheaply built, the railroad served the speculators as a means to threaten the Central with a ruinous rate war and to force William H. to buy the line to protect the Vanderbilt interests. Less than a year after he

bought the line it went bankrupt; he considered the purchase the worst business decision of his life.

William H. found the running of the railroad empire a demanding affair. One day in October of 1882, during a period of deep involvement in the Nickel Plate negotiations, two reporters interviewed him as he rested in his private railway car in Chicago. The reporters questioned Vanderbilt about the Nickel Plate battle and plans to drop a fast mail train the Central ran between New York and Chicago. The *New York Times* reported, in detail, the Vanderbilt interview:

Q: Does your limited express pay?

A: No; not a bit of it. We only run it because we are forced to do so by the action of the Pennsylvania Road.

Q: But don't you run it for the public benefit?

A: *The public be damned.* What does the public care for the railroads except to get as much out of them for as small a consideration as possible?<sup>17</sup>

When the public learned of Vanderbilt's exclamation, "the public be damned," outraged reaction came fast and furious. Flashed over the telegraph, his words found the front page of newspapers all over the country, and condemnation of William H. followed. America was finding the accumulation of great wealth deeply troubling and feared the emergence of gigantic corporate entities such as the New York Central which seemed to hold so much power over the lives and livelihoods of average citizens. "The public be damned" became a rallying cry for the populists and politicians, who demanded that the government curb the powers of the new corporate giants, especially the railroads. Ironically, William H. Vanderbilt, the richest man in the country, the man who controlled the New York Central, had uttered the words that brought success to the forces seeking to regulate the railroads. Eventually government regulation of the railroads, in the name of the public, almost destroyed them.

Social critics attacked the giant corporations, the trusts, and the railroads for their misdeeds. Henry D. Lloyd's *Wealth against Commonwealth* (1894), Ida M. Tarbell's *History of the Standard Oil Company* (1904), Upton Sinclair's *The Jungle* (1906), and Theodore Dreiser's trilogy: *The Financier* (1912), *The Titan* (1914), and *The Genius* (1915), all chronicled the transgressions of the giant businesses that emerged after the Civil War. Both

### *The Commodore's Grand Central*

the companies and the men who ran them, and amassed such prodigious fortunes, came under harsh criticism.

Because the railroads constituted the largest and most powerful businesses of the time, they served as touchstones for criticism and discontent. Thomas Nast's cartoons portrayed the Vanderbilts and the New York Central as exercising a stranglehold on the commerce of New York City and State. The American labor movement began with efforts to organize railroad workers and, in 1894, just a year after the Columbian Exposition in Chicago opened, the American Railway Union, led by Eugene Debs, organized the first major strike in the nation's history, against the railroads. In Pittsburgh, violence broke out and the governor of Pennsylvania finally called for federal troops to restore order after millions of dollars of Pennsylvania Railroad property went up in smoke. Railroad service across the East shut down.

### *The Vanderbilts and the Gilded Age*

Both the Commodore and his wealthy son lived comparatively frugally, given their enormous wealth. William Henry's yearly income averaged \$10,000,000 but his expenses ran less than \$200,000. Over the remaining years of his life his fortune doubled. As Commodore Vanderbilt quipped: "Any fool can make a fortune. It takes a man of brains to hold on to it after it is made." By 1883, William Henry's wealth had reached the staggering total of \$194 million.

Unlike his father, William H. Vanderbilt spent at least some of his fortune, becoming the first Vanderbilt to build a mansion on Fifth Avenue in New York, the fashionable address favored by the millionaires of the Gilded Age, the Age of Energy. His second son, William K., and his ambitious wife, Alva, persuaded him that as the richest man in the world he needed a home befitting his stature. Issac Buckhout, who had collaborated in the plans for the first Grand Central, designed the mansion at 640 Fifth Avenue, which occupied the entire block between 51st and 52nd streets.

At one point, six hundred workmen and sixty sculptors were working on the mansion, which was completed in December of 1881. Critics poked fun at William Henry's new home. One critic called it a "gloomy

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waste of rubbed sandstone” and added, “The baroque interior of the home of the head of the House of Vanderbilt was a tasteless hodgepodge, ostentatiously crammed with riches. . . . It was a stylistic mess that cost a fortune.”<sup>18</sup>

The mansion, perhaps a “stylistic mess,” started a family tradition that in the end bankrupted the family fortune. The millions spent on 640 Fifth Avenue represented just the start. William Henry’s sons, William K. and Cornelius II, lavished millions more on their homes on Fifth Avenue and in Newport, Rhode Island. In Asheville, North Carolina, his third son, George, constructed the largest private home ever built in this country—Biltmore—set amidst 146,000 acres of countryside. The next generation of Vanderbilts followed their parents’ example, spending millions more on their homes, summer estates, and “camps” in the Adirondacks—all constructed not for comfort but for grandeur, to celebrate and glorify the House of Vanderbilt.

William H. Vanderbilt retired from active railroad affairs in 1883, retaining only his directorship in the New York Central. He devoted much

*Mansion of William H. Vanderbilt (first two facades at left), on Fifth Avenue looking north from 51st Street*

*The Commodore's Grand Central*

*Interior of the William  
H. Vanderbilt man-  
sion at Fifth Avenue  
and 51st Street, 1883*

Image not available.

of his time to horses and his art collection and prepared to turn over the Vanderbilt fortune to his sons. A gigantic fortune indeed. "I am the richest man in the world. I am worth one hundred ninety-four million dollars," William Henry boasted to a friend one day. Apparently he was. His only rival, England's Duke of Westminster, held a fortune worth somewhere around \$200,000,000, but it was almost all in land. Henry Clews, a legendary Wall Street operator and social gadfly, in his memoirs commented on Vanderbilt's fortune: "The ordinary human mind fails to grasp the idea of such a vast amount of wealth. If converted into gold it

would take five hundred strong horses to draw it from Grand Central Depot to the Sub-Treasury in Wall Street.”<sup>19</sup> Wealth of this magnitude appears staggering today, and William H. enjoyed his wealth before the federal income tax became permanent.

On December 7, 1885, William Henry met with Robert Garrett, the president of the Baltimore and Ohio Railroad, in Vanderbilt's mansion on Fifth Avenue. Garrett arrived without an appointment to discuss the B&O's desperate need for access to New York harbor via the Jersey side of the Hudson. The B&O faced bankruptcy unless it could deliver freight and passengers directly to New York City, the key advantage enjoyed by Vanderbilt's rail lines. At around 2:00 P.M., William suddenly grabbed at his throat and fell to the floor dead. He had outlived the Commodore by only eight years. Now, the responsibility fell to William Henry's sons to oversee the fortunes of the Vanderbilt railroad empire and of its crown jewel, Grand Central.

### *The Grandsons of the Commodore*

William Henry's death, like his father's, sparked intense interest in the division of his fortune among his heirs. William H. Vanderbilt had four sons—Cornelius II, William Kissam, Frederick, and George—and four daughters. His two eldest sons served as officers in the railroad business, as their father and grandfather had demanded. While they both learned the railroad business thoroughly, their temperaments differed. Cornelius II was a serious man. Friends and acquaintances reported that they never saw him smile. He taught Sunday school at St. Bartholomew's Church, where he met his future wife, Alice Claypoole Gwynne. William K., on the other hand, appears to have been dedicated to pleasure and his social life, as well as to the railroad business.

When William H. died, he left \$10 million to his sons Frederick and George and the same amount to each of his daughters. The remainder of the fortune he left equally to Cornelius II and William K.; each inherited \$65 million. William H. dared to do what the Commodore had cautioned him never to do. He divided the bulk of his estate between his two eldest sons, leaving neither as the clear head of the House of Vanderbilt, further weakening the Vanderbilt grip on the New York Central.

The Commodore had been a little rough around the edges; he had not been raised in luxury. William H. had spent years on a farm on Staten Island raising hogs and vegetables. By contrast the grandsons of the Commodore received the finest education money could buy in Europe and America and, by the time of William's death, had achieved a degree of social respectability, a fortune of \$200 million being hard for the social arbiters to ignore. Still the old Knickerbocker elite of New York City withheld their acceptance of Cornelius II and William K., but their wives set out to change that.

William K.'s formidable wife, Alva, took the lead. Armed with the Vanderbilt millions, Alva Smith Vanderbilt, counseled by the social dandy Ward McAllister, plotted to conquer New York society. McAllister, who coined the term the "Four Hundred" to describe New York's social elite, chose the term because that was the number of people who could fit comfortably into the ballroom of Mrs. Caroline Schermerhorn Astor, *the* Mrs. Astor. For years Mrs. Astor dominated the social elite of New York and refused to recognize the Vanderbilts. Alva simply would not be deterred and, with McAllister's assistance, finally triumphed, with a fancy dress ball held on March 26, 1883, at her new mansion at 660 Fifth Avenue. The ball reportedly cost \$75,000, and even Mrs. Astor attended. Guests came dressed as knights and fairy tale characters: Cornelius II appeared as King Louis XVI and Alva dressed as a Venetian princess. William H., accompanied by Ulysses S. Grant, attended in black tie.

Here New Yorkers witnessed spending beyond avarice. Flowers for the ball cost \$11,000, some guests' costumes ran as high as a \$1,000. Henry Clews, with a strong sense of irony, compared the Vanderbilt ball favorably to the antics at Versailles and the entertainments of the Roman emperors.<sup>20</sup>

Not more than four blocks to the east, next to the New York Central train yard at 42nd Street, stood squalid tenements filled with Irish, German, and Jewish immigrants who considered \$1 a day a good wage. Nothing so clearly illustrates the contrasts of the Gilded Age more than this juxtaposition of the Vanderbilt ball and the lives of the millions of ordinary Americans struggling for a decent life and unable to comprehend the wealth amassed by the Commodore and his son, wealth that funded a fancy dress ball so that Alva Vanderbilt could have her social triumph.

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The ball represented only the beginning. New mansions followed in New York and lavish “summer cottages” in Newport, Rhode Island: the Breakers for Cornelius and the even more expensive Marble House for William K. and Alva, both designed by Richard Morris Hunt.

When Cornelius Vanderbilt II completed the Breakers in 1895, the reputed cost of the building alone totaled \$2 million, with an additional \$9 million spent on furnishings. Newport endures as a place where the excesses of the Gilded Age remain on view. Armies of servants catered to every whim of the newly created class of self-styled aristocrats. For sumptuous balls, the wives and daughters spent thousands on gowns, while at the same time the laborers working at Grand Central received \$1 a day for ten hours of work.

On September 29, 1904, the board of directors of the New York Central awarded pensions to three long-time employees. John W. Horan, aged seventy, had worked for the railroad for forty-four years as a clerk, and the board set his pension as \$20 a month. Richard Hennessey, sixty-eight, had labored for fifty-one years as a section hand, while James Cleary, eighty-two, had served as a baggageman for fifty-six years. Both

*The mansion of Cornelius Vanderbilt II, at Fifth Avenue and 57th Street, replaced by the Bonwit Teller department store*

### *The Commodore's Grand Central*

Hennessey and Cleary, “unable to work” any longer, received pensions of \$15 a month.<sup>21</sup> Did Cornelius II and William K., sitting on the board with J. P. Morgan and William Rockefeller, brother of John D., think about the vast gulf between a pension of \$15 a month and the millions they spent?

Succeeding generations of Vanderbilts continued to spend until the fortune ran out. In the space of four generations, a major part of the largest fortune in American history simply disappeared. As the riot of spending continued unabated, direct involvement of the Vanderbilt family in the New York Central Railroad, the cornerstone of the Vanderbilt fortune, declined. At the time of Cornelius's death in 1899, William K. was living abroad for long periods of time. Day-to-day management of the Central rested in the capable hands of its professional managers; the Vanderbilts eventually came to play the role of minor stockholders. A congressional investigation in 1931 determined that the entire stock holdings of the various Vanderbilt descendants totaled less than 5 percent of the stock of the New York Central Railroad.

“The Gilded Age,” an expression coined by Mark Twain to characterize the extravagance, waste, and frivolity of the period after the Civil War, coincides exactly with Howard Mumford Jones's “Age of Energy.” Those years saw great achievements in American material progress and the unleashing of the industrial age. Yet, parallel to this constructive energy stands the conspicuous display of personal wealth.

### *The End of the Commodore's Grand Central*

When first opened in 1871, the Grand Central Depot generated awe. However, by the time of William Henry Vanderbilt's death in 1885, the steady growth in traffic for the railroads using the terminal had generated enormous problems. With only fifteen tracks, the arched train shed became inadequate as long-haul and commuter traffic grew at a rate far exceeding all projections. Envisioned to serve the needs of the railroads for twenty-five to thirty-five years, the terminal reached capacity much more quickly. In 1886, just fourteen years after Grand Central first opened its doors for business, an annex with seven additional tracks was added on the east side of the train shed, along Depew Place. Even these addi-

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tional tracks provided only short-term relief as passenger volume increased relentlessly.

In 1898, the railroads once again improved Grand Central, with a three-story addition to the terminal building and a major reconfiguration of the waiting rooms. The most important change involved the construction of an enlarged concourse across the head of the tracks in the train shed. Prior to this alteration, each railroad had provided a separate waiting room and access to the train platforms. A passenger arriving on a New York Central train and departing on a New Haven train had to walk through the New York Central waiting room, out onto the street, proceed to the entrance of the New Haven waiting room, and walk through it to board the New Haven train. The new concourse cost \$2,500,000, but it dramatically improved the flow of people through the station and

*Grand Central in 1898, from 42nd Street, with cable cars on 42nd Street and showing the station for the Third Avenue El at right*

Image not available.

among the three railroads' platforms. However, it failed to solve the underlying problem: too few platforms to serve the growing volume of passenger traffic.

As the century drew to a close, critics labeled Grand Central the worst rail facility in the country and New Yorkers increasingly complained about the crowded terminal and open train yard to the north. A *New York Times* editorial condemned Grand Central for aesthetic reasons and as a health hazard: "It is known to travelers as one of the most inconvenient and unpleasant railroad stations in the whole country. The statement errs on the side of moderation. When our pretentiously named station was new it aroused a considerable amount of local pride . . . but that day passed long ago and for many a humiliating year the ugly structure has been a cruel disgrace to the metropolis and its inhabitants. At present the odors that permeate its waiting rooms . . . reach every would-be passenger, disgust him with plain hints of gross uncleanness, and threaten him with typhoid and diphtheria."<sup>22</sup> The last part of the editorial is a thinly veiled reference to the flood of immigrants using Grand Central to travel to other parts of the country after being processed at Ellis Island. In the remodeled Grand Central an "immigrant waiting room," in the basement, served recently arrived immigrants waiting to board special trains the railroad ran to the Midwest.

To many New Yorkers, Grand Central no longer conveyed a sense of grandeur for a city that prided itself on its preeminent place in American life. Newspapers criticized both the building and New York Central for not providing a more fitting terminal:

Nothing pertaining to New York City except its government has been so discreditable to it as its principal railroad station. Wretchedly cramped in space, stingy of the many accommodations demanded by arriving and departing travelers, ill-arranged, dark and repelling, this utterly inadequate structure has been considered by its owners to be good enough for New York. . . . The privilege conferred upon these railroads of possessing the only terminal station on Manhattan Island is one of immense value. . . . the Grand Central Station furnishes terminal accommodations which would be considered adequate in Sandusky, Ohio. . . . It is a long standing affront to the

people of New York, an evidence of disgraceful ingratitude and indifference on the part of the railroad companies.<sup>23</sup>

Here the editors touched on a key point concerning Grand Central and the New York Central Railroad—its monopoly on direct rail access to Manhattan, the cornerstone of the entire Vanderbilt system. The company remained vulnerable to the charge that it provided inadequate service and accommodations in exchange for a monopoly on direct rail access to New York, an asset of immense value.

Commodore Vanderbilt's cramped and overburdened terminal provided a concrete, everyday focus for the criticism of all of the vast changes taking place in the lives of the people of New York and the entire country. One of the country's largest and most powerful railroads, the New York Central stood accused of ignoring the needs of the traveling public and of being more concerned with profits than with providing decent service. Even the conservative *Scientific American*, not known as a muck-raking publication, recognized the seriousness of the congestion at Grand Central and called for large-scale changes: "Grand Central Station at Forty-second Street will continue to be the only great terminal in New York. . . . radical change must be made in this terminal or the traffic within the next few years will be thrown into a condition approaching deadlock."<sup>24</sup>

Only one real solution remained: replace Grand Central Depot with a completely new facility, a new terminal with vastly increased capacity. This is precisely what the New York Central Railroad set out to do.

## *The Engineer's Grand Central*

On January 8, 1902, the 8:17 commuter train from Danbury, Connecticut, paused in the Park Avenue tunnel at 58th Street, awaiting a signal to proceed. Smoke and steam choked the tunnel. Despite warning lights and signals, a train from White Plains, New York, crashed into the rear of the Danbury train, killing fifteen passengers and injuring scores more. Screams filled the splintered cars at the rear of the Danbury train. Coals from the stoves used to heat the passenger cars spilled out, and the danger of fire spread. New York City firemen quickly arrived on the scene; Battalion Chief Thomas Freel heroically climbed down into the tunnel and crawled through the cars, amidst the dead, in a frantic search for survivors. Upon hearing the alarm, William K. Vanderbilt, then a board member of the New York Central and Hudson River Railroad, rushed to the scene from his Fifth Avenue mansion. Unable to offer any assistance, he went to the railroad's headquarters at Grand Central to await further news.<sup>1</sup>

Reaction to the tragedy, indignant and impassioned, pressured New York's district attorney to indict the operator of the White Plains train, Charles Wisker, for manslaughter. An inflamed press demanded the indictment of the officers and directors of the New York Central for the operation of a public health hazard, the Park Avenue tunnel. In May of 1903, in response to the tragedy, New York City and the State of New York outlawed the operation of steam locomotives south of the Harlem

## *The Engineer's Grand Central*

River (in effect, all of Manhattan Island), including the Park Avenue tunnel, after July 1, 1908. The New York Central desperately needed to solve the tunnel problem. They also needed to deal with their antiquated passenger facilities at Grand Central Depot or relocate passenger operations from 42nd Street, an unthinkable alternative.

### *William J. Wilgus, the Chief Engineer*

One of the officials of the New York Central who recognized the serious problems the railroad faced with its outdated facilities at 42nd Street was William J. Wilgus. Born in Buffalo, New York, in 1865, he never attended college but his brilliance propelled him to a distinguished career as a self-taught railway engineer. In 1883, after completing high school, Wilgus began his railroad career working with the Minnesota and Northwestern Railroad and the Duluth and Winnipeg Railroad. He joined the New York Central in 1893 and, in less than a decade, rose to the position of chief engineer. During the First World War, Wilgus served with the American Expeditionary Force under General Pershing. In France, he ran the railroads for the Military Railroad Commission with such distinction that the French government awarded him a medal; thereafter Wilgus proudly used the title *Colonel*. A final triumph came during the Great Depression when President Franklin Roosevelt appointed Wilgus director of the Emergency Relief Bureau for New York City, an agency charged with the awesome responsibility of alleviating the ravages of the Depression in the nation's largest metropolis. In his later years, he established a lucrative practice as a consulting engineer and eventually retired to his farm in Claremont, New Hampshire, where he died peacefully, at the age of eighty-three, in 1949. After Grand Central Terminal, Wilgus's most important work involved serving as a consulting engineer on construction of the Holland Tunnel, completed in 1927, which linked lower Manhattan to Jersey City.

In 1902, Wilgus had recently been promoted to the position of fifth vice president and placed in charge of all engineering for the New York Central. He knew that another remodeling of Grand Central Depot simply would not suffice.

The officials of the New York Central never considered relocating its

*William J. Wilgus, chief engineer of  
the New York Central Railroad and  
the genius behind the plans for the  
new Grand Central*

Image not available.

terminal facilities; they knew the superb advantages afforded by the 42nd Street location. At the turn of the century, as New York spread steadily up Manhattan Island, 42nd Street became the heart of Midtown. The Harlem Railroad's original choice of Fourth Avenue (Park Avenue) as its north-south route and the emergence of Fifth Avenue as the city's premier address channeled high-class residential and commercial development of the city toward the east side of the island. As the city expanded northward, Grand Central emerged as the transportation hub for fashionable Midtown: numerous streetcar lines converged at 42nd Street, and the IRT (Interborough Rapid Transit), the city's subway, built a major station underground adjacent to the terminal. Adding to the transportation mix, the Third Avenue elevated railway's spur above 42nd Street stopped at Grand Central's front door.

The depot covered three city blocks, but the prohibitively high price of the surrounding land kept the New York Central from acquiring additional property to expand the terminal horizontally. In a stroke of genius, Wilgus envisioned expanding not horizontally but vertically, and not up but down—building two terminals, one over the other. A two-

Image not available.

story underground facility, with one set of tracks over the other, would provide vastly increased capacity to serve the ever-increasing volume of long-distance and commuter passengers.

Another obstacle remained: if the New York Central continued to use steam engines for motive power, then the problems associated with the Park Avenue tunnel—smoke, soot, and heat—remained. In addition, the legal mandate that resulted from the tunnel accident required the complete elimination of steam operations below the Harlem River by 1908. To Wilgus the solution demanded a change from steam to electric power. Switching to electric power would eliminate both the dangerous conditions in the Park Avenue tunnel and allow for the construction of an underground two-story train yard.

Wilgus, not a modest man, took full credit for the new Grand Central Terminal and the complex of buildings around 42nd Street, later hailed as “Terminal City,” that resulted from this plan. In a lengthy article published in *Transactions*, the journal of the American Society of Civil Engineers, in 1940, he explained his “Concept of an Entirely New Terminal Utilizing Air Rights.” He described how, dissatisfied with the other proposals for expansion, he had wondered if the best solution might not be to “tear down the old building and train shed and in their place, and in the yard on the north, create a double-level, under-surface terminal on which to superimpose office quarters and revenue producing structures made possible by the intended use of electric power.”<sup>2</sup>

Wilgus touched on two key elements of the new Grand Central station. Without doubt, any solution would involve enormous costs. How would the railroad finance these enormously expensive improvements? Wilgus proposed to use the “air rights” above the new underground terminal to construct revenue-producing buildings with income sufficient to finance the changes. He stated somewhat dramatically: “Thus from the air would be taken wealth with which to finance obligatory vast changes otherwise nonproductive. Obviously it was the right thing to do.”<sup>3</sup> In a letter to New York Central’s president, William H. Newman, he proposed a fifteen-story office building over the 200,000 square feet of surface area then occupied by the old terminal building and train shed. Wilgus projected rental income of \$1,350,000 a year, representing a 3.5 percent return on “all of the Grand Central Station terminal changes,

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including those for depression of the tracks, yard improvements, etc.," including electrification.<sup>4</sup> Wilgus's ideas proved extremely attractive to Newman and the board of directors, who approved the vast undertaking with no dissenting voices.

### *A Multifunctional Plan*

Wilgus followed his letter of December 22, 1902, to President Newman with another, in March of 1903, in which he laid out, in detail, all the component parts of the immensely complicated project. Remarkably, nearly one hundred years later, the Grand Central Terminal complex embodies almost all of the elements Wilgus proposed in 1903:

1. a double level, underground terminal with a loop track at the suburban (lower) level
2. an elevated driveway around the twelve-story building connecting Park Avenue north and south of the new terminal
3. the elevated driveway carried on an arch bridge over 42nd Street connecting with Park Avenue south to the street
4. north of the terminal from 45th to 48th streets, over the underground train yard, provision made for a "grand court or park" over the train yard and for future development of revenue producing buildings
5. a new hotel on Madison Avenue between 43rd and 44th streets to be "run on first class lines, similar to the Waldorf-Astoria"
6. a waiting room eighty feet in width extending across the entire station
7. the main concourse, sixty feet in width, with direct connections to Vanderbilt Avenue on the west and Depew Place on the east
8. from the concourse, ramps leading down to the long-haul train platforms
9. ramps from the concourse, along with stairs and elevators, to the lower concourse, where ramps would lead to the suburban train platforms
10. a direct connection with the IRT subway at the suburban level
11. north of the station between 45th and 48th streets, construction of a separate baggage facility connected to the tracks below by elevators and "endless belts"

12. changing from steam to electric power which would make possible "all of these improvements, which otherwise would be impracticable owing to smoke, cinders and gas"
13. separation of the suburban from the through service

Wilgus predicted that, with the improvements enumerated above, the railroad's commuter traffic to New York's northern suburbs would triple or even quadruple. He added that a new terminal of "monumental appearance" would have a positive impact on public opinion: "the entire project will probably make it the most attractive locality in New York and gain for us the approval of the general public and the municipal authorities."<sup>5</sup> After the disastrous train wreck in the Park Avenue tunnel, the Central certainly needed to generate favorable public opinion.

Busy railroad terminals, especially a major facility like Grand Central, bustled with activity: Trains arrived and departed, passengers hurried back and forth along the platforms, baggage moved to and from the trains, while suburban riders rushed to their jobs or appointments in the city. With the addition of mail and express service, railroad terminals constituted the busiest and most congested of buildings, filled with the energy of people traveling near and far.

Planning railroad facilities, especially a head terminal such as Grand Central, proved challenging and few designs succeeded. Early head terminals, including the first Grand Central, included a concourse running at a right angle to the platforms and tracks. The second La Salle Street Station in Chicago (1868–72), Park Square Station in Boston (1872–74), and the Central Railroad of New Jersey Station in Jersey City (1887–88) all shared the same basic head house design with its inherent limitations. Platforms simultaneously served incoming and departing trains, long-haul and commuter service, baggage and freight. Departing passengers intermingled with incoming passengers while railroad employees unloaded baggage, mail, and freight. Waiting areas and restaurants, located in the concourse at the end of the train platforms, only added to the congestion.

Wilgus's design brought order to the inherent chaos by separating activities. He planned the lower level of the two-story underground facility exclusively for commuter service and reserved the upper level

concourse for *departing* long-distance trains. For the heart of Grand Central Terminal he envisioned a central concourse providing an appropriate stage for New York Central's famous passenger trains, which had colorful names like the Twentieth Century Limited, the Empire State Express, and the Wolverine. Departing passengers, descending via ramps to a concourse, would purchase tickets and proceed to the gate to board their train. No dashing commuters or piles of baggage would interfere. Departing from Grand Central eventually evolved into a grand adventure, a lavish procession through New York's most magnificent public space.

Since the lower level served only suburban trains, the twice daily commuter rush hours no longer interfered with the railroad's more glamorous long-distance trains. With ramps connected directly to the city streets and to the IRT subway, commuters could complete their journey to work without crossing the concourse on the upper level. On the west side of the upper level, Wilgus set aside a number of platforms to serve all incoming, long-distance trains. Arriving passengers exited their trains and proceeded up ramps to a large reception area. At this "Incoming Station" they met friends and relatives or proceeded up a flight of stairs to an enclosed cab stand and street exit. Elevators provided direct access to the lobby of the Biltmore Hotel, built over the Incoming Station. Wilgus planned the Incoming Station, completely separate from the main concourse, for passengers arriving from upstate New York, the Midwest, and New England, on the long-distance trains of the New York Central and the New Haven railroads.

Wilgus devised an ingenious way to handle baggage. As part of the project the Central constructed a detached baggage facility between 43rd and 44th streets, reached by means of an elevated roadway. Taxis and freight wagons dropped off and picked up baggage far from the train platforms. Elevators moved the baggage to and from the train platforms, eliminating any need to cross the concourse. Spaced along the platforms, ten elevators served the outgoing trains and nine the incoming. Departing passengers proceeded to the platforms while their baggage descended from the baggage building to the trains waiting below. At the Incoming Station, baggage moved directly from the trains to the baggage building above. For arriving passengers staying at the Biltmore Hotel, baggage went by elevator directly to their rooms.

When Grand Central Terminal opened, the *Railway Age Gazette* pointed out that Wilgus's clever plan for baggage handling solved a problem other terminal designs failed to deal with effectively: "In this way all conflict in the handling of baggage is eliminated and interference with passengers is reduced to a minimum."<sup>6</sup> In 1964, as long-distance train travel continued the inexorable decline it began in the 1930s, the Pan American office building replaced the baggage building. However, the elevators remain part of the fabric of Grand Central. Commuters now use both the upper and lower levels and pass around the old baggage elevators as they hurry to and from their trains, without a thought to a time when long-distance train travel from Grand Central represented the height of luxury and sophistication.

Wilgus's plans included provisions for U.S. mail carriage and express freight service, two other important railroad functions. Along with the other major railroad systems, the New York Central carried mail under contract to the U.S. Post Office. When railroading first began, mail contracts provided the fledgling railroads with an important source of revenue and promoted an efficient and inexpensive mail service that knitted the country together. On the east side of the upper level of the new Grand Central, Wilgus reserved a number of tracks and platforms for mail and freight service. In 1907, the railroad built a new post office building on the corner of Lexington Avenue and 45th Street and leased the facility to the U.S. Post Office for \$51,981 a year.<sup>7</sup> Elevators connected the post office with the platforms below, allowing arriving mail to move directly to the sorting room above.

In partnership with the American and Adams express companies, the Central provided freight service at 42nd Street. The express companies shipped high-value freight in the Central's long-distance trains and split the fees fifty-fifty with the railroad. As Grand Central Terminal neared completion, the railroad constructed a new building for Adams Express at Lexington Avenue and 48th Street, on the future site of the Waldorf-Astoria Hotel. For the American Express Company, the railroad built a new building on Lexington Avenue between 43rd and 44th streets adjacent to the post office. At both express facilities elevators moved freight from the train platforms below ground to the warehouses above.

Wilgus's plan provided for all of the different functions and services

## *The Engineer's Grand Central*

needed at the 42nd Street terminal and succeeded beyond all expectations. Grand Central remains, to this day, the most complex of urban forms and stands as the centerpiece of a thriving transportation and commercial nexus in the heart of New York City. Almost one hundred years after Wilgus first described his bold ideas to the president of the New York Central Railroad, his innovative concept still functions superbly.

## *A Massive Construction Project*

For many New Yorkers and people throughout the country, the image of Grand Central remains the building's world-famous facade on 42nd Street. Behind it stands the Grand Concourse, surrounded by stately columns rising to the vaulted ceiling over which the Milky Way is spread. Forgotten now are the less showy elements of the epic effort undertaken by the New York Central Railroad at the turn of the century; for the new Grand Central complex involved much more than just the famous terminal building on 42nd Street.

To begin, the vast two-story underground train yard, which stretched to 56th Street, required the excavation of more than three million cubic yards of dirt and rock. Plans to convert from steam to electric power necessitated the building of electric power generating plants and an elaborate distribution system through the areas to be electrified in Manhattan, the Bronx, and Westchester. Finally, a massive real estate development of the air rights over the railroad's property in midtown Manhattan followed the completion of the underground facilities and the switch to electric power. Such a complicated construction effort had never before been attempted in any American city.

To complete such a complicated construction effort required superb organizational skills. William Wilgus, in charge of all construction and electrification, divided the work into eight separate projects:

1. Grand Central Yard

Excavation of the train yard, construction of the two-story underground terminal

2. Grand Central Station

Construction of the new station building

3. Electrification
  - Hudson Division—from Grand Central to Croton-on-Hudson
  - Harlem Division—from Grand Central to North White Plains
  - New Haven Railroad—supply electric power to New Haven from Woodbridge to Grand Central
4. Port Morris Branch Depression
  - Lower tracks from Mott Haven to Port Morris in the Bronx
5. Marble Hill Cut-Off
  - Build tunnels in Bronx under Marble Hill just over Harlem River to shorten and straighten tracks between Hudson River and Mott Haven
6. High Bridge, Morris Heights and Fordham Heights
  - Eliminate grade crossings on Harlem Division between Mott Haven and Woodlawn in Bronx
7. Hudson Division
  - Four tracking of line from Mott Haven to Croton-on-Hudson
8. Harlem Division
  - Four tracking of line from Mott Haven to North White Plains.<sup>8</sup>

He appointed competent subordinates to manage each project, but retained overall control and responsibility. Since each part of the project affected all the others, Wilgus's brilliant leadership ensured overall coordination.

Construction began in the summer of 1903 and would continue until the summer of 1912. Yearly, Wilgus provided Newman and the board of directors with a detailed summary of progress on each of the eight separate projects, accompanied by updated cost estimates. Wilgus's first report, in 1904, estimated the total cost of all planned work at \$40,746,350, an immense sum even given the wealth of the New York Central. To put the project in perspective, for the 1902–3 fiscal year, total revenue of the New York Central slightly exceeded \$82 million. The New York Central faced the daunting challenges of managing the most complicated building project in New York's history and securing the staggering sums needed to fund it and run a profitable enterprise at the same time.

To complicate matters further, costs escalated almost from the first day work got under way in 1903. Just one year into the undertaking, the original estimate of \$40.7 million rose to \$59.9 million and in 1906 to

## *The Engineer's Grand Central*

\$71.8 million.<sup>9</sup> Wilgus struggled to justify the project's increased expenditures, which doubled in two short years. Despite the rapidly escalating costs, the railroad remained committed to building the largest railroad complex in the world and to accomplishing the task with style and grace, regardless of the ultimate expenditure.

This construction project illustrates the confidence that drove large businesses and the leading engineers and builders during the Age of Energy. In 1898, the entire outstanding indebtedness of the New York Central Railroad, second in size only to the Pennsylvania Railroad, totaled only \$64 million. Three years later, the Central decided to proceed with the Grand Central project, at a cost equivalent to billions of dollars in today's terms. Faced with capital demands on this scale, a business proceeds only if it harbors superb faith in its own future. During the Age of Energy the transformation of American society succeeded because company after company, and the individuals who led them, exhibited unbounded faith in the future and in their own abilities.

Despite the criticism of the conspicuous consumption of the Gilded Age and the extravagance of the Fifth Avenue and Newport mansions, the fact remains that American business in the period after the Civil War created the largest industrial system in the world. Engineers and builders met any challenge, whether it involved a bridge across the East River or a canal across Panama. Grand Central Terminal serves as a conspicuous example of the imagination and daring that characterized a remarkable age. If the New York Central's executives had been timid, or even just more cautious, one of the great glories of New York might never have been created.

### *Excavation*

One challenge dominated all others: to build a completely new terminal while not interrupting scheduled service at the 42nd Street terminal. Each day hundreds of trains arrived and departed and thousands of long-distance passengers as well as an army of commuters hurried through the terminal. How could the gigantic construction effort be carried out without disrupting an already crowded schedule? Throughout the nine long years it required to complete the project, the operating division, responsible for maintaining scheduled service, waged a constant struggle

with Wilgus and other railroad officials in charge of the new construction. To complicate matters further, throughout the entire construction period, passenger volume steadily increased.

Maps of the Grand Central area from 1898 illustrate the magnitude of the undertaking. The original Grand Central building and train shed stretched from 42nd to 45th streets between Depew Place and Vanderbilt Avenue. An open train yard reached to Madison Avenue on the west, while turntables and an engine house filled the yard to the east, next to the American and Adams express company warehouses along Lexington Avenue. Narrowing to four tracks at 49th Street, the rails ran in an open cut until entering the Park Avenue tunnel at 56th Street.

Wilgus devised a plan to manage the excavation and construction in stages by dividing the old terminal building, train shed, and train yard into a series of bites and having construction proceed one bite at a time. In each bite, work began by demolishing all structures within the bite and removing the existing railroad tracks. Once cleared, work crews excavated to a depth of between 50 and 60 feet. With excavation completed, construction began on the two-story underground structure. As soon as work crews completed the new platforms and tracks, the operating division assumed control and the excavation and construction workers moved on to the next bite.

*Railway Age Gazette* described the complicated nature of the construction process: "It has been possible to withdraw only a small section of area of the old terminal from service at any one time, and it has been necessary to complete work on a corresponding section and put it into service before another portion is disturbed. In this way the old terminal has been gradually replaced by the new until the last tracks in the old station were taken out of service on June 21, 1912."<sup>10</sup>

Wilgus mapped out a total of twelve longitudinal bites, starting with the east side of the train shed and yard along Depew Place. The schedule called for the completion of the first bite and release to the operating department by December of 1905. The final bites, on the west side, were to be completed between December of 1907 and January of 1908. Wilgus's ambitious schedule included dates for the start of concrete work and erection of the steel framework in each bite.

After receiving bids from thirteen companies and comparing them

Image not available.

*The area surrounding Grand Central Depot in 1890, before electrification and construction of the new terminal*

*Wilgus's excavation  
plan for Bite no. 2*

Image not available.

carefully, the railroad signed a contract on August 7, 1903, with the O'Rourke Construction Company of New York for the excavation of the train yard. O'Rourke's contract specified the completion of all excavation work south of 57th Street for \$8,555,000. Excavating more than 3,000,000 cubic yards of material required a great deal of blasting, since the hard Manhattan schist lay only a few feet below the surface.

O'Rourke's most difficult problem was how to haul away the tremendous amount of earth and rock they excavated without creating massive traffic jams in Midtown. In 1903, the horse-drawn wagons used on most construction sites had extremely limited capacity—three or four cubic yards filled a wagon. At that rate, the Grand Central excavation would generate more than one million wagonloads. O'Rourke and the railroad needed an alternative hauling system.

The Panama Canal, the most massive excavation project of the age, provided a model for a solution. When the French, led by the hero of the Suez Canal, Ferdinand de Lasseps, had tried to build a canal across the Isthmus of Panama, they had failed because they never devised an adequate system for removing the excavated material. When John Stevens arrived in Panama in 1905 to lead the American effort, he recognized the key to building the canal: organizing an efficient system for hauling away the tremendous amount of earth his steam shovels dug each day.<sup>11</sup> To do this, he built an elaborate railroad system. Steam shovels filled one railroad car after another, as they waited on tracks laid alongside the excavation site. Once the cars were filled, steam engines pulled them to dump sites, the largest of which formed the Pacific terminus of the canal at Colon. As the shovels dug deeper into the cuts, the railroad advanced with them. To keep the excavation going required careful scheduling, continuous relocation of tracks, and a never-ending supply of cars. Stevens' railroad system proved to be the crucial component of the American success in Panama.

The Panama Canal involved excavation on a scale that vastly exceeded the efforts at Grand Central, but Stevens and the engineers in Panama were working where nothing had been built before, the opposite of the problem confronting engineers at 42nd Street. At Grand Central, construction crews faced limited space, adjacent property owners, numerous surrounding buildings, and a tremendous amount of outside traffic. For example, on Park Avenue at 49th Street, the F. and M. Schaefer Brewery

Image not available.

filled an entire block. Because excavation would be proceeding right next to the brewery's foundation, the railroad erected costly shoring to reinforce the brewery walls. Despite these efforts, the brewery sued the railroad for substantial damages to their property caused, in their view, by the excavation for the underground train yard.

*Excavation along Park Avenue between 49th and 50th streets, looking north, 1906*

At Grand Central, Wilgus and his fellow engineers set up a railroad system to remove the earth and stone from the 42nd Street site in the exact same manner as in Panama. The Central provided the O'Rourke Construction Company with hopper cars. Once filled, the railroad cars carried the rock and earth through the Park Avenue Tunnel, out of the city, and dumped some of the rock and earth along the Hudson River north of New York City, to widen the right of way along the river bank. With the remaining material, the railroad created a giant landfill at Croton-on-Hudson, for a new train yard, where long-distance trains could switch from steam to electric engines for the run to Grand Central. As the O'Rourke steam shovels moved deeper into each bite, crews relocated the tracks to keep pace with the excavation.

Image not available.

*Excavation of southern  
portion of Bile no. 2,  
1907*

Carting away the excavated material posed a major scheduling problem. In addition to the thousands of train movements needed each day to maintain scheduled passenger service, the operating department struggled to manage the trains moving back and forth to the dumping sites in Westchester County. Later, when construction began, trains also transported iron, steel, cement, and other construction materials to 42nd Street from the Central's storage yard at Mott Haven in the Bronx.

Scheduling difficulties notwithstanding, this imaginative use of the Central's existing rail network greatly facilitated both the excavation and the construction efforts. Subsequent large-scale construction projects in Manhattan have not had access to the rail system used so effectively for this massive building effort at the turn of the century. The congestion around major construction sites, so frustrating to generations of New Yorkers, serves as testimony to the efficiency of using a railroad solution for the most complex construction project in the city's history.

To oversee the excavation and construction phase of the project, Wilgus set up the Construction Committee, consisting of New York Central

engineers, including himself, and representatives from the O'Rourke Construction Company. The committee carefully monitored the progress of the excavation in hopes of maintaining Wilgus's tight schedule; any delay jeopardized meeting the city's deadline for eliminating all steam operations in Manhattan. As importantly, delays cost the railroad money.

When the O'Rourke Construction Company began work at 42nd Street, the *New York Times* reported that the company planned to complete the entire excavation in just two and a half years and to employ 3,000 men in the effort. Confidently, John O'Rourke, president of O'Rourke Construction Company, told a reporter from the *New York Daily Tribune* that he foresaw "no danger of the work being delayed." When pressed about the contract deadline, O'Rourke added, "I'll beat the life out of it."<sup>12</sup>

To begin, more than two hundred buildings awaited demolition before any excavation could start in Bite 1, including eighty-six buildings between 45th Street and 50th Street along Lexington Avenue. On the block bounded by 44th and 45th streets from Depew Place to Lexington Avenue stood twenty-five buildings, including a large storage warehouse on 44th Street. Eight five-story apartment buildings lined Lexington Avenue, and a number of two- and three-story residential buildings would have to be removed from 45th Street. In 1900, 875 people lived on the block between 44th and 45th streets, but they had to move as the railroad acquired the property and began demolition.

From the very start of excavation work, O'Rourke simply could not keep up with the schedule. At the beginning of 1905, the company informed the Construction Committee that the deadline for completion of the excavation of Bite 1, July 1, 1906, could not possibly be met.<sup>13</sup> At meeting after meeting, O'Rourke's representatives blamed the operating division for refusing to release tracks in a timely fashion to enable excavation to proceed on schedule.

Problems with the schedule continued into the following year. At one meeting O'Rourke promised to add Sunday shifts. However, the following month, the railroad again complained about the slow pace of excavation and pointed to the "lack of sufficient forces" on the Sunday shift. O'Rourke admitted that the company had failed in efforts to recruit a Sunday labor force. They had attempted to hire seventy carpenters

Image not available.

Image not available.

and five hundred laborers to work on Sunday, but on the most recent Sunday only twenty-four carpenters and one hundred ninety laborers had reported for work. Wilgus countered that the problem resulted from O'Rourke's pay scale and insisted that the O'Rourke Company "pay the market price for such labor."<sup>14</sup> A standoff continued; the railroad demanded that O'Rourke meet the schedule spelled out in their contract, even if it required paying higher wages. On the other hand, O'Rourke wanted to keep costs as low as possible to ensure handsome profits.

Charles Knowlton, one of the New York Central engineers, reported that, in one eleven-day period, the excavation rate dropped from 9,000 cubic yards every six days to only 6,000 cubic yards in eleven days.<sup>15</sup> At the rate of 545 cubic yards a day, Knowlton calculated, the excavation would require 5,504 days to complete. Clearly, the Central found the pace of excavation unacceptable. O'Rourke countered that the railroad,

*Excavation of southern portion of Bite no. 2, from Depew Place looking south with the old Grand Central Depot on the right*

Image not available.

*Excavation for the underground train yard, looking west toward St. Patrick's Cathedral, 1908*

late in the delivery of plans, continually failed to provide the one hundred railroad cars needed each day to haul away excavated material.

Finally, in May of 1907, the board of directors reached the limits of its patience and decided to cancel O'Rourke's contract and complete the excavation with its own work force. Wilgus agreed but reminded the board that the O'Rourke Company still had outstanding invoices to the Central totaling \$1,220,000 and that, in his judgment, the Central owed O'Rourke at least \$664,624 for work completed. To settle matters as quickly as possible, the board ordered the contract canceled and negotiated a final payment to O'Rourke of \$750,000.<sup>16</sup>

Wilgus, writing privately in December of 1906 to W. C. Brown, a senior vice president of the New York Central, admitted that some of the responsibility for the delays did in fact rest with the railroad, and he identified the railroad's operating division as the culprit in the process. Wilgus

pointed to the reluctance of the operating division to relinquish any space for the new construction: “my experience in the past two years has shown the hesitancy of those charged with the responsibility of operating the terminal of giving up any space that is turned over to them.” Referring to his original timetable for the first three bites and the ever-growing volume of passenger service using Grand Central, Wilgus warned that all construction might grind to halt: “If the constantly growing traffic of the company demands the entire use of three bites . . . we will be facing not only a practical cessation of the work enlarging the terminal or at least lengthening of the time of construction.”<sup>17</sup> The problem seemed to be intractable, yet throughout the decade-long construction, the volume of passenger traffic increased steadily while construction continued.

### *The Underground Train Yard*

Construction of the underground platforms and tracks followed as soon as excavation allowed. Because each bite constituted a small part of the planned underground train yard, construction in one bite added only a portion of the underground facility. Work in each bite involved multiple stages: excavation; building foundations; erecting the steel frame to support the two levels of the train yard and the streets above; pouring the concrete floor, walls, and ceiling; building platforms; installing all necessary utilities; laying tracks and third rails (which carried the electrical current); and finally installing switches and signaling systems. With the next bite, the construction crews repeated the process all over again. Each bite constituted an independent construction project; only at the very end of the long and complicated effort would the separate bites be joined to complete the underground complex. This sectional construction allowed parts of the new underground facility to open as soon as work crews finished laying tracks and signals. At the same time, excavation and construction in the next bite proceeded at a fevered pace.

No model for this kind of engineering challenge existed. *Engineering News* described the complexity: “numerous complications and variations arise. . . . this resulted in very heavy concentrated loads. . . . it required many columns to be supported on girders, since the columns in the suburban story had to be located between the suburban tracks, while those in

Image not available.

*Construction of upper and lower tracks and platforms in the underground train yard, looking south from 48th Street, 1911*

the express story had to be set between express tracks, the track layouts of the two yards being quite different. . . . remarkably heavy girder construction results.”<sup>18</sup> The design of the underground train yard consisted of a giant concrete and steel box with the city streets carried overhead, from east to west, by viaducts. Complete roofing over of the upper level did not occur until the development of the air rights over the terminal north of 44th Street after the new Grand Central opened in 1913.

One of the unprecedented engineering tasks was designing two completely different track layouts on the upper and lower levels, with tracks and platforms on the upper level not directly over those on the lower level. Supporting columns on the lower level needed sufficient strength to carry not only the weight of the concrete floor and platforms above, but also the tremendous weight of trains moving through the upper level and stopping alongside the passenger platforms. The columns on the lower level would need to carry loads of 3,000,000 foot-pounds and in

some cases more than 7,000,000 foot-pounds, while on the upper level columns would carry both the cross streets and eventually the air rights buildings above. The design of the upper level formed a massive railroad bridge, its steel girders in many places being seven feet in depth and in some places ten feet, calling for the most sophisticated engineering available. A two-story station designed to have trains arriving and departing on one level with a second set of trains arriving and departing on another, never attempted before, challenged all of the skills of the engineers and builders involved.

The generations of long-distance travelers in the past and the commuters who pass through the terminal today hardly give a second thought to the complexity of the massive structure. Platform lighting in the underground train yard casts shadows over the supporting structures, and concrete covers the massive steel columns and cross girders. Beyond the platforms, the train yard looms as a dark, mysterious cavern through which trains glide, the structure hidden from view. An absence of any

*Construction of 48th  
Street viaduct over up-  
per and lower tracks in  
Bite no. 2, 1908*

Image not available.

### *The Engineer's Grand Central*

clear view of the massive steel frame masks the innovative engineering employed at Grand Central. By contrast, the engineering of the Brooklyn Bridge, visible for all to see, contributes to an appreciation of the bridge as an engineering marvel as well as an aesthetic achievement of American building. Truly a triumph of engineering, the underground train yard remains overshadowed by the famous palatial building on 42nd Street and its world-famous Grand Concourse. With the possible exception of Roebling's work on the Brooklyn Bridge, the engineers of the Age of Energy toiled in relative obscurity. McKim, Mead and White, Richard Morris Hunt, Carrère and Hastings, Cass Gilbert, and other gifted architects of the era remain celebrated, while engineers like William Wilgus, who engineered and supervised the construction of the magnificent structures the architects designed, receive far less attention. Certainly as much as the architects of the age, they deserve attention for creating these great achievements in American building art.

### *Loop Tracks*

As construction of Grand Central moved forward, planning turned to the loop tracks, an integral part of Wilgus's original concept. Loop tracks solved one of the most vexing design problems head terminals such as Grand Central faced. In all head terminals, arriving trains stopped and discharged passengers. Train crews then backed the train away from the platform, separated the engine from the passenger cars, turned the engine around, and reorganized cars and engines to make up departing trains. All of this activity necessitated a significant number of train movements, and the flying switch would be far too dangerous in an underground train yard. Wilgus's plan for loop tracks eliminated these problems. Arriving trains would stop briefly at the Incoming Station to discharge passengers and then proceed around the loop to the other side of the train yard for servicing and preparations for departure. By pointing the engine in the right direction for departure, the loop tracks eliminated numerous switching and shunting movements.

Loop tracks required a substantial radius, and at Grand Central the needed space extended beyond the perimeter of the new terminal building on both the upper and lower levels. On the west side, the loops

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extended under Vanderbilt Avenue to the next block west, while on the east side the loops reached to Lexington Avenue.

*Construction of loop tracks at corner of 42nd Street and Lexington Avenue, 1912*

A major obstacle stood in the way. To the east, the New York Central did not own the property at 42nd Street and Lexington Avenue. On the corner stood the Hospital for the Ruptured and Crippled; a row of commercial buildings that included the Warner Fuller Wall Paper Company and Brandess Brothers grocery filled the rest of the block. To complete the loop tracks, the railroad needed to purchase the entire block from 42nd to 43rd streets between Lexington Avenue and Depew Place. Not until construction of the terminal building neared completion in 1910 did the railroad finally obtain the property, purchasing it for \$1,350,000.<sup>19</sup> Whitney Warren, at that time chief architect of the terminal, opposed the loop tracks, and his opposition delayed construction of the loop tracks considerably.<sup>20</sup> Despite Warren's opposition, the operating and engineering departments, who clearly saw the advantages of the loop tracks,

### *The Engineer's Grand Central*

mounted a campaign to include the loop tracks, and ultimately their arguments prevailed. Work on the loop tracks began in January of 1913.

When Grand Central opened, the *New York Times* predicted that the new terminal, with its loop tracks on both the upper and lower levels, would “permit the passing through its gateway of 100,000,000 persons every year.” The editors rhetorically asked what accommodations would be necessary when volume exceeded even that figure: “When the traffic exceeded that who knows? It has been suggested that by that time the growth of New York and the swelling of the tide of traffic will force the station to some new position beyond the Harlem River.”<sup>21</sup> The number of passengers never approached 100,000,000 people a year; traffic peaked in 1947, when 65,000,000 passengers passed through the terminal. Long-distance passenger traffic soon declined dramatically, as airline and automobile travel, heavily subsidized by the federal government, lured long-distance travelers from the nation’s trains. Even before the advent of the airline and automobile age, Grand Central’s capacity went underutilized; but at the turn of the century, the future for the railroads appeared limitless and a facility as large as Grand Central seemed more than justified.

### *Technology at Grand Central: The Advent of the Electric Age*

While excavation and construction of the underground train yard moved forward, Wilgus turned his attention to the task of electrifying the railroad’s operations in Manhattan, the Bronx, and Westchester. Electric technology made the entire Grand Central project possible. Wilgus premised his plan on the successful switch from steam to electric power—a leap into the unknown. Until then, no American railroad had electrified its main line service for any considerable distance.

Eliminating the steam locomotive provided the key to solving the interrelated problems faced at the 42nd Street facility. Switching to electric power allowed for the radical new terminal design and the resulting dramatic increase in capacity. Eventually, the new underground train yard covered a total of seventy-nine acres on the two levels, more than three times the area of the old facility. In the Commodore’s train shed, even with the addition of an annex built along Depew Place, only nineteen tracks ran next to passenger platforms. By comparison, the new two-

story underground facility included seventeen platform tracks on the suburban level and thirty-three on the upper level, an increase in capacity of more than 150 percent. Electricity also solved the pollution problem in the Park Avenue tunnel and allowed the railroad to develop its "air rights" in Midtown, eventually creating Terminal City. The *New York Times* noted electricity's crucial role in the new station's design: "Here we reach the keynote of the whole great project, for without electrically hauled trains the improvement could not have been developed along the proud and original lines that mark it."<sup>22</sup> Grand Central represents not just a triumph of American building art, but also a triumph of technology.

Wilgus proceeded in his usual systematic manner. First he established the Electric Traction Commission, separate from the Construction Committee, to oversee all aspects of the planning and installation of the electric system. He suggested to company president Newman that the commission include Wilgus, George Gibbs, who was another New York Central engineer, and two outside consultants, Bion Arnold and Frank Sprague, well-known figures in railroad electrification in America. Sprague's fame rested on the successful completion of the country's first electric street railway in Richmond, Virginia. Wilgus proposed yearly consulting fees of between \$7,500 and \$10,000 for both Sprague and Arnold. Newman quickly endorsed the idea.

For its initial agenda, the Electric Traction Commission carefully considered a number of crucial questions: the geographical size of the "electric zone," the type of current to use (direct versus alternating), whether to transmit the current via overhead wires or to use a third rail, and the number of power plants to build.<sup>23</sup> The work of the Electric Traction Commission reflected the professional thoroughness with which planning of the Grand Central effort proceeded. Wilgus and the railroad left little to chance. With the leading experts in the field as consultants, the commission carefully reviewed the latest electrical research, worked out the design and specifications for all the new equipment, selected the manufacturers to build the new engines and other equipment, set up an exhaustive testing program, and carefully monitored all installations within the electric zone. When the first electric engines entered service in 1907, the New York Central anticipated no major problems. This confidence rested in no small measure on the work of the Electric Trac-

tion Commission, whose deliberations serve as a testament to careful, rigorous technological innovation.

### *Electric Power Needs*

As the Electric Traction Commission considered the myriad questions entailed in the conversion from steam to electric traction, a spirited discussion of the comparative advantages of electric versus steam power arose among professional railroad engineers. John Droege, a noted railroad professional, succinctly set out the advantages and disadvantages of electric service for any railroad contemplating switching to electric.

The benefits of electric operation as compared with steam, or claimed by the electrical engineers and other supporters of electrification, may be divided into four classes: (1) freedom from smoke; (2) greater engine efficiency; (3) elimination of coaling, watering etc.; (4) reduced operating costs.

The disadvantages claimed by opponents of electrification may be divided into four groups: (1) the heavy capital outlay required; (2) the additional danger due to high voltage lines; (3) additional opportunities for delay to trains; (4) higher operating costs.<sup>24</sup>

Bion Arnold, one of Wilgus's consultants, published an article in the *Railroad Gazette* in 1902, in which he examined the advantages of electric power based on his research conducted for the Electric Traction Commission. Arnold set out to determine the number of kilowatts needed to power the 600 train movements at Grand Central on an average day. He used a dynamometer car attached behind a steam engine to measure the drawbar pull that steam engines exerted when accelerating from a dead stop to normal running speed. He measured the drawbar pull for different sizes of trains and computed the average drawbar pull for each class of service (determined by factors like number of cars, weight). Arnold then converted the drawbar pull to horsepower and calculated the number of kilowatts per hour necessary to supply the needed horsepower. He estimated the electric generation capacity needed at 1,800 kilowatts per hour, if all trains to and from Grand Central ran on electric power. In a typical year, he projected, total electric consumption would

be 15,768,000 kilowatt hours for 205,285,710 ton-miles of service, an average of 63 watts per ton-mile.<sup>25</sup> A ton-mile served as the standard measure by which the railroads calculated the cost of transporting passengers or freight.

At this point, the disadvantages of electric traction that Droege had pointed out became apparent. To build a power plant capable of generating a minimum of 1,800 kilowatts required a very substantial investment, and the cost of a transmission system would need to be added to it. Arnold, Wilgus, and the other engineers realized that electric traction for heavy railroad service would require a substantial initial capital investment. Electric street railways, which the newspaper editorialists pointed to as models for solving the Central's problems, provided no real comparisons. Ton-miles for an electric powered streetcar system paled next to the requirements for hauling heavy, long-distance trains. A typical train weighed in excess of 800 tons; even a string of streetcars fully loaded, weighed far less and demanded much less power. Sprague's electric engines for the Richmond street railway developed 15 horsepower; Arnold estimated that the new electric engines for use at Grand Central would require 2,500 horsepower. The system would demand power on a scale far exceeding that of any street railway in the country.

Even with the large initial capital investment, Arnold estimated the overall long-term cost of electric operations to be about the same as steam service. Steam engines required much more maintenance; when an engine had completed a scheduled run, a railroad pulled it out of service to add water and fuel and to remove ashes. In addition, steam acted as a powerful corrosive agent, and engines periodically needed major overhauls to clean boilers and keep their complicated machinery in working order. Electric engines, much simpler in design with far fewer parts, operated for longer periods between scheduled maintenance.

Arnold's research compared steam and electric operating costs on a locomotive mile basis; his calculations showed that operating costs for steam engines averaged 23.05 cents per mile versus only 15.8 cents for the electric engine. However, fixed charges for the electric engines, to cover the initial investment for generating plants and transmission lines, stood at 7.8 cents a mile versus 1.1 cents for steam locomotives. Arnold estimated total costs for the new electric engines at 23.6 cents a mile, only slightly

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*Turbine room in the Port Morris power plant, serving the electric zone, using equipment manufactured by the General Electric Company, 1906*

lower than for steam, 24.2 cents a mile. He concluded that the “savings in operational expenses by the electric system would be sufficient to offset the increased charges due to the additional investment made necessary by its adoption.”<sup>26</sup>

In the final analysis, the Central’s decision to convert to electric traction did not rest solely on a cost-benefit basis but on a legal one. New York City and State, backed by strong public opinion, had demanded the elimination of steam at Grand Central and especially in the Park Avenue tunnel. Though pressured to switch, Wilgus and the Electric Traction Commission remained confident that operating savings would offset the initial capital costs, once the new the electric equipment replaced the railroad’s steam operations in the New York metropolitan region. In addition, the railroad planned to supply electricity from its generating plant at 49th Street and Park Avenue to the new buildings constructed over the underground train yard.

*The Electric Zone*

A key issue the Electric Traction Commission considered at its early meetings in 1903 was how far north from Manhattan to extend the new electric service. The legislation passed by the city and state required eliminating steam power only from Manhattan Island. Early discussions focused on switching from steam to electric engines at Mott Haven just over the Harlem River in the Bronx. In a farsighted move, Wilgus pressed to extend the electric zone farther north, through the Bronx and into Westchester County.

Wilgus proposed electric service as far as Croton-on-Hudson, thirty-three miles from Grand Central, on the Hudson Division and to North White Plains, twenty-three miles to the north, on the Harlem Division. The topography of the New York Central's rights of way in the Bronx and Westchester County, having no severe grade changes, posed no special difficulty for electric engines. In addition, switching from steam to electric engines at two separate locations, one each for the Hudson and Harlem divisions, rather than only at Mott Haven in the Bronx, promised considerable time savings.

Wilgus's most persuasive argument involved the railroad's commuter service to the growing suburbs north of New York. By the turn of the century, the Central was generating substantial revenue by providing daily service for people living outside of the urban core who commuted back and forth each day to work. In 1904, Wilgus reported to board member William K. Vanderbilt that in 1899 the Harlem and Hudson divisions had carried 4,146,239 suburban passengers and that in 1903 suburban volume had grown to 6,239,399 passengers, an increase of more than 50 percent in four years.<sup>27</sup>

Steam-powered locomotives had proved ill-suited for short-haul commuter service, which made frequent stops covering short distances between stations. Slow to accelerate, steam engines took a considerable amount of time to reach running speed. The stop-and-go service of a commuter train required an engine capable of reaching full speed rapidly and then, a short distance later, stopping quickly. Wilgus, confident that the new electric equipment would meet these requirements perfectly, predicted a significant increase in the railroad's commuter business.

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*The electric zone, encompassing the Harlem and Hudson divisions of the New York Central Railroad  
and the New Haven Railroad*

At first, the Electric Traction Commission resisted the idea of expanding the electric zone. In late October of 1903, the plan for an expanded electric zone passed by a vote of only three to two, with Wilgus casting the deciding ballot. However, at a meeting in November, after a very persuasive presentation by Wilgus, the commission voted unanimously to recommend extending the electric power system through the Bronx and into Westchester County.

*Direct versus Alternating Current*

A second decision to be made by the Electric Traction Commission was the choice between direct and alternating current; this debate, over the most suitable type of current, involved not just the engineering profession. The sometimes-public “battle of the currents” also engaged two emerging corporate giants, each fighting to dominate the electricity business. Westinghouse Electric, led by the domineering George Westinghouse, already world renowned for developing his Westinghouse air-brake for the railroads, emerged as the leading corporate proponent of alternating current. General Electric Company, more experienced with direct current applications for transportation, pushed for its adoption.

While the Electric Traction Commission prudently considered both types of power, from the beginning they leaned toward direct current. Edison's first electric generating plant on Pearl Street in lower Manhattan, Sprague's first electric street railway in Richmond, the IRT subway, and the first electric elevators in New York's skyscrapers all used direct current. In February of 1902, Sprague submitted a detailed feasibility study for the Central's electrification in which he carefully reviewed all uses of electric traction by railroads to date. He listed fourteen examples of direct current installations, including the Central London Underground, the Orleans Railway running from the Gare d'Austerlitz to the new Gare D'Orsay in Paris, the elevated railways in Chicago, and the Baltimore and Ohio tunnel (through which a small electric engine pulled steam-powered trains). Sprague included three alternating current railways; all were small rail lines in Switzerland. With more direct current systems already in place, he said, he could legitimately “confine my recommendations to the Direct Current Motor System which has demonstrated its ability to fully meet the conditions imposed by your service as far as

motive power is concerned.”<sup>28</sup> Despite Sprague’s careful analysis, the “battle over the currents” for the Grand Central electrification intensified and soon reached a very public stage.

Bion Arnold, the Central’s other outside expert on the Electric Traction Commission, also favored direct current for the Central’s purposes, however, he believed alternating current to be more suitable for long-haul service, because of the efficiency associated with the transmission of alternating current over long distances. On the other hand, given the demands of suburban commuter service, he favored direct current for the Grand Central electrification: “I believe that the alternating current railroad motor will yet prove to be most efficient for long distance railways . . . however, it has not demonstrated its ability to start under load as efficiently or to accelerate a train as rapidly as the direct current motor.”<sup>29</sup> With two of the five members of the commission leading proponents of direct current, without surprise, the commission officially recommended direct current.

Westinghouse Electric and George Westinghouse, bitterly disappointed, continued to argue in public for alternating current and strongly criticized the Central’s decision in favor of direct current. In December of 1905, Westinghouse wrote an open letter to President Newman of the New York Central in the *Railroad Gazette*, bluntly recommending, “Change your plans providing for the use of the continuous current, third-rail equipment, to those employing the alternating current, single-phase, overhead system.” Westinghouse claimed the installation cost of alternating current, with an overhead distribution system, to be \$15,350 per mile, substantially less than the cost per mile for a direct current system. Westinghouse followed up his letter to Newman with an open letter attacking Frank Sprague suggesting that the real reason behind the Central’s decision to use direct current was the General Electric Company. Despite Sprague’s international reputation as a giant in electrical engineering and electric traction, Westinghouse accused Sprague of a conflict of interest. The alleged conflict arose because the General Electric Company used Sprague’s multiple control system in its electric engines; G.E. had acquired the rights to Sprague’s patents when it absorbed the Sprague General Electric Company in 1903. Sprague, according to Westinghouse, stood to gain financially and had used his position to influence the Central to select General Electric’s direct current equipment.

Sprague answered immediately with an open letter of his own. He expressed outrage at Westinghouse's charge: "This contract, under present conditions, confers upon the officials of the General Electric Company no authority whatsoever, so far as I am concerned, and no man knows better than yourself that I would brook no interference by individual or corporation with my professional opinion."<sup>30</sup> Sprague then listed the "facts" presented in Westinghouse's open letter to Newman and challenged each. Sprague reminded Westinghouse that his inventions had served as stepping stones to Westinghouse's own fortune and ended the letter by reiterating his commitment to the highest standards of the engineering profession: "My engineering convictions and conclusions are my own. They are dictated by no man or corporation."<sup>31</sup> Like Wilgus, he considered himself, above all else, a professional engineer dedicated to the highest scientific standards. In Sprague's view, all his work, and that of the other professionals serving on the Electric Traction Commission, rested on sound scientific evidence and careful deliberation. Westinghouse's public attacks on Sprague and, by inference, on the Electric Traction Commission accomplished little; the Central continued its plan to use direct current in the electric zone.

In addition to advocating alternating current motors, Westinghouse argued for the use of overhead transmission lines to distribute electric power. Developed for the country's street railways, overhead transmission equipment formed an important part of Westinghouse's business. Wilgus and the Electric Traction Commission decided on a third rail distribution system, in which each engine was equipped with contact shoes extending from the side of the engine's frame to draw electric power from the third rail. The IRT subway adopted a third rail system, which proved to be quite successful.

Westinghouse charged that a third rail system, expensive to build, posed a hazard to railway workers, especially in crowded railway yards. In addition, heavy snow could potentially disrupt a third rail system; by contrast an overhead wire transmission system remained immune to the effects of the weather.

Wilgus countered by pointing to European rail systems' successes with third rails. As part of the Paris Exposition of 1900, the Paris and Orleans Railroad constructed a two-mile extension, in a tunnel along the left

*The Engineer's Grand Central*

bank of the Seine, from the Gare d'Austerlitz to a new station near the exposition site. Service on the Quai d'Orsay extension employed direct current transmitted via a third rail. Completed in 1900, the Gare d'Orsay represented an important development in the evolution of electric railway traction because of the use of the third rail. The new Paris station revolutionized rail terminal design. With electric power, trains arrived, one story below ground level, directly into the main concourse of the station. In addition the use of a third rail proved hardly noticeable; overhead wires would have been much more intrusive.

Wilgus carefully considered the problems and hazards a third rail transmission system entailed and, with the ever-inventive Frank Sprague, designed a solution. In 1905, Wilgus and Sprague patented a third rail electric transmission system with the rail enclosed on three sides by a wooden cover. Wilgus and Sprague's patented cover protected the electrified third rail from the top and the two sides; only the bottom of the third rail remained exposed. Shoes, extending from the sides of the new electric engines, remained in contact with the underside of the rail by means of upward pressure exerted by springs. With the third rail covered on top and both sides, a railway worker could not accidentally touch the

*Electric engines manufactured by General Electric in Schenectady, N.Y., for the Paris-Orleans Railway*

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third rail, unless he made contact with the exposed bottom of the rail. With this simple, elegant technical solution, Wilgus and Sprague eliminated the objection that a third rail distribution system posed a danger to railroad workers. In addition, the cover protected the third rail from rain and snow, no small consideration given the often heavy winter snows.

To avoid the appearance of a conflict of interest in their patent, Wilgus and Sprague refused royalties from the New York Central for its use of their third rail system in the railroad's electric zone. Nevertheless, they actively pursued licensing their design to other railroads switching from steam to electric power.

*An early electrified station, Gare d'Orsay (now Museum d'Orsay) in Paris, 1902*

### *The New Electric Engines*

By May of 1903, the Electric Traction Commission had completed detailed specifications for the new electric engines, and they invited ten firms to submit bids, including only two American companies, General Electric and Westinghouse Electric. The remaining eight companies, all

European, reflected the more extensive development of electric traction in Europe at the time. Specifications required the new electric engines to be capable of completing a round trip from Grand Central to Harmon, New York, a distance of thirty-four miles each way, in one hour with a 550-ton train in tow.

After considering all bids, in November of 1903 the commission recommended to the board of directors that the railroad accept the proposal presented by the General Electric Company. Winning the contract represented an important victory over G.E.'s archrival, the Westinghouse Electric Company. G.E. believed electric power to be the wave of the future for the railroads and put its reputation on the line to build the new engines within the allotted time frame and to meet all specifications.

The New York Central drove a hard bargain. Wilgus had informed the General Electric Company that the railroad judged its initial price unacceptable: "We do not believe the prices named in your original proposal are entirely satisfactory to us and therefore we make to you the proposition that your company furnish us the electric locomotives as follows: thirty engines at \$30,526.31 each, for a total contract cost of \$915,789.30." He further stipulated, "This proposal is also conditioned upon the manufacture by the G.E. Co. of the first locomotive within a short period of time, say eight (8) months, and the thorough testing of said locomotive under the actual severe conditions recited in the specifications on an elemental stretch of track not less than five miles in length."<sup>32</sup> General Electric, with little hesitation, agreed to the Central's terms.

General Electric's stock rose sharply following the announcement of the contract to build engines for the Central's massive electrification project in New York. As soon as the news became public, G.E. stock went up six points.<sup>33</sup> A nearly million-dollar contract was important to a company whose revenue in the previous year had totaled \$22 million. G.E. manufactured the electric motors and the control mechanism, while the American Locomotive Company, like G.E. located in Schenectady, New York, built the chassis and wheel trucks for the new electric engines, under subcontract to General Electric.

With a deadline of less than eight months, G.E. assigned its best engineers and workmen to the project. In late 1904, Wilgus informed the Electric Traction Commission of G.E.'s successful test of the electric en-

gine, on October 27. The electric engine had hauled eight passenger cars on a ten-mile test track equipped with a third rail. The engine had achieved a top speed of 55 miles per hour. Crucially, the new electric engine had accelerated from a dead stop to a speed of 30 miles an hour in one minute, exactly the type of performance needed for the Central's commuter service.

An article published in 1904 in the *Railroad Gazette* pointed to these first tests as a historic milestone in the evolution of transportation technology: "The occasion marks a new era in the development of transportation facilities in this country. . . . the New York Central's electrification scheme is the first radical change on the part of an existing steam road to electric operation for comparatively long distances."<sup>34</sup> The *Gazette* mentioned that two or more of the new electric engines could be operated together for especially heavy trains, because they came equipped with the Sprague–General Electric system of multiple unit control.

To make the first tests more dramatic, G.E. and the Central staged a race between two trains on the test tracks; each train consisted of eight passenger cars, one powered by the new electric engine, the other by a steam engine. The new electric engine won handily; it accelerated more rapidly and beat the steam engine over a four-mile distance by more than half a mile. G.E. made no special changes to strengthen the test track *except* to add special clips, bolted to the ties, to each rail "to prevent any possibility of the rails spreading," called "nosing," in which the weight and driving force spread the tracks.<sup>35</sup> Ominously, the tendency for the new electric engines to spread the track eventually came back to haunt Wilgus and everyone involved in the electrification effort.

Officials of the New York Central and G.E. basked in the success of the first tests. A *New York Herald* headline read "Electric Engine Beats All Rivals," and the article pointed out that railroad officials from all over the country had attended the test, an indication of the importance of this new technological development.<sup>36</sup> Wilgus, in an interview with the *New York Times*, emphasized that the tests proved that the new electric engine performed "better than the builders thought possible and that questions of electric traction for high speed trains [had been] solved for all times." He pointed to the significance of the successful test for one of the major problems the Grand Central project needed to solve—the Park Avenue tunnel.

The new electric service would “relieve New York of all trials and tribulations that travel through the tunnels has forced upon them for years past.”<sup>37</sup> Since electricity provided the key to solving a number of interrelated challenges faced at 42nd Street, the successful tests of the first electric engine marked a crucial step forward. Wilgus reported to the Electric Traction Commission that General Electric had performed “marvelously.”

Not satisfied with a single series of tests, the engineers wanted to be sure the design would hold up under the demands of heavy use. On the test track near Schenectady, the new electric engine ran continuously with careful monitoring and, as problems emerged, G.E. and American Locomotive undertook any needed modifications. Over the following months, the engine ran a total of 45,000 miles, operating eight hours a day for 112 days at an average speed of 50 miles an hour with numerous starts and stops. The test program, a model of technical rigor, ensured the New York Central that its innovative electric service did not depend on unproven technology. Once introduced, the new electric service had to perform flawlessly. If not, the railroad ran the real risk of missing the legal deadline for eliminating steam operations in Manhattan.

Prior to the electrification of Grand Central, no railroad had used electric traction to power heavy trains at high speeds for long distances. Street railway systems operated light trolley cars at low speeds. Previous electric traction projects with heavier trains had involved only short distances and slow speeds. In Baltimore, the B&O's electrified Howard Street tunnel ran for only 1.5 miles and the electric engines usually operated at a speed of 15 miles an hour or less. *Leslie's Weekly* commented that the Central's new engine represented “the most powerful electric engine in the world, capable of pulling nine heavy Pullman cars at up to ninety miles an hour—an unheard of speed—over long distance.”<sup>38</sup>

If anything went wrong with this project, the credibility of the engineers and the companies involved, both the New York Central and General Electric, stood to be seriously compromised; and if electric traction failed, the state and city legislatures might impose draconian limitations on the Central's all-important franchise to operate trains to midtown Manhattan. With so much riding on the successful introduction of electric traction, Wilgus and the other engineers on the Electric Traction Commission believed the extensive testing program worth the time and

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expense it entailed. Above all else, the Central needed the new electric engines to be both reliable and safe.

On September 30, 1906, the new electric engine completed a first run into Grand Central from Woodlawn in the Bronx. William Wilgus manned the controls, joined by officials from the New York Central and the General Electric Company; riding along were observers from other railroads. Wilgus confronted one problem on the run. There was a one thousand-foot gap in the third rail beginning at 56th Street. Upon leaving the Park Avenue tunnel, he simply accelerated and let momentum carry the electric engine and cars smoothly across the gap. Officials of the New York Central expressed deep satisfaction with the progress to date and Wilgus added that “the trip was thoroughly successful.”<sup>39</sup> A reporter for the *Railroad Gazette* summed up the significance of the first run to Grand Central: “There is no more interesting or vital question to be settled regarding the future of railroad operation in this country than the success of electric operation in regular service.” The *Gazette* praised the New

*The first electric train to Grand Central ready to leave the terminal, September 30, 1906, with William J. Wilgus at the controls*

Image not available.

York Central and its new electric equipment as “remarkably successful, particularly for an undertaking which is so much of an experiment.”<sup>40</sup>

Just as Wilgus had predicted, the advent of electric service generated a great deal of favorable publicity. A headline in the *World* read: “First Electric Train Enters New York City, Thousands of Spectators Cheer.”<sup>41</sup> The *New York Times*, in an editorial published the day of the first run to Grand Central, stated the popular view: “No announcement could be better adapted to cheer the northward commuter in particular, and the traveling public in general, than that now made that an electric train will actually run today through the Harlem tunnel to the Grand Central Station.”<sup>42</sup>

The Central appeared to be in a position to beat, by over a year, the deadline of July 1, 1908, imposed by the city and state legislatures to end steam operations in Manhattan. Scheduled train service with the new electric engines began on December 11, 1906, and as fast as G.E. delivered the new equipment, the railroad replaced its steam engines with electric ones. By July of the following year electricity powered almost all of the New York Central's trains. Wilgus provided the board of directors a summary of the electric traction situation at Grand Central as of July 1, 1907 (see Table 2.1). By comparison, the New Haven's electrification efforts lagged far behind, although they labored under the same deadline to switch from steam to electric service above 42nd Street.

Even George Westinghouse's attacks could not diminish the accomplishments of Wilgus and the Electric Traction Commission. In only four years, they planned, tested, and put into service a totally innovative electric traction system. Where once only noisy steam engines spewing smoke and soot had operated, clean and quiet electric engines now powered trains in and out of midtown Manhattan. One of Wilgus's fellow engineers, Arthur M. Waitt of the American Society of Civil Engineers, whose opinion mattered greatly to Wilgus, summarized the achieve-

ment: "The change from steam to electric power at the New York terminal of the New York Central and Hudson River Railroad—the most congested terminal in the world—with but little derangement of the train service, is but little short of a miracle; and up to the present time, it may be properly rated as one of the most difficult and complicated engineering problems which has been undertaken and successfully carried through."<sup>43</sup> Wilgus could be justifiably proud.

### *The Woodlawn Wreck*

Wilgus's intensive efforts overseeing the entire Grand Central project took a physical toll on him, and at the end of 1906, the incessant work and responsibility had left him drained. In January 1907, Wilgus requested a one-month leave of absence for health reasons, and the executive committee of the board of directors immediately approved. In recognition of his outstanding work, the committee increased his salary by \$5,000 to \$40,000 a year—a very substantial salary in 1907. John Stevens, while directing the massive effort to build the Panama Canal, had received only \$30,000 a year. Wilgus left for the southwestern United States for a much needed rest, as the Central steadily and rapidly added electric service.

On February 15, 1907, the New York Central proudly introduced a new electric train on the Harlem Division, an express to White Plains departing each evening at 6:15 P.M. Newspaper accounts reported that the commuters riding the first trip "were delighted except for the one objection voiced by many passengers after the first trip—that the train went at too great a speed." The next evening, the train left Grand Central a little late; at Woodlawn in the Bronx, the train rounded a curve at 205th Street and flew off the tracks. At least twenty people died instantly and more than 150 more received injuries, many serious. Rescue workers desperately searched for survivors as hundreds of onlookers gathered to stare at the wreckage, which stretched along the tracks for over a mile.<sup>44</sup>

For the second time in less than a decade, a terrible train wreck threw the New York Central and the public into turmoil. All the favorable public opinion the railroad garnered for its introduction of electric service and the removal of steam engines from the Park Avenue tunnel disappeared in a moment. Public condemnation escalated; the district

attorney's office in New York called for the indictment of the railroad officials who were responsible, just as it had done in 1902 when the deadly wreck occurred in the Park Avenue tunnel.

First reports from the crash site described the train as traveling at an excessive speed. However, by midnight the railroad's investigation attributed the wreck to the spreading apart of the tracks, and Superintendent Ira McCormick reported: "As nearly as I can make out, by the dim light of lanterns, the accident was caused by the spreading of rails, but whether or not this was due to the heavy weight of the motor cars or to a broken fishplate I am unable to state. There is, however, a broken fishplate between 204th and 205th streets."<sup>45</sup> A fishplate was a forged metal plate on which the rails rested inside a flange. Spikes, driven through holes in the fishplate, secured the plate and the rail to the wooden tie. McCormick admitted that the train had departed behind schedule and taken the curve at a high rate of speed, but he added that the curve's banked construction met all standards for high-speed use.

Coverage of the wreck dominated the city's newspapers for the next few days, and sensational headlines fanned the flames of public indignation. In the *New York Herald*, the story filled the front page under the banner: "Twenty-Five Killed and Seventy-Five Injured as an Electric Train on the New York Central is Wrecked on a Curve: Victims Burned to Death After Cars Set on Fire by the 'Electrified Rail.'"<sup>46</sup> The press portrayed the New York Central as a callous corporate giant operating in a manner that endangered the lives of its passengers. The *New York Times* traced the Central's history of accidents in a long story titled: "Previous Central Wrecks: Several Serious Ones in Recent Years on the Road"<sup>47</sup> and reminded readers of the Park Avenue tunnel crash.

More devastating to the interests of Wilgus and the Electric Traction Commission, an editorial in the *New York Journal* linked the accident directly to the design of the new engines: "The theory of Assistant District Attorney Smith, that the [electric engines] are too heavy for the rails, is worthy of investigation. One of these motors weighs as much as a locomotive and tender. Because of the compact build of the motor, the strain on the rail is much greater than under the locomotive. . . . If the Assistant District Attorney's theory is correct, the wreck was preventable."<sup>48</sup>

If negligence caused the wreck, then someone bore direct respon-

sibility and Assistant District Attorney Smyth already had a suspect—William J. Wilgus. The following week, the *New York World* identified Wilgus publicly: “Asks Indictment of Wilgus for Central Wreck: Assistant District Attorney Smyth Wants Him and Others Tried for Manslaughter” and reported Smyth’s opening remarks to the coroner’s jury, where he placed the blame squarely on Wilgus’s shoulders. To make matters worse, William Newman, president of the New York Central, and vice president and general manager A. H. Smith, appearing before the State Railroad Commission the very next day after District Attorney Smyth’s damning statement, both placed blame on Wilgus. Distraught and angry, Wilgus was determined to defend his honor and his professional reputation.

Wilgus hurriedly returned to New York. His entire professional career and the years of careful, meticulous work on the electrification of the Central’s service in New York now stood in jeopardy. If the official investigations found Wilgus negligent, his reputation in the eyes of his fellow professional engineers, extremely important to him, faced ruin. Despite his years of distinguished service to railroading and the New York Central, he might be remembered only as the Central officer responsible for the deaths of more than twenty people one horrible night in the Bronx.

Wilgus finally testified before the coroner’s jury and mounted a vigorous defense. In his testimony Wilgus defended the design of the new electric engines and the exhaustive testing that had been undertaken by the railroad and the manufacturer before the first electric engines entered service: “There had never been a feature of the system installed that had not been approved by every member of the commission and every outside authority consulted on it.”<sup>49</sup> He remained determined to protect his professional reputation despite the effect this defense might have on his relationship with the New York Central. Wilgus’s defense of his work and that of the Electric Traction Commission proved successful; suspicion shifted to other possible causes for the wreck.

A bitter battle continued within the ranks of the senior management of the New York Central over the real cause of the wreck and who bore ultimate responsibility. Almost thirty years after the Woodlawn wreck, Wilgus assembled an exhaustive file of material (more than five hundred typed pages) concerning the accident and the ensuing conflict among the rail-

*Original design for the first electric engine: four driving wheels, two guide wheels in front and back, with the weight of the engine concentrated in the center over the driving wheels*

Image not available.

road's executives. He placed the file among his papers, given to the New York Public Library, and left instructions that, until his death, no one could examine the file without his permission. A five-page introduction signed and dated by Wilgus on July 6, 1936, began the secret file: "Much ill feeling within the ranks of the railroad company [New York Central] resulted from inquiries that followed the accident."<sup>50</sup> Wilgus then explained the stunning events that compelled him to assemble the file: on April 4, 1907, the senior vice president of the company, Mr. W. C. Brown, stated to Wilgus his belief that responsibility for the accident rested on the flawed design of the new electric engines. Despite what the officers of the Central said publicly or under oath to the coroner's jury, grand jury, or the New York State Railroad Commission, at least Brown believed the design of the new engines to be the cause of the Woodlawn wreck.

Wilgus had been stunned by Brown's accusation and responded by writing him a ten-page letter, with numerous exhibits attached, five days later, on April 9. In the letter, Wilgus presented a detailed defense of the design of the new electric engines and discussed, at some length, the attention given to the "nosing" problem. Nosing presented an obvious potential for derailment, exactly what happened at Woodlawn on the fateful night of February 16, 1907.

General Electric knew of the nosing problem. William B. Potter, chief engineer of G.E.'s Electric Railway Department, who had played a key

Image not available.

*Modified design for the first electric engine: four wheel ponies added to front and back to spread the weight of the engine away from the center*

role in the development of the Central's new electric engines, in his reminiscences, written in 1930, commented on the tests of the first engine: "this locomotive ran well for about 20,000 miles and then, as the track alignments and joints were worn by the many repeated passages, the locomotive developed a tendency toward horizontal alignment, or nosing."<sup>51</sup> At the insistence of the Electric Traction Commission, G.E. and American Locomotive added two-axle guiding trucks to the front of the test engine to solve the problem. After more tests, the changes seemed to eliminate the problem, and on August 7, 1906, G.E. and American Locomotive certified "that in their judgment no detrimental nosing would occur in the New York District."<sup>52</sup>

Whether Wilgus realized it or not, his letter to Brown represented a time bomb for the New York Central. Wilgus, in his usual painstaking detail, provided a record of two and a half years of efforts to deal with the nosing problem. He may have been satisfied, but how might the district attorney, the Railroad Commission, or the public react if they learned that the Central knew of the potential for the new electric engines to nose? Barely two months after the new engines entered service, the disastrous wreck occurred precisely because the tracks spread apart on the Woodlawn curve.

Brown never responded to Wilgus's letter, but on April 12, 1907, just three days later, Ira A. Place, vice president and chief legal counsel of the New York Central, visited Wilgus. Place described the potentially devas-

*The Engineer's Grand Central*

tating consequences to the railroad if Wilgus's letter became public and demanded that Wilgus burn the letter along with all copies. With his career hanging in the balance, Wilgus agreed.

A cover-up at the highest corporate levels of the New York Central Railroad ensued. The chief legal office of the company went to two of the Central's vice presidents and demanded that they destroy materials—potentially of great interest in the ongoing investigations of the Woodlawn accident. Wilgus and Brown both agreed to the cover-up and destroyed their copies of the letter. Despite a promise Place made to Wilgus to keep him informed of any additional action on the part of the Central to redesign the electric engines, the railroad proceeded to do just that—undertake significant modifications—without Wilgus's knowledge or involvement.

When he learned of the modifications, Wilgus felt he had been double-crossed, and on April 26 he wrote a threatening letter to Place. To protect himself, he informed Place, he had re-created the letter sent to Brown. A handwritten note appears on the document indicating that Wilgus never sent it to Place, but rather informed him verbally of its content.

Wilgus's reconstruction of his letter to Brown served as a form of blackmail, his motive—to forestall continuation of the Central's internal investigation of the design of the electric engines. The Central's moving forward with major modifications would represent an explicit condemnation of the original design, calling into question the professional work of Wilgus and the rest of the Electric Traction Commission. Wilgus

*Redesigned electric engine developed after the Woodlawn wreck*

Image not available.

simply could not abide this challenge to his professional competence.

Despite his threat, the railroad pushed ahead with a redesign. J. F. Deems, superintendent of motive power, ordered the American Locomotive Company to replace the pony trucks under each end of the electric engines with four wheel trucks. The wheel modifications represented an implicit admission that the original design of the electric engines, with all weight concentrated over the driving wheels, might have been the real cause of the Woodlawn wreck.

Wilgus mounted a vigorous opposition to the proposed changes. In June, he wrote to Newman protesting Deems's plan to modify the new electric engines. Wilgus pointed out that the electric engines had already been run for a total 271,681 miles with only one mishap. He added, "No indications have developed of nosing action of electrical equipment on tracks."<sup>53</sup> This last statement seems disingenuous; William Potter of G.E., for one, knew of the nosing problem and, in reference to the Woodlawn accident, stated bluntly, "It is no doubt the running qualities would have been much improved by lengthening the locomotive, increasing the distance between truck centers and wheel base of the guiding trucks."<sup>54</sup>

On July 11, 1907, William J. Wilgus submitted his resignation to the president and directors of the New York Central Railroad, to take effect on September 30, 1907. A proud individual at the height of his professional career, Wilgus could not stay on after the challenge to his professional competence and authority as an engineer. Rather than continuing to work for the New York Central and have his integrity questioned further, he resigned.

Eventually, the railroad significantly modified the design of the electric engines, adding four wheel bogies to the front and back of its engines. These modifications spread the weight of the engine from the center driving wheels and eliminated completely the danger of nosing. Neither the public, the district attorney, nor the State Railroad Commission drew a connection between the modified design and the Woodlawn accident. All official inquiries placed the blame for the wreck on excessive operating speed.

Despite the Woodlawn wreck and Wilgus's enduring bitterness, he deserves credit for a splendid achievement. In the annals of engineering at

### *The Engineer's Grand Central*

the turn of the nineteenth century, the New York Central electrification stands as one of the most important accomplishments in the history of technological innovation.

### *The End of the Commodore's Grand Central*

Amid the horror of the Woodlawn accident and the scandal surrounding the ensuing investigations, the railroad continued with the excavation and construction of the underground train yard. As soon as work crews finished the new tracks and train platforms in Bites 1 and 2 on the east side of the train yard, the railroad opened a temporary passenger station at Lexington and 43rd Street, using the first floor of Grand Central Palace, an exhibition hall for trade shows and conventions built by the Harlem Railroad. All three railroad lines, the Central, Harlem, and the New Haven, first shifted their commuter service from the old Grand Central to the temporary station; long-haul service continued from the old depot. As construction progressed, the railroads gradually switched long-distance trains to the temporary facility.

On June 5, 1910, the last trains left from the old Grand Central. At 9:44 P.M. the New York Central's Pacific Express, to Buffalo, departed, followed at the stroke of midnight by the Owl, the New Haven's overnight train for Boston; silence fell. Commodore Vanderbilt's depot, so proudly opened in 1871, had reached the end of its useful life and now awaited the wrecker's ball.

Dismantling the iron and glass train shed, the most striking part of the old Grand Central, began even before all service had shifted to the temporary station. Wilgus and the Central engineers devised an ingenious method for removing the arched train shed while continuing to use the tracks below. They constructed a giant wooden scaffold, spanning the entire width of the train shed and resting on train wheels. The lowest level of the scaffold was high enough for trains to pass under, and the top level reached to the shed roof, almost one hundred feet above. Workmen climbed to the top of the scaffold to dismantle the roof of the train shed from the inside out. Demolition began at the rear section of the train shed and as each section came down, workmen positioned the scaffold under the next section. The traveling platform functioned flawlessly. During

Image not available.

the entire time it took to dismantle the old train shed, scheduled service continued without interruption and not a single injury befell a passenger or workman. Newspaper accounts pointed out how difficult a challenge removing the old shed represented. One reporter went so far as to call the project “one of the most daring in the history of building.”<sup>55</sup> The ingenuity of the demolition platform captures the simple elegance and brilliant application of engineering principles to everyday problems that allowed scheduled service to continue uninterrupted in the midst of the massive construction project.

*Demolition of a segment of the train shed, looking south toward 42nd Street, 1908*

### *The New Terminal Building on 42nd Street*

As the end of 1911 approached, work on the terminal building on 42nd Street, the new Grand Central, began. Construction followed the sectional technique that had been used for the underground train yard. As

Image not available.

Image not available.

*The Engineer's Grand Central*

*Engineering Record* reported, the building, “entirely of steel frame construction,” rose as a series of “separate longitudinal, full-length zones reaching from 42nd Street north to column line 20”; the article added, “the work has been difficult, complicated and dangerous.”<sup>56</sup> Construction of each zone or section proceeded from the base up to the concourse roof, with the first section on the east side erected between May and September of 1911 using 4,831 tons of steel. Work proceeded on each additional section, moving from east to west.

*Erection of steel for  
ceiling of Grand Con-  
course, looking east to-  
ward Lexington  
Avenue, ca. 1911*

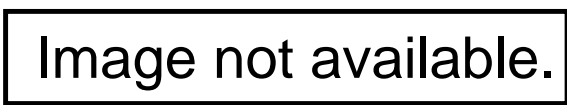
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Roof trusses spanned the entire width of the Grand Concourse, and from them hung the vaulted ceiling. Two large derricks lifted the roof trusses, assembled on the floor of the concourse and riveted together, and held them in place while workers riveted the trusses to the cross beams. Grand Central, by no means the first steel frame building, demanded exacting construction techniques because of the size of the steel members used in the construction and the widths to be spanned.

Even as construction of the terminal building commenced, the final configuration of the interior remained undecided. A heated debate was going on over whether to use ramps or stairs. Wilgus's original concept included the use of ramps wherever possible instead of stairs, to facilitate the movement of large numbers of people efficiently throughout the station. With the Grand Concourse below street level and the express and suburban tracks further underground, he argued, ramps and gravity

*Construction of terminal building, from Lexington Avenue, January 1912*



*Construction of terminal building two months later, from 42nd Street*

would draw passengers from the street down to the concourse and suburban levels and from there down to the waiting trains. As he did with many of the key features of the original plan, Whitney Warren, the architect who assumed design control in 1907, opposed the use of ramps and insisted on replacing them with stairs. Wilgus, as long as he remained with the New York Central, argued for retaining the ramps.

Wilgus and the other advocates of a stairless station prevailed. The use of ramps in Grand Central remains one of its most innovative features. Press descriptions of the new facility pointed out that travelers could “go from the point where the red cross-town car dropped them at Forty-second Street straight to their waiting berth in the Pullman, one level below the street, without finding a single step to descend.”<sup>57</sup> Like many of the essential elements of the plan Wilgus presented to the New York Central in 1903, the ramps proved an ingredient in the success of Grand Central. Today, thousands pass through each day, hurrying to trains or simply crossing the concourse as they travel through the midtown business district. Without ramps, the Grand Concourse, one story below street level, could not function as smoothly as the crossroads of New York and as one of the city’s great public spaces.

## *Completion of the Terminal*

After Wilgus's abrupt departure from New York Central, construction of the terminal continued for another six years. Creating Terminal City, the associated collection of hotels, apartments, and office buildings which transformed Midtown, continued into the 1920s.

While construction proceeded, the Central's board of directors struggled with the ever-increasing costs. As of December 31, 1907, the cost of all completed work totaled \$29,484,620, including more than \$12 million for electrification, \$5.5 million for the excavation and building of the underground train yard, \$7 million for four-tracking of the Harlem and Hudson divisions, and \$2.4 million for the construction of the new Grand Central building. Such an enormous financial gamble could only succeed if passenger volume increased and, as importantly, earnings from the railroad's freight business expanded as well. Without continued growth, the railroad could not hope to service the huge amounts of capital it had committed to Grand Central. In the final analysis, the Central's bold leap into the future failed. Yet, as the new century began, the future for the railroad's flagship station appeared limitless.

In November of 1911, news of the opening of Pennsylvania Station overshadowed the progress at Grand Central. The New York Central's archrival, the Pennsylvania Railroad, beat the Central by a decisive margin in the race to construct a new passenger facility to serve Manhattan. Press reports lavished praise on McKim, Mead and White's Pennsylvania Station, with its classical Beaux-Arts design. The Pennsylvania and Long Island railroads immediately saw heavy traffic flowing through their magnificent new station on 33rd Street.<sup>58</sup>

## *The Opening of Grand Central*

Finally, in February of 1913, after almost a decade of construction and the expenditure of millions of dollars, the New York Central proudly announced the completion of the new terminal and underground train yard. Reaction to the new facility seemed nothing short of ecstatic. The usually reserved *New York Times* called the new Grand Central the "great-

est railway terminal in the world.” John Droege praised the new Grand Central as a great civic center: “The Grand Central Terminal is not only a station; it is a monument, a civic center or, if one will, a city. Without exception, that part of it which is the station is not only the greatest head station in the United States but the greatest station of any type not only on this continent but in the world.”<sup>59</sup> An article in the popular journal *Munsey's Magazine* also recognized the new Grand Central as the “The Greatest Railroad Terminal in the World.” The article described, in detail, the complicated construction process: “No similar enterprise was ever undertaken on so gigantic a scale, or in the face of such conditions . . . on the site of the old terminal, which could not be abandoned.” *Munsey's* concluded by pointing to the significance of Grand Central in terms of American building art: “[Grand Central] promises to be the most successful combination of the esthetic and the practical in city building yet planned in America. . . . you will find that it is much more than a railroad station. It will be a new city center; a vast theater of great events; another triumph of constructive American achievement.”<sup>60</sup>

During the Age of Energy—an era which witnessed the construction of the transcontinental railroad, the Brooklyn Bridge, the Panama Canal, Pennsylvania Station, the New York subway, and the first skyscrapers—Grand Central Terminal stood as yet another stirring triumph of American building art. The United States emerged as the most powerful nation in the world, and the country's engineers, architects, and builders overcame every challenge they faced. Yet just over the horizon loomed the automobile and truck, destined to challenge the railroads and drive them to the brink of disaster. In that process, Grand Central itself faced destruction. Amidst the celebration, no one imagined the threats that lay ahead.

## *The Architect's Grand Central*

As a new century began, the completion of Grand Central marked the emergence of a distinctive building art in the United States, a style that combined imaginative architectural design, innovative engineering, and daring construction. The term *American Renaissance* captures the period beginning with the completion of the Brooklyn Bridge in 1883.<sup>1</sup> The longest bridge in the world at the time, the Brooklyn Bridge represented a triumph of engineering and aesthetics and brought the Roeblings, father and son engineers, national and international acclaim.

New York saw a transformation of its built environment; there the American Renaissance produced its greatest achievements, including the largest subway system in the world, the Brooklyn Bridge, the tallest buildings in the world, and two stunning railroad facilities, Pennsylvania Station and Grand Central. “Skyscrapers” rose in lower Manhattan—the Singer Building (1907–8) on lower Broadway, Louis Sullivan’s Bayard Building (1897–98) on Bleecker Street, and Daniel Burnham’s Flatiron Building (1901–2) at the corner of Broadway and Fifth Avenue at 23rd Street. Made possible by invention of the elevator and iron and steel frame construction, the skyscraper allowed the city to move upward and served as an expression of the ingenuity and exuberance of American society as the nineteenth century came to a close and the twentieth century began.

William Morris Hunt, Daniel Burnham, Cass Gilbert, and Charles

McKim, among the most famous architects of the Age of Energy, represented the ascendance of Beaux-Arts design, named after the Ecole des Beaux-Arts in Paris, where many of America's leading architects trained. The Beaux-Arts school focused on the classical forms of ancient Greece and Rome and married this aesthetic form with iron and steel construction. In New York, in addition to Grand Central, the U.S. Customs House (1901–7) on Bowling Green designed by Cass Gilbert, the New York Public Library (1902–11) by Carrère and Hastings, and the Pennsylvania Station (1901–11), McKim, Mead and White's masterpiece, all reflected a striving for the ideals of classical form.

Grand Central also reflects the fledgling efforts of Americans to organize a systematic response to the conditions of the swelling American city, to beautify and bring order out of chaotic growth. After the Civil War, American cities grew at a rate never before experienced in history and became crowded, dirty, congested, and filled with millions of immigrants struggling to gain a foothold in American life. In 1890, Jacob Riis, a Danish immigrant and crusading journalist, published his famous pictorial essay on the lives of the poor, *How the Other Half Lives*. Riis captured the harsh reality of the urban poor in New York. Over a century later, the photographs of people sleeping in cellars, or the drunks in all-night saloons swilling cheap whiskey, or the homeless children huddled together sleeping in a doorway still tug at the reader's emotions. Riis described the conditions of Jewish immigrants on the Lower East Side of New York just before the turn of the century, when the first Vanderbilt mansions were rising on Fifth Avenue to the north: "It is said that nowhere in the world are so many people crowded together on a square mile as here. The average five-story tenement adds a story or two to its stature in Ludlow Street and an extra building on the rear lot. . . . The sanitary policeman whose beat this is will tell you that it contains thirty-six families. . . . In Essex Street two small rooms in a six-story tenement were made to hold a 'family' of father and mother, twelve children and six boarders."<sup>2</sup> Riis's work inspired a legion of reformers dedicated to ameliorating the worst conditions of urban life.

Efforts to deal with the appalling conditions in American cities took a number of forms. Protestant churches organized missionary activities to bring moral uplift to the immigrant masses: the Young Men's Chris-

tian Association built residential and recreation facilities in the cities; Y.M.C.A.s provided places where young men could find clean and decent housing in a religious atmosphere. Jane Addams, a disciple of the American philosopher William James, sought to duplicate the ties of the small town and rural village within the confines of the teeming urban ghettos by founding Hull House in Chicago in 1889. Addams intended to re-create a sense of community amidst the alienation and disorganization of an emergent urban society. Although few in number, settlement houses represent the first secular attempts to alleviate the appalling social conditions created by industrialization and rapid urban growth.

Settlement houses focused on assisting people living in slum neighborhoods; another group of social activists argued that efforts had to be undertaken to alter the physical makeup of the American city and, in the process, to do away with slum neighborhoods. Cities needed an overall plan for their physical development; the shaping of the built environment could not be left to the haphazard forces of private development. Advocates of planned development believed that having a city plan would bring a modicum of order to the chaos of the exploding cities. Calls for systematic planning in the American city led to the emergence of the City Beautiful movement, which not only advocated large-scale urban planning but also sought to beautify the city.

Grand Central Terminal exemplifies both the Beaux-Arts style and the City Beautiful movement. Whitney Warren, the architect of the terminal building on 42nd Street, trained at the Ecole des Beaux-Arts, and his design reflected all of the elements the Beaux-Arts sought to achieve. Grand Central also embodied the goals of the City Beautiful—systematic planning and building on a grand scale with a conscious effort to beautify as well as to provide the most modern railroad terminal in the world. How the terminal complex achieved these lofty goals involves a complicated story with a fascinating cast of characters.

### *The Architectural Competition*

In early 1903, the board of the New York Central approved Wilgus's dramatic plan and announced an architectural competition for the new terminal building on 42nd Street, inviting four firms to submit prelimi-

inary plans and drawings. Two of the firms, D. H. Burnham and Company of Chicago and McKim, Mead and White of New York, among the most prominent in the country, seemed logical choices. Samuel Huckel Jr. of Philadelphia, the third firm, had designed a number of stations for the Pennsylvania Railroad. The remaining firm to be invited was Reed and Stem of St. Paul, Minnesota, far removed from New York, whose previous commissions included a number of local stations for the Central and its subsidiaries.

Burnham and McKim, Mead and White were at the forefront of American architecture at the turn of the century. Daniel Burnham had risen to national prominence as director of planning for the World's Columbian Exposition, held in Chicago in 1893. Burnham's most famous buildings included the Marshall Field department store in Chicago (1893), the Flatiron Building in New York (1903), and the magnificent Union Station in Washington, D.C. (1903–8). McKim, Mead and White, with offices in New York, played as prominent a role in American architecture as Daniel Burnham. Charles Follen McKim trained at the Ecole des Beaux-Arts, and his firm served as architects to the American aristocracy of the Gilded Age, designing numerous homes in New York and "cottages" in Newport for their wealthy clients. Stanford White learned his trade as an apprentice and traveled extensively in France and Italy, where he absorbed the classical architectural models. White, a prominent socialite as well as a brilliant architect, led a scandalous life, cutting an imposing figure in the night life of New York until driven to bankruptcy by high living. White's life ended tragically in an infamous scandal in 1906, when the irate husband of his lover, the beautiful Evelyn Nesbit, shot him dead in the restaurant atop Madison Square Garden, one of his most notable designs. Just before White's death, the Pennsylvania Railroad had chosen McKim, Mead and White to design the company's new terminal at 33rd Street. Pennsylvania Station came to be celebrated, along with Grand Central, as among the most beautiful buildings ever constructed in the United States. When in 1968 the new Madison Square Garden sports and entertainment complex replaced McKim, Mead and White's building, forcing Pennsylvania Station into the basement of the new building, one prominent critic called the demolition the worst act of urban vandalism in American history.

*Reed and Stem's plan  
for a Grand Central  
Terminal topped with  
twelve stories of rental  
space and ringed by an  
elevated roadway with  
a bridge over 42nd  
Street connecting it to  
Park Avenue*

Image not available.

Reed and Stem, of St. Paul, were not in the same league as Burnham or McKim, Mead and White, but they enjoyed a good regional reputation. William Wilgus influenced their inclusion in the design competition. He had been favorably impressed with their work, and happened to be married to Charles Reed's sister. Charles Reed and William Wilgus discussed ideas for the new terminal at some length before Reed and Stem's formal submission. Wilgus's letter to New York Central president Newman in March of 1903, where he first laid out his ideas for a new terminal, had included a number of the key elements of the plan Reed

Image not available.

*Reed and Stem's plan  
for a Court of Honor,  
lining Park Avenue  
north of the new  
terminal*

and Stem submitted to the competition. Wilgus included an elevated roadway around the terminal, with an arched bridge over 42nd Street to link Park Avenue north and south of the terminal, restoring Park Avenue as a north-south artery in the city. Most crucially, Wilgus premised his entire conception of the project on the construction of a revenue-producing building over the new underground station and train yard. In turn, Reed and Stem's submission featured a twelve-story office building rising from 42nd Street, just as Wilgus had proposed to Newman.

McKim, Mead and White's proposal, bold in concept, included a sixty-five-story tower atop a fourteen-story office building, which would have been the tallest building in the world at the time. Their plan included a fixed white beam atop the tower illuminated from below with red lights. Modeled after the palaces of Florence, the design reflected the classical themes emphasized by the Beaux-Arts and featured a dramatic arched passageway through the building, connecting north and south Park Avenue, with space to drop off and pick up passengers.

Reed and Stem's plan, not without its classical elements, incorporated a "Court of Honor" north of the terminal, facing up Park Avenue, and included plans for two classical buildings facing across Park, one for the Metropolitan Opera and the other for the New York Academy of Design. Befitting a Beaux-Arts plan, the buildings provided a classical terminus for Park Avenue, destined to become Manhattan's grand boulevard.

Reed and Stem's design won the competition. Wilgus stated, some-

what disingenuously, that the selection of Reed and Stem's plan rested on their idea for an elevated roadway around the terminal building and a bridge over 42nd Street connecting Park Avenue north and south of the new terminal. While the elevated roadway provided an important element of the plan, it seemed rather a thin reason for choosing Reed and Stem's plan over the other submissions. Wilgus's family ties to Charles Reed obviously played a major role. Family ties continued to play a major role in the design of Grand Central, but in a manner which William Wilgus eventually found quite unpleasant.

### *Whitney Warren*

Architect Whitney Warren attended the Ecole des Beaux-Arts from 1888 to 1891, following in the footsteps of the renowned Richard Morris Hunt, Louis Sullivan, and Charles McKim. Warren returned from Paris in 1892 to form the architectural firm of Warren and Wetmore. Warren's most important commission to date, the New York Yacht Club, on West 43rd Street, opened to widespread praise in 1901. Warren was also a distant cousin and social acquaintance of William K. Vanderbilt, who in 1903 played a prominent role on the board of directors of the New York Central and Hudson River Railroad, simultaneously serving on the board's powerful Executive Committee.

Warren recognized the importance of the new Grand Central, destined to be among the most important set of buildings ever constructed in New York City, and desperately wanted the commission. Fame and fortune awaited the architect who designed the new Grand Central. Warren privately prevailed upon William K. Vanderbilt to include his firm and, in turn, Vanderbilt set out to use his considerable influence with the board. Wilgus rather cryptically remarked later, "In the latter part of 1903, Warren and Wetmore of New York proposed themselves in connection with the Grand Central Terminal design."<sup>3</sup>

In spite of the outcome of the formal competition, Vanderbilt insisted that Reed and Stem join forces with Warren and Wetmore in the design of the entire project. The reaction of Reed and Stem can only be imagined: their elation after being selected over both Burnham and McKim, Mead and White and their outrage at being forced to share the design

work for the new terminal complex with Warren and Wetmore. Reed and Stem recognized the formidable forces they faced and reluctantly agreed to the proposed arrangement. On February 8, 1904, they signed a contract with the New York Central Railroad and officially became partners in Associated Architects.

The February 9, 1904, minutes of the Executive Committee include a copy of the contract with Associated Architects. The motion approving the contract allowed the Central to cancel the contract at will: "The Company reserves the right to cancel at any time." A note penciled next to the sixth clause, signed by the secretary, notes: "Ordered added, upon being read at meeting of February 19, 1904." Oddly, the minutes of February 19 do not include any reference to the contract with Associated Architects.<sup>4</sup> This added clause, allowing the Central to cancel the contract with Associated Architects at any time, took on great importance when the railroad abruptly canceled the contract with Associated Architects after the untimely death of Charles Reed in December of 1911.

Upon Reed's death, and without wasting a moment, the Central immediately entered into a new contract, with Warren and Wetmore solely, to complete all design work. Charles Wetmore, Warren's partner, engineered the underhanded deal with President Newman as they returned to New York in Newman's private railroad car after attending Reed's funeral in Scarsdale, New York. Warren and Wetmore, with Reed hardly cold in his grave, conspired with the railroad to take over all design work for the Grand Central project.

Outraged, Allen Stem and Reed's estate sued Warren and Wetmore for breach of contract. The firm stood accused not only of seeking to defraud Reed and Stem of money owed for work completed at the time of Reed's death but also of seeking to secure all credit for the new Grand Central. During the protracted legal proceedings, Wilgus vigorously supported Reed's claims, but the New York Central avoided being dragged into the lawsuit because of the cancellation clause in its contract with Associated Architects. Without that clause, Charles Reed's estate would certainly have also sued the New York Central Railroad for breach of contract. After a bitter legal battle that dragged on for almost a decade, in January of 1920, New York's highest court found Warren and Wetmore guilty and ordered them to pay Reed and Stem \$223,981 for the firm's share of the

design work completed or in progress at the time of Reed's death.<sup>5</sup> Not only did they pay substantial damages, but they also suffered public humiliation. The American Institute of Architects, the most prestigious professional organization in the field of architecture, expelled Warren for breaching its code of professional conduct. Ironically, despite the lawsuit and professional censure, Whitney Warren remains to this day the architect most associated with the design of Grand Central.

### *Controversy*

Controversy over credit for the design of Grand Central continued for years. William Wilgus took credit for the idea of a two-story underground terminal powered by electricity and for using the air rights to pay for the vast changes planned for the 42nd Street station. He never claimed any credit for the architectural design of the terminal building itself; a brilliant engineer, Wilgus had no training or expertise as an architect. In turn, Wilgus attributed to Reed and Stem the idea for the elevated roadway around the building and the arched bridge carrying Park Avenue over 42nd Street.

Warren and Wetmore's major contributions included replacing the twelve-story revenue building, proposed by Wilgus and Reed and Stem, with a lower but more monumental structure devoted to railroad functions with limited commercial space. Warren and Wetmore's design proclaimed the glory and might of the New York Central Railroad by adopting the language of the Beaux-Arts in a classical, low-rise building with arches and portals crowned by ornamental statues and detailing. Warren focused on the monumental aspect, rather than the mundane world of square footage and rental income. In addition, Warren's building did not include the elevated driveways of Reed and Stem's design. Wilgus, angered at the decision to abandon both the revenue-producing building and the elevated roadways, maintained that Warren's design involved only the exterior treatment of the station and did not alter the essential circulation and separation of functions he had originally proposed to Newman in 1903. Wilgus summarized the changes from his perspective: "The Company, however, while not approving the change from the fundamental features of the original inception, contrary to the

views of its Vice President [Wilgus], concluded that the exterior treatment of the station proper, consisting of a low monumental effect without the elevated driveway and 42nd Street bridge, was preferable to the revenue producing type with the Reed and Stem driveways.”<sup>6</sup> To the end of his life, Wilgus remained embittered at William K. Vanderbilt’s intrusion into the design of Grand Central and his insistence that Whitney Warren play a pivotal role.

But more than just personal connections had led to Warren’s inclusion. Vanderbilt, enamored of the Beaux-Arts, in the 1890s commissioned Richard Morris Hunt to design his New York mansion on Fifth Avenue at 52nd Street and the Marble House, his summer home in Newport, Rhode Island. Marble House presents the classical model so favored by the Beaux-Arts, drawing heavily on Jacques-Ange Gabriel’s Petit Trianon at Versailles for inspiration. Facing Newport’s fashionable Bellevue Avenue, the Marble House’s front facade includes four huge Corinthian columns dividing the exterior into a series of classical, symmetrical bays. Over the front entrance Hunt included the head of Apollo. Today, as guides for the Newport Preservation Society escort tourists through the Marble House, they point out William K. Vanderbilt’s initials carved into the sculpture. The Vanderbilts, never reticent, felt comfortable with Hunt’s use of the ancient gods to adorn their summer pleasure palaces.

If Vanderbilt chose Versailles as a model for his Marble House, it remains no wonder that Warren persuaded him to adopt a monumental, Beaux-Arts design for Grand Central, the crown jewel of the New York Central Railroad, the “Vanderbilt System.” Warren’s design for the facade of Grand Central, facing south down Park Avenue, mirrored the symmetry of the Marble House. Instead of the four bays of Hunt’s Beaux-Arts design, Warren incorporated three bays, each with arched windows, and ten Corinthian columns. Just as the Marble House evoked the grandeur of Versailles and Louis XIV, Warren’s design for the Grand Central terminal building drew on the classical grandeur of Greece and Rome for its inspiration. Warren crowned the facade of Grand Central, not with Apollo, whom Hunt had selected for the doors of the Marble House, but with Mercury, Minerva, and Hercules.

Warren’s plans dramatically changed Reed and Stem’s design for the interior of the terminal building. Reed and Stem’s plan provided for a

large amount of retail space along 42nd Street and Vanderbilt Avenue and for a narrow concourse running across the full width of the interior from Depew Place to Vanderbilt Avenue. Warren's interior, monumental in nature and mirroring his exterior, revolved around a much more spacious central concourse, with an arched ceiling high overhead and viewing galleries at the upper level. Entering the terminal via 42nd Street, departing passengers would pass through an elaborate waiting room, purchase tickets, and proceed majestically through the Grand Concourse before descending to the underground platforms and the waiting express trains. Warren's interior embodied the Beaux-Arts precept of designing a public building around its central space, in this case the Grand Concourse, from which other rooms should radiate. Warren wanted to remove the experience of train travel from the ordinary and utilitarian and to evoke the romance of travel, especially on the Central's glamorous long-distance trains. To accomplish this end, Warren devoted a substantial share of Grand Central's total interior volume to the Grand Concourse at the heart of the terminal. Entering Warren's concourse, both traveler and the pedestrian knew, without doubt, that they had arrived in a special place. In the final analysis, Warren deserves the major credit for the appearance of the interior of Grand Central and particularly the Grand Concourse, which came to be hailed as New York's forum, its Piazza San Marco.

Whitney Warren also deserves full credit for the exterior treatment of the building. His daughter, in 1941, gave the Cooper-Hewitt Museum, in New York, Warren's signed original sketch of the south-facing facade of Grand Central. Sketched are three triumphal arches facing down Park Avenue, adorned by Corinthian columns with a heroic sculpture centering the cornice. A more finely detailed drawing of the south facade, with a number of notes in Warren's hand, is held by the New-York Historical Society.

As the design controversy simmered, construction of the two-story underground train yard, begun in 1904, moved forward. Since construction of the new terminal building on 42nd Street was to follow the completion of the underground train yard and creation of the electric zone, arguments over the final design of the terminal building dragged on until December of 1909.

To complicate matters further, the New Haven Railroad entered the

Image not available.

*Whitney Warren's  
drawing of the front  
facade of Grand  
Central, with his  
annotations*

fray. The New York Central's long-term agreement with the New Haven allowed for joint use of the Park Avenue tracks and of the Central's terminal facilities in Manhattan. Further, the agreement required the New Haven to pay a fee to the Central for each passenger hauled between Woodlawn in the Bronx, where the New Haven tracks joined the Central's, and Manhattan and to pay one-third of the cost of any improvements to the railroad's terminal facilities in Manhattan.

Since the New Haven shared the costs for any improvements, it insisted on the right to approve any plans for changes to the 42nd Street facilities. The two railroads formed a joint committee in May of 1906 to ensure the New Haven's involvement in the planning process. At the very first meeting of the joint committee the New Haven asserted its right, not only to be consulted, but also to approve the final design: "the New Haven Company believes that it should be consulted and its consent obtained before any permanent change in the present Grand Central Station is adopted by either the Central Company or the Harlem Company."<sup>77</sup>

Minutes of the May meeting of the joint committee indicate that the New Haven knew quite well the cost implications of Warren's plan for a low monumental building instead of Wilgus's and Reed and Stem's original concept for a twelve-story building with ten floors devoted to rental

space. The New Haven officials raised serious objections: "The second plan [Warren's] provides for no office space over the Railroad Terminal south of 43rd Street. . . . such a building as contemplated by the first plan [Reed and Stem's] is more suitable as a piece of architecture, is as well adapted to electrical operation, is just as efficient as [the second] and more economical." New Haven officials continued their objections in the most forceful of terms: they refused to pay their one-third of the cost of the monumental building proposed by Warren and supported by William K. Vanderbilt: "The New Haven is willing to bear one-third of the charges on the cost of the first plan. . . . it is not willing to bear such proportions of the charges on the cost of the second plan."<sup>8</sup> Unlike the Central and Vanderbilt, the New Haven resisted helping to fund a monument to the grandeur of the New York Central Railroad and the Vanderbilts.

The lower cost of Wilgus's and Reed and Stem's design was one of its appeals to the New Haven Railroad. The joint committee estimated that, with its twelve-story revenue-generating building, it would cost \$36,194,000, leaving the New Haven's share of the financing at \$281,170 per year. By comparison, Warren's monumental building, estimated to cost \$42,000,000 to build, would require the New Haven to contribute \$382,042 a year. Warren's plan increased the New Haven's share by \$100,000 a year, an increase of 36 percent over the Reed and Stem plan.

With the joint committee unable to reach a consensus, a showdown came in December of 1909, when the boards of directors of the two railroads entered the controversy and assumed direct responsibility. The two boards formed a second "joint" committee, whose composition is revealing. William K. Vanderbilt, William H. Newman, and three other board members represented the Central, while the New Haven members included J. P. Morgan, William Rockefeller, Lewis Cass Ledyard, William Skinner, and the president of the New Haven, Charles Mellen. Not coincidentally, J. P. Morgan, William Rockefeller, and Lewis Cass Ledyard also served on the board of directors of the New York Central.

How could the interests of the New Haven be independently represented by men who at the same time served as directors of the Central? To modern judgment, a conflict of interest appears obvious, but to the turn-of-the-century corporate world, such interlocking relationships were all too common.

Two days before Christmas in 1909, the new committee presented its recommendation to the directors of the New York Central. Newman explained the committee's discussions regarding the pros and cons of the Reed and Stem building versus the Warren building. After Newman's presentation, William Rockefeller moved that the board approve Warren's plans for the building; the minutes report simply that Rockefeller's motion carried with no recorded vote.<sup>9</sup> Still, the board added one crucial change. Rockefeller's motion required that the Warren plan incorporate the foundations for a high-rise revenue building, to be constructed sometime in the future; this proved to be a very significant addition. After World War II, when the Central, desperate for additional revenue, sought to develop the air rights directly over Grand Central, the strengthened foundation, required by Rockefeller's motion, encouraged the railroad's efforts.

After Rockefeller's motion passed, Lewis Ledyard moved that the elevated roadway carrying Park Avenue around the terminal building which had been proposed by Reed and Stem, also be included. Ledyard's motion carried. Wilgus later claimed that the inclusion of Reed and Stem's elevated roadway, a key feature of their plan, had been a principal reason for the selection of Reed and Stem in the original architectural competition. Wilgus, writing in 1913, argued that the decisions made by the board of directors in 1909 vindicated his original ideas as well as those of Reed and Stem. He wrote that the board "reverted to the original Reed and Stem plan" and explained further, "Subsequent to the writer's severance of connection with the improvements, the elevated driveways and 42nd Street bridge crossings, which had been omitted contrary to his recommendations, were restored, the steel work in the main building north of 43rd St. has been designed and built for future additional revenue-producing stories." Wilgus concluded with a note of triumph, "Thus has the improvement been completed to accord with the fundamental features proposed in the original inception of 1902, and with an exterior treatment of the station building that displays the architectural ideas of Warren and Wetmore combined with the novel elevated driveway features of the Reed and Stem plan."<sup>10</sup>

While the board did restore the elevated roadway, a significant contribution from Reed and Stem's original design submission, the final design of the terminal building itself, the masterpiece on 42nd Street most famil-

iar to the public reflects Whitney Warren's hand. The low-rise, classical Beaux-Arts exterior and the monumental interior concourse resulted from Warren's concept of Grand Central as a fitting gateway to the greatest city in the country.

At that meeting on December 23, 1909, the Central's board dealt with another important issue. Lewis Ledyard proposed to have the New Haven Railroad share with the New York Central the cost of any real estate projects the Central planned for the 42nd Street area not specifically earmarked for railroad purposes. The New York Central Railroad intended to enter the real estate development business and wanted the New Haven as a partner. Jointly the two railroads agreed to advance the initial capital needed to develop the air rights over the underground train yard and to share in rental or lease income. In 1912, the directors of the two railroads reorganized the New York State Terminal Realty Company, which became the two railroads' real estate development subsidiary. Eventually the railroads agreed to advance the necessary capital on a fifty-fifty basis and to share net revenue on the same basis.

In retrospect, the decisions made at the December 1909 meeting of the boards of directors proved to be crucial ones. After years of bitter debate, the board finally decided in favor of the low monumental building first proposed by Whitney Warren to William K. Vanderbilt in 1904.

William Wilgus argued vigorously, for the rest of his life, that he deserved credit for the original concept for the overall Grand Central project. When the new Grand Central opened in 1913, articles filled the leading magazines and New York newspapers. A number of stories gave a prominent place to the role played by Wilgus in the overall concept of the project as well as offering some credit to Reed and Stem. By contrast, the New York Central Railroad was far less generous. To coincide with the opening, the company published an elaborate brochure that included a number of colored drawings depicting the new terminal and the entire "Terminal City" development. In his papers, Wilgus included one of these brochures with extensive annotations. His notes reflect his bitterness at the omission of mention of himself and Reed and Stem from the Central's official publication. In his later years, Wilgus wrote poignant letters to editors and authors of articles on Grand Central whenever they failed to give him the credit he believed he so richly deserved.

### *The Architect's Grand Central*

Any serious study of Grand Central leads to the conclusion that the genius of William J. Wilgus stands behind the project. While Wilgus played only an indirect role in the design of the terminal building itself, that was just one component of an immensely complicated effort. He deserves recognition for the scope of his imagination: he looked at the Commodore's Grand Central Depot with its open train yard to the north and envisioned a project that transformed the entire thirty-block area into one of the most vibrant urban concentrations in the world. Grand Central still resonates with the life and vitality of the city and functions efficiently almost one hundred years after Wilgus first wrote to the president of the New York Central and presented his revolutionary plans.

### *The Beaux-Arts*

During the period after the Civil War, as America emerged as the most powerful nation in the world and as the country's businesses prospered, American building art searched for an appropriate style to express the country's new position. While critics like Lewis Mumford have referred to the Beaux-Arts derisively as "imperial," in city after city civil and business leaders chose the Beaux-Arts for important public and private buildings. Grand Central Terminal and Pennsylvania Station, two of the major buildings constructed in New York around the turn of the century, both epitomize the influence of this style. As gateways to the most important city in the country, these terminals combined monumental scale with the capacity to handle a large flow of people daily and their architecture provided the perfect solution to the challenge at hand.

The history of American architecture involves "the search for a usable past."<sup>11</sup> Whitney Warren wrote, "Architecture being a seasoned art, for any specific purpose there should be precedent and tradition."<sup>12</sup> In each major time period in the country's history, architects and builders sought a vocabulary with which to express the American experience. The lack of a long collective history created a vacuum but also offered opportunity. Absent an established style, in a country which glorifies the self-made man, the possibility for reinvention abounds. In the period after the Civil War, the rise of big business and the creation of stupendous personal fortunes offered a unique opportunity to create a new built en-

vironment. In cities across the country, but especially in New York, strong-willed clients—governments as well as private businesses and individuals—sought an architectural style that would proclaim their preeminence and wealth. Commodore Vanderbilt, his son William H., and his grandson William K., all forceful and impassioned men, imagined their terminals in New York to stand for all time as monuments to their wealth and power. They needed a “usable past” and the Beaux-Arts fitted their desires perfectly.

Just after the Civil War, when the Age of Energy commenced, anyone could call himself an architect and open a practice, regardless of formal study. Only one school in the country offered a formal program of study in architecture; architectural training came by way of an apprentice system, whereby an aspiring architect worked for a period of time in the office of a practicing architect or draftsman before setting out on his own. Thomas Jefferson, celebrated as a great American architect for the design of his home, Monticello, the campus of the University of Virginia, and the Virginia State Capitol in Richmond, was completely self-trained. He absorbed the classical style from careful reading and study of Andrea Palladio's *Four Books of Architecture*, first published in 1570. The Massachusetts Institute of Technology established the first academic architectural training program in the United States in 1865, followed by the School of Architecture at Cornell University in 1871 and the University of Illinois and Syracuse University in 1873. As an alternative, Americans interested in architecture could study abroad, especially in Paris at the most famous school of architecture in the world.

The Beaux-Arts style takes its name from the Ecole des Beaux-Arts in Paris. At the end of the nineteenth century and well into the beginning of the twentieth, the Ecole's influence reigned supreme in American architecture. The impact the Beaux-Arts school exerted on American architects, including the architect most responsible for the design of the exterior of Grand Central and the Grand Concourse, cannot be overestimated. This influence came in a most direct way. Aspiring American architects left the United States, went to France, and enrolled in the famous academy on the Rue Bonaparte. There, they followed a course of study that had been in place for more than a hundred years.

Nothing in the young United States compared with the glory of the

monumental architecture of Paris and Versailles and the attraction of Paris itself, the City of Light. At a time when few American cities boasted a population approaching one hundred thousand, Paris's population already numbered over a million. The city's streets and boulevards included the greatest concentration of classically inspired buildings and monuments in the world. With the rebuilding of Paris from 1853 to 1870 under Napoleon III by the prefect of the Seine, Baron Georges Eugène Haussmann, the monumental and awe-inspiring nature of the French capital only increased.

The Ecole traced its origins to the reign of Louis XIV and the establishment of the Académie Royale d'Architecture by Colbert in 1671, with a commission to provide architecture for the royal crown. Louis, with Colbert's guidance, named a group of architects to meet periodically to advise the crown on the design of royal buildings, with the implicit purpose of increasing the glory of Louis's reign. To ensure that young architects of the realm might benefit from its studies, the Académie established a school of architecture. During the eighteenth century, the Académie developed a full course of study, including a series of design competitions which became central to the architectural training provided by the Académie and later by the Ecole des Beaux-Arts.

After the French Revolution, the revolutionary forces suppressed all royal academies, and a bitter struggle followed for control over the training of artists and architects. With the restoration of the monarchy, in December of 1816 Louis XVIII ordered that the former Convent des Petits-Augustins on the Quais Malaquais and the Rue Bonaparte, on the left bank of the Seine, be assigned to the Ecole Royale et Speciale des Beaux-Arts. A royal order in 1819 united the special schools of architecture, painting, and sculpture into the Ecole Royale des Beaux-Arts. By 1819 the architecture program established a separate curriculum from those in painting and sculpture.<sup>13</sup>

The 1819 curriculum remained in place for over a century and a half; the course of study proceeded in a hierarchical fashion. A student first found a master, an architect with an established reputation, who oversaw an atelier, a studio, near the Ecole, where students spent most of their time working together. Once admitted to an atelier, the student formally applied as an "aspirant" to the Ecole and prepared for the entrance exam-

inations. A French citizen had only to be between the ages of fifteen and thirty; a foreign student required a letter of introduction from his ambassador. Study at the Ecole was free to any student, French or foreign, capable of passing the entrance examinations, which tested students in mathematics, geometry, history, drawing, and architecture. A difficulty for American students proved to be mastering the French language sufficiently to pass the entrance examinations. American aspirants often took the examinations a number of times before gaining admission to the Ecole. Once admitted, a student entered the "second class," the first stage in the curriculum.

Faculty offered formal lectures on architectural history, ornamentation, and other subjects but did not require students to attend. The heart of the curriculum consisted of a series of formal competitions in which students first prepared sketches at the Ecole in solution of a design problem. With a twelve-hour time limit, these preliminary drawings demanded an ability to respond quickly to a complex design problem. After completing their sketches, the students returned to their ateliers to complete formal plans and elevations within two months for judgment by the faculty.

Work on plans and elevations proceeded at a feverish pace, and active encouragement and critique were provided by fellow students. Weekly visits from the *patron* of the atelier offered an opportunity for review of the work in progress, often accompanied by stinging critiques and suggestions for improvements. It was in these cramped, dirty, drafty, and cold studios that the real architectural training occurred. Students remained with an atelier for years; the atmosphere, decidedly bohemian, contributed to the sense of adventure and romance surrounding study at the Ecole, especially for the American students. Louis Sullivan described his atelier in a letter home in 1874: "It is the dammedest pigsty I ever got into. First it's cold, and when you light the fire it smokes so that it nearly puts your eyes out, and you have to open the windows, which makes a devil of a draft, which is not recommended for people with a cold."<sup>14</sup> Students in an atelier did not pay their *patron*; rather, he received a salary from the Ecole and earned additional fees from private practice.

Students vied for admission to the ateliers of the most famous of the French architects. Victor Laloux, who designed the Gare d'Orsay, an

important precursor to Grand Central, served as a *patron* at the turn of the century. A description by one of Laloux's students captures the atmosphere of a *patron* in his atelier: "Followed by his pupils, he went from table to table, giving his criticism to each student in turn; having made the rounds, he would bow, put on his silk hat and quietly leave the room, but no sooner was the door shut than pandemonium would break loose and a noisy discussion of what he said follow."<sup>15</sup>

To move from the second to the first class at the Ecole required a student to pass a number of *concours*, or competitions, including four in construction employing stone, wood, and iron. Each competition required numerous drawings, showing the central elements of a projected building with stone, iron, and wood detailing, and mathematical calculations demonstrating the structural integrity of the building. Including the proper engineering details provided the hardest challenge for first-year students. This training, with its emphasis on all aspects of building design, proved invaluable to the American students when they returned to a country engaged in a building frenzy. Back in the United States, Ecole-trained architects and their partners easily won one major architectural competition after another.

The curriculum of the first class placed even greater emphasis on the *concours*. Design problems focused on plans for major public buildings—museums, hotels, train stations. Study at the Ecole culminated in the competition for the Grand Prix de Rome, open only to French students and judged by members of the French Academy. The press followed the competition closely. At the ateliers, first class students competing for the Grand Prix received a great deal of attention from the *patron*; winning the Grand Prix brought great prestige not only to the student but to his atelier and his *patron*. The winner of the Grand Prix went to Rome to study, at government expense, for four or five years. Upon returning to Paris, many winners of the Grand Prix went on to brilliant architectural careers.

Not all students who attended the Ecole passed from the second to the first class. In fact, many students, especially the American students, merely studied at the Ecole for a number of years and then left to establish an architectural practice. The American Institute of Architects, founded in 1857, required an apprenticeship or attendance at either the Ecole des

Beaux-Arts or the Royal Academy of Design in London before application for membership. The A.I.A. viewed study at the Ecole or the Royal Academy as evidence of sufficient training in the field of architecture for membership in the country's most influential architectural organization. In 1863, the French government introduced a *diplome* to those who completed the curriculum at the Ecole, and by the turn of the century obtaining the *diplome* had become the goal of American students at the Ecole.

Until the First World War the Ecole flourished and continued to attract a large number of American students. In 1968, after the student uprising in Paris, the French government distributed architecture studies from the Ecole to a number of other institutes of higher education. On the Rue Bonaparte and Quai Malaquais, the buildings of the Ecole, visibly suffering the ravages of time, now serve as a fine arts school run by the French Ministry of Education. Just off the Rue Bonaparte stands the Palais des Etudes with its covered courtyard, the famous Salles des Etudes Antique, once the heart of the Ecole. Formerly filled with models of ancient Roman and Greek statues, the Salles des Etudes Antiques now stands empty and forlorn. On the second floor, the library, dusty and dark, is crammed with architectural drawings growing brittle with age. Only echoes of the vitality and energy of the architectural glory of the Ecole at the turn of the century remain.

### *The Beaux-Arts and American Architecture*

Training provided at the Ecole, firmly rooted in the classical past, provided the United States with precisely the right architecture for the Age of Energy. With its foundations in the classical beauty of Greece and Rome and the glory of the *ancien régime* in France, the Ecole training provided a means of architectural expression which communicated the confidence and exuberance of a young nation destined to dominate the world stage. Whether for city governments striving to bring order and dignity to the exploding American city, powerful companies seeking a monumental building to symbolize corporate strength, or newly minted millionaires desiring a grand town house or summer home, the architecture taught at the Ecole provided a suitable "usable past."

Richard Morris Hunt, the first American to attend the Ecole des Beaux-Arts, enrolled in 1846 and remained in Paris for eight years. After completing his studies, he returned to the United States and embarked upon a distinguished architectural career; ultimately Hunt's work became synonymous with the age. He first served as an assistant on the construction of the Capitol in Washington and thereafter proceeded from one major commission to another. His last major design, the magnificent Fifth Avenue entrance to the Metropolitan Museum of Art, was completed by his son Richard Holland Hunt, after the senior Hunt's death in 1895. Richard Morris Hunt served as court architect to the Vanderbilts: he designed the Marble House and the Breakers in Newport for William K. and Cornelius II, respectively, and for George the famous Biltmore in Asheville, North Carolina, the largest private home ever built in America.

H. H. Richardson followed Hunt to the Ecole in 1862 and stayed through the Civil War years. Richardson, a southerner born on a plantation in St. James Parish, Louisiana, in 1838 and raised in New Orleans, went north in 1854 to study engineering at Harvard University. After returning from Paris, Richardson won the competition for his most famous design, Trinity Church and Rectory on Copley Square in Boston.

Soon other Americans followed in the footsteps of Hunt and Richardson, eight students in 1888, twenty-two by 1895. Whitney Warren completed the first-class examination in 1890.<sup>16</sup> Until the outbreak of the First World War, the number of Americans enrolled at the Ecole averaged about twenty each year. A roster of American graduates of the Ecole comprises a veritable who's who of American architecture at the turn of the century, including Sullivan, McKim, Carrère, Warren, Pope, Kahn, and Van Alen. Not only did many of the most famous American architects of the era attend the Ecole, they went on to found architectural firms where they shared their training with like-minded colleagues, further reinforcing the dominance of the Beaux-Arts style. Certainly the most famous of these firms was McKim, Mead and White. Charles McKim, an Ecole graduate, teamed up with the brilliant Stanford White to design a number of the most famous buildings ever built in this country, including Grand Central's rival, Pennsylvania Station.

In city after city, America was demanding architects with imagination,

to establish a new form of architectural expression to capture the age. Ecole graduates, with their experience of numerous design competitions while in Paris, were superbly prepared for the architectural competitions by which the designs for state capitols, public buildings, great libraries, railroad stations, and the like were chosen. For example, between 1886 and 1926 twenty-four new state capitols were designed and built and almost all involved a formal design competition. Ecole-trained architects' well-developed presentation skills won almost every major architectural commission.

An early triumph of Beaux-Arts design on the American shore came with the World's Columbian Exposition in 1893. The Exposition included construction of the White City, a series of Beaux-Arts buildings which served as exhibition halls to display the new products of the American industrial revolution. Millions of Americans journeyed to Chicago to visit the White City and gaze upon the wondrous products of American

*The Beaux-Arts on display in America: the central lagoon at the World Columbian Exposition, Chicago, 1893*

Image not available.

*The Architect's Grand Central*

genius, energy, and imagination. Daniel Burnham of Chicago, chief architect of the Exposition and a graduate of the Ecole, assembled a distinguished group of American architects and artists to design the buildings, grounds, fountains, and statues for the fair. Included among the Exposition's architects were a number of illustrious graduates of the Ecole: Richard Morris Hunt, H. H. Richardson, Louis Sullivan, and Charles McKim.

The Columbian Exposition's White City drew its inspiration directly from the Paris Universal Exposition of 1889, where Ecole architects designed the major buildings, including the Petit Palais by Girault and the Grand Palais by Deglane. Both the Petit Palais and the Grand Palais remain, as does the most famous structure built for the Paris Exposition, the Eiffel Tower. Chicago's White City of 1893 perfectly mirrored the buildings constructed in Paris four years earlier. Daniel Burnham's central role ensured the dominance of the Beaux-Arts and confirmed the Beaux-Arts as the most forceful means for architectural expression at the turn of the century.

America's Beaux-Arts buildings did not merely copy buildings of Paris

*The Grand Court at  
the Columbian Ex-  
position, illuminated  
by electricity*

Image not available.

Image not available.

or Rome; rather, they expressed a particular American interpretation of the lessons of the Ecole. Their sheer energy and vitality distinguished them from their European predecessors. Even Le Corbusier, the acerbic architectural theorist and polemicist for modern architecture, soon to replace Beaux-Arts, recognized the uniqueness and originality of the Beaux-Arts in the United States: “In New York then, I learn to appreciate the Italian Renaissance. It is so well done that you could believe it to be genuine. It even has a strange, new firmness which is not Italian, but American!”<sup>17</sup> Vincent Scully, renowned architectural and art historian, simply and eloquently characterized the achievements of the Beaux-Arts in America at the turn of the century: “The Beaux-Arts tended to build better monuments and urban spaces than the later period, at least in America, has been able to do.”<sup>18</sup>

*The Beaux-Arts in  
New York: McKim,  
Mead and White's  
Pennsylvania Station  
at 33rd Street*

### *Grand Central and Beaux-Arts Design*

Graduates of the Ecole found great success in New York. The list of important public and private buildings designed by graduates of the

Image not available.

*Drawing of the interior of Grand Central, detailing the complexity of the new, multilevel facility*

Ecole includes the Customs Building, the Municipal Building across from City Hall, the Post Office at 34th Street, the Flatiron Building, Pennsylvania Station, the New York Public Library, and the Chrysler Building. Grand Central Terminal embodies all of the essential elements the training at the Ecole des Beaux-Arts sought to impart. Above all else, Grand Central's design allows for the steady flow of thousands of people each day to and from the heart of the metropolis. The arrangement of interior spaces composes a clearly laid out pattern of circulation so that passengers move from the street to their trains smoothly and without confusion. At the Ecole, design problems often involved the planning of large public buildings, and the arrangement of the interior was of paramount importance. Interior rooms, regardless of size, had to lead logically from the entrance to the "main element." At the heart of a Beaux-Arts building, the central space, where the primary function of the building took place, provided the focal point for the entire design.

The New York Public Library, on Fifth Avenue at 42nd Street, two blocks from Grand Central, provides a perfect example of this principle. Constructed at the same time as the terminal and designed by John M. Carrère and Thomas Hastings, both of whom studied at the Ecole, the

library includes a clearly defined path leading from the entrance on Fifth Avenue to the central space, the main reading room. The main reading room sits at the top of the building, three stories above the primary entrance. Beaux-Arts design requires a clear path, and at the library this is provided by a series of grand stairways that lead through a series of galleries and corridors. Anticipation builds as the visitor climbs to the third floor to the McGraw Rotunda, with carved-wood walls and a painted ceiling, and then through the catalogue room to the climactic space. Recently, the restoration of the main reading room of the library returned this magnificent space to its turn-of-the-century glory.

As soon as Whitney Warren became involved with the design of Grand Central, his attention turned to the “main element,” the space at the heart of the terminal. Reed and Stem’s plans included a central concourse with

*Final floor plan of the  
new Grand Central*

Image not available.

Image not available.

*Cross-sectional drawing showing elevations of each level of Whitney Warren's design*

access to the train tracks, but their concourse was relatively small in scale. Warren dramatically altered the nature of the concourse and made it the central focus of the plan, so that the entire terminal revolved around a much larger central space. Soaring higher than five stories, with second-floor galleries overlooking the first floor, Warren's Grand Concourse clearly reflects his training at the Ecole des Beaux-Arts. On a somewhat smaller scale, Warren repeated this scheme on the lower, suburban level, which has its own concourse providing access to the train platforms. On both the through and suburban levels, Warren's design used an axial arrangement of space and succession of spaces to move passengers to their trains with clarity and without confusion.

The building's central public spaces for handling incoming and departing passengers provide a model of coherence and clarity. From the main entrance on 42nd Street, the path leads downward, by ramp, through the waiting room, to the Grand Concourse. From the cab stand on Vanderbilt Avenue, the path leads to a balcony overlooking the central space of the building and then down a processional staircase, modeled after Garnier's staircase in the Paris Opera, to the floor of the Grand Concourse. Other spaces radiate outward. Ramps continue the march to the lower level concourse; the path remains clear and unequivocal.

An essential element of Beaux-Arts design is that the outside of a building reveals what is within. According to Garnier, this was "a great first principle, a principle of reason and truth. It is the requisite: the exterior mass, the composition of the outside, indicate the interior plane, the composition of the inside."<sup>19</sup> The classical exteriors of both the New York Public Library and Grand Central signify the important functions within. Not intended to house ordinary commercial activities, the New

York Public Library and Grand Central Terminal serve knowledge on the one hand and travel on the other. One cannot mistake these Beaux-Arts buildings for anything else; their exterior language speaks clearly.

Warren insisted on a low-rise, monumental exterior for Grand Central instead of the high-rise office building of the original Reed and Stem design. He realized that a high-rise office building with the railroad terminal occupying the first three or four stories would simply be another office building in a city filling with such structures. By contrast, his monumental treatment, with its triumphal arches facing south down Park Avenue, created the triumphal entryway that, he wrote, every great city deserved. Whitney Warren's original elevation for Grand Central includes three grand arches flanked by paired columns, suggesting the arched gateways to the city of Paris, topped by a large sculpture consisting of figures from the ancient myths. Exterior ornamentation, not for mere show or decoration, set the scale of the building and reflected the importance of the activity to take place within. Exterior ornamentation followed the interior plan, and the classical ornamentation of the Beaux-

*The Grand Concourse at the opening of the terminal in 1913, from the balcony, looking east*

Image not available.

*The Architect's Grand Central*

Arts style served to complement the rationality of the interior plan, not to overwhelm it. At Grand Central, the elaborate exterior clearly conveyed a sense of exuberant wealth and power. Warren's patrons, the New York Central and the Vanderbilts, expected nothing less.

Warren crowned the south facade with a pure Beaux-Arts sculpture. No building of a monumental nature could be considered complete without ancient gods to adorn it. The sculptor chosen to execute the statues for the south facade, Jules Alexis Coulan of Paris, held the coveted position of professor at the Ecole des Beaux-Arts. Whitney Warren had studied with Coulan while in Paris. William K. Vanderbilt played a role in selecting Mercury as the personage to crown the building's south facade. He knew his mythology; after all, he had directed Richard Morris Hunt to adorn the doors of his Newport mansion with Apollo. The *New York Times* described the theme of the sculpture as "an attempt to offer a

*The waiting room,  
Vanderbilt Hall, 1914*

Image not available.

Image not available.

tribute to the glory of commerce as exemplified by [the New York Central] . . . the whole to stand as a monument to the glory of commerce as typified by Mercury, supported by moral and mental energy—Hercules and Minerva. All to attest that this great enterprise has grown and exists, not merely from the wealth expended, nor by the revenue derived, but by the brain and brawn constantly concentrated upon its development for nearly a century.”<sup>20</sup> If William K. Vanderbilt had a god bedecking his monument to himself in Newport, then his railroad needed at least three gods to adorn its monument in New York. The Central envisioned the new terminal’s lasting through the ages in the heart of the greatest city in the world. Three triumphal arches facing down Park Avenue, with the gods soaring overhead, reminded all New York of the important role played by the New York Central Railroad, the heart of the Vanderbilt system.

An early architectural evaluation of Grand Central argued that New Yorkers would soon come to regard the Beaux-Arts exterior of the new terminal as a work of great beauty: “It is expected that the exterior shall

*Facade and sectional views of the 42nd Street side of Warren's building*

Image not available.

*The Beaux-Arts at Grand Central: erection of Jules Coulan's sculpture of Mercury, Minerva, and Hercules at top of the 42nd Street facade, 1914*

appeal to the average citizen, that in its shape and in the composition of lights and shadows which give it its character—lights and shadows formed by cornices and pilasters, not to mention windows and doors—there shall be something that will have that quality which the public understands as architectural beauty.”<sup>21</sup> Indeed, Grand Central, although constructed by a private company, serves as a public building in the broadest sense of the word. The Grand Concourse, the central element of the building, provides a secular cathedral to the spirit of commerce and the exuberance of travel. It continues to serve as both a gateway to the city and as a magnificent public building that lifts the spirits of all who pass through it.

### *Grand Central and the City Beautiful*

During the 1900s, New York's population grew at a frenzied pace. Social and physical disorganization prevailed. Even on Fifth Avenue, where fashionable stores catered to the affluent, no symmetry or similarity of

style characterized the architecture. New York did not pass its first zoning law until 1916, only then dividing the city into districts for residential and commercial use and limiting tenement density, to ensure adequate light and air for the city's poor. Reformers led by George McAneny called for the city to organize a citizen's advisory committee to draft the first master plan for New York, to beautify the city streets, build parks and recreation areas for the poor, and recommend laws to regulate building height and tenement construction.

New York's tentative steps represented the influence of the City Beautiful movement, which at the turn of the century sought to bring beauty and harmony to the chaos of the American city. With an emphasis on aesthetics as well as systematic planning, the movement proposed to improve the environment in the country's teeming urban centers by constructing magnificent public and private buildings, civic centers, boulevards, and parks. Proponents argued that more beautiful and dignified physical surroundings would influence city residents and lead to a more harmonious life for all residents, from the humblest tenement dweller to the richest resident in the most exclusive neighborhood.<sup>22</sup> In the United States, the origins of the City Beautiful concept began with the evolution of the profession of landscape architecture and in particular with the work of Frederick Law Olmsted, who, with his partner Calvert Vaux, designed and oversaw the construction of Central Park.<sup>23</sup> Central Park remains the crowning achievement of the landscape architecture movement in the mid-nineteenth century. Olmsted intended the park to beautify the city as well as to bring a sense of order and decorum to the urban scene. Central Park further stimulated the movement of New York's population up Manhattan Island, especially after the city paved Fifth Avenue from 14th Street to 58th Street, the southern entrance to the park. With the opening of Central Park, Fifth Avenue north of 42nd Street emerged as the most fashionable address in the city, home to the Vanderbilts and other titans of the Gilded Age. A resounding success, Central Park prospers today, one of the great urban parks in the world.

In Europe, the transformation of Paris by Baron Haussmann during the Second Empire directly influenced the idea of the City Beautiful in the United States. Haussmann reconstructed large parts of Paris, building the grand boulevards that lend so much to the beauty and grandeur of

that city. These boulevards created great urban vistas terminating at the sites of Paris's monumental buildings, which had been designed by architects trained at the Ecole des Beaux-Arts. City Beautiful plans in this country usually included both grand boulevards and monumental civic buildings, to provide the American city with the broad vistas and soaring civic complexes Haussmann so successfully introduced into the Parisian landscape.

The Columbian Exposition's White City epitomized the City Beautiful's commitment to comprehensive planning, for its monumental buildings and exhibition halls were constructed around a central lagoon. Neoclassical in design, all of the main buildings reflected the Beaux-Arts style and the influence of chief architect Daniel Burnham. Visitors to the White City drew the obvious contrast between the order, harmony, and sheer beauty of the Exposition and the ugliness and squalor of America's cities. If the White City could be beautiful and harmonious, why couldn't New York or Chicago or Cleveland also be?

Burnham himself grasped the essential issue and wrote that, at the Exposition's White City, "a great truth, set forth by artists, was taught to our people. The truth is the supreme one of the need of design and plan for whole cities."<sup>24</sup> To implement the City Beautiful, to construct a White City in an American city required a comprehensive master plan. Not surprisingly, calls for master plans by City Beautiful advocates immediately encountered resistance from property interests in cities, who objected to having limitations placed upon the use of their private property.

This battle between private property rights and a desire for public planning to regulate the use of private property to promote the "common good" echoes to the present day. When the City of New York passed its Landmarks Preservation Law in 1965, the law saved Grand Central from destruction. In turn, the New York Central Railroad argued that Grand Central's landmark designation deprived the company of the rights inherent in its private property. Eventually the legal battle reached the U.S. Supreme Court. Advocates of landmarks preservation argued that buildings like Grand Central and the New York Public Library are not merely utilitarian structures but also serve to beautify and inspire and that New York had an obligation to see to their active preservation, or all traces of the best of the city's architectural heritage would disappear.

In New York, the City Beautiful movement led to the first master plan for the City of New York, prepared in 1907 by the New York Public Improvement Committee. Great fanfare greeted publication of the plan. However, the plan achieved limited success because it ignored the underlying economic forces shaping the city and proved unable to reconcile private property rights with the need for government regulation to order the built environment.

At the very time the Public Improvement Committee published its ambitious plan, the New York Central's new terminal complex was moving forward at a frenzied pace. When completed, the project had transformed a sprawling section of midtown Manhattan into a harmonious complex of hotels, offices, and apartments, the kind of planned urban environment the City Beautiful envisioned; at 42nd Street rose New York's version of the White City. An early evaluation of the impact of Grand Central on the area around the terminal praised the new buildings as "most harmonious and better balanced than any group of buildings in any other American city."<sup>25</sup> Newspaper and magazine accounts placed the new rail facility and the accompanying "Terminal City" development squarely in the context of efforts to beautify the American city. In 1910, before the new terminal opened, a *New York Herald* article entitled "More Millions to be Spent in Beautifying the New Grand Central Terminal" commented on the likely impact of the sums being spent by the New York Central. According to the paper, the railroad's effort had evolved "with a view to making its Forty-second Street terminal one of the beauty spots of the city."<sup>26</sup> Robert Pope, writing in one of the first issues of *Town Planning Review*, the official journal of the new profession of urban planning, added: "When all the buildings that cover the surface of this huge terminal are completed they will form one of the most wonderfully beautiful groups of structures in the world. . . . In this section of New York, at least, there will be a level sky line, like that which is so much admired in the cities of Europe."<sup>27</sup> In his view, Grand Central stood among the most beautiful buildings in the world and the New York Central's planned collection of buildings around Grand Central, all of a uniform height and design, compared favorably with the best of Paris.

A review in the *New York Times* made reference to the original Reed and Stem plan for a "Court of Honor," which the writer expected to be

constructed along the newly restored Park Avenue, north of the terminal and, according to the newspaper, soon to be the new home of the Metropolitan Opera: "The possibility was immediately presented [the directors of the Metropolitan Opera House], of having Park Avenue open into a great plaza with a stately new opera house set in the center, rivaling the beauty of the Place de l'Opera in Paris."<sup>28</sup> While the 1907 master plan for New York never materialized, Grand Central achieved a greater impact on the urban fabric of New York than any other building project in the first half of the twentieth century, until construction began on Rockefeller Center.

Charles Mumford Robinson, a leading advocate of comprehensive planning at the turn of the century, identified three goals of the City Beautiful: "a bettering of those circulatory problems that have been created by congested traffic, the improvement of social conditions in many directions, and increasing the visible beauty and splendor of cities."<sup>29</sup> The Grand Central project more than met all three of Robinson's goals.

Grand Central represented systematic planning and construction on a grand scale; the railroad took an open train yard that ran from 42nd to 54th streets between Lexington and Madison avenues and placed it underground. In the air, over the two-story underground railroad yard and terminal, the railroad constructed a new terminal, followed by hotels, offices, and apartment buildings. The railroad deliberately set out, as the *Times* described it, "to fashion anew that entire section of the city where the old station stood, to build or cause to be built thirty blocks of buildings in Manhattan, all guided by one hand that would supervise their purpose and direct the general harmony of architecture."<sup>30</sup>

Advocates for the City Beautiful, Robinson and Pope among them, realized that for the turn-of-the-century city to function properly, improved transportation was vital. In New York, a step in this direction came with the construction of the city's first subway, the Interborough Rapid Transit, to run under Fourth (Park) Avenue to Grand Central, turn to the west under 42nd Street to Broadway at Times Square, and then continue uptown. From the first, plans for Grand Central included links to the city's new subway system. William Wilgus envisioned the New York Central's tracks connecting directly with the subway "so that

certain portions of the trains can pass under 42nd Street and thence to the Battery.”<sup>31</sup> Wilgus’s plan for a direct connection with the IRT was never realized. Even without it, Grand Central remains the preeminent example of the type of transportation hub Robinson and the City Beautiful advocates espoused.

A central goal of the City Beautiful movement involved improvement of social conditions in the American city. The first Grand Central’s open train yard hardly benefited social conditions in the neighborhood to the north and east of the station. By comparison, the new Grand Central served as a catalyst for the transformation of the east side of Manhattan in the vicinity of 42nd Street. Wilgus wrote that the open train yard from 45th to 49th streets had acted as a “veritable ‘Chinese Wall’ to separate the city into two parts for fourteen blocks—nearly three quarters of a mile—between 42nd Street and 56th Street, and forced the discontinuance of a leading north and south thoroughfare, then known as Fourth Avenue.”<sup>32</sup> Crossing these obstacles to normal urban traffic were the footbridges and viaducts that spanned the train yard, but the noise, steam, and dirt had discouraged all but the hardiest travelers from crossing.

Commercial activity had intermingled with residential buildings around the old Grand Central. Both the Adams Express and American Express companies operated freight buildings on 48th and Lexington Avenue adjacent to the train yard and the American Express Company’s stables occupied a building on 42nd Street between Second and Third avenues. The F. and M. Schaeffer Brewery filled the block from 49th to 50th streets, the present site of the Waldorf-Astoria Hotel, and further north the Steinway Piano factory stood on the corner of Park and 52nd Street. Slaughterhouses and meat-packing plants, such as United Dressed Beef at 43rd and the Sulzberger Slaughter House at 44th, lined the East River.

After construction of the new Grand Central, apartments and the most fashionable hotels in New York rose over the underground rail yard as part of Terminal City: the Ambassador, Biltmore, Commodore, and eventually the Waldorf-Astoria, in 1932. Office buildings followed: the Graybar Building on Lexington between 42nd and 43rd and the New York Central Building on 54th Street; later the Chrysler Building (1930)

at 42nd and Lexington and the Daily News Building (1930) at 42nd and Second Avenue. Grand Central Terminal stimulated the development of the entire district around 42nd Street. This accomplishment fulfilled hopes that the City Beautiful would serve as a catalyst for urban change.

The comprehensively designed project converted Grand Central from an obstacle to urban development into a dynamic catalyst for change, transforming Park Avenue north of 45th Street into Manhattan's only grand boulevard. A Park Avenue association soon formed and provided the funds to landscape the center median as a park with walkways, flowers, and benches, mirroring the boulevards of Paris. Park Avenue flourished as the most prestigious residential district in New York and in the entire country, precisely the goal of the City Beautiful—the transformation of the crowded, decayed, and ugly into the harmonious and beautiful.

The boulevard provided the perfect setting for the Beaux-Arts buildings that followed. Warren's New York Central Building, built in 1929, further enhanced the beauty of Park Avenue and fit perfectly with the series of apartment buildings constructed over the New York Central's underground train yard. These first air rights buildings, of uniform design and height, with matching cornices, created a sense of continuity as they flowed northward from the New York Central Building. Given the width of the new Park Avenue, these grand buildings did not overpower the street below.

Since the City Beautiful movement sought to increase the beauty and splendor of the city, to magnify a sense of grandeur, the Beaux-Arts neoclassical style provided the perfect architectural vocabulary. Whitney Warren compared Grand Central to the triumphal gates of ancient cities: "This portal was usually decorated and elaborated into an Arch of Triumph, erected to some naval or military victory or the glory of some personage. The city of today has no surrounding wall that may serve, by elaboration, as a pretext to such glorification, but none the less, the gateway must exist, and in the case of New York and other cities, it is through a tunnel which discharges the human flow in the very center of the town. Such is the Grand Central terminal and the motive of the facade is an attempt to offer a tribute to the glory of commerce as exemplified by that institution."<sup>33</sup> Warren's comments apply to the interior

*Original air rights  
buildings along Park  
Avenue north of  
Grand Central, look-  
ing south from 49th  
Street toward the New  
York Central Build-  
ing, 1933*

Image not available.

of Grand Central as well. The Grand Concourse became New York's most famous interior space and provided New York with a secular cathedral larger than the nave of Notre Dame in Paris.

Certainly Grand Central's architecture inspired hymns, but at what cost? An article in *Railway Age Gazette* in 1913 pointed to the extraordinary capital costs of both Grand Central and Pennsylvania Station: "The new passenger terminal facilities of the New York Central in New York City will probably cost \$200,000,000 when completed. This sum would build 2,000 miles of double track road at \$100,000 a mile. The fixed charges, taxes and depreciation will amount to nearly \$20,000,000 per annum."<sup>34</sup> Operating expenses and maintenance for the two facilities

added \$3,000,000 in expenses. For Grand Central, yearly costs equaled 80 percent of the New York Central and New Haven railroads' combined gross from passenger revenue to and from New York. Building and operating these monumental terminals strained even the wealth of the mighty Central and Pennsylvania systems.

In an ironic comment, the author of the *Railroad Age Gazette* article chastised the railroads for spending such profligate sums on passenger terminals when their freight business provided a more important source of both revenue and profit: "vast sums are, or have been, expended in providing elaborate passenger terminals and only insignificant appropriations made for handling the more important freight traffic."<sup>35</sup> The comment proved prophetic: soon enough the railroads entered a period of slow, steady decline, losing the battle for passenger travel to the automobile and airplane and the battle for freight traffic to the truck. When the decline set in, passenger service became unprofitable first. Maintenance costs for palatial railroad terminals on the scale of Grand Central and Pennsylvania Station contributed significantly to overall losses. In the early 1900s, railroad executives could not have imagined the competitive forces just over the horizon.

## *New York's Grand Central*

As the new Grand Central took shape at 42nd Street, the social transformation of New York continued. Waves of immigrants from southern and eastern Europe changed the complex mix of people crowded onto Manhattan Island. The population of the outer boroughs grew as the city's first subway lines allowed the more affluent to move. As suburban rail lines stretched into Westchester and Fairfield counties to the north and Nassau County to the east, the wealthy, and soon New York's expanding middle class, could contemplate moving farther from the city's urban core.

New York was a place of extraordinary contrast, where the lives of the rich and the poor and the various ethnic enclaves stood in stark contrast with one another. The city's expanding rapid transit system offered the opportunity to glimpse the juxtaposition. William Dean Howells, in his novel *A Hazard of New Fortune*, captures this contrast as his middle-class character March travels downtown on the Third Avenue El: "He went over to Third Avenue and took the elevated down to Chatham Square. He found the variety of people in the car as unfailingly entertaining as ever. . . . Now and then he found himself in a car mostly filled with Neapolitans from the construction far up the line, where he had read that they are worked and fed and housed like beasts. . . . March never entered a car without encountering some interesting shape of shabby adversity, which was always adversity of foreign birth. . . . The small eyes, the high

cheeks, the broad noses, the puff lips, the bare, cue-filiated skulls, of Russians, Poles, Czechs, Chinese; the furtive glitter of Italians, the blond dullness of Germans; the cold quiet of Scandinavians—fire under ice.”<sup>1</sup>

In this remarkable passage Howells distilled all of the prejudice and fear that the immigrant city evoked in the mind of the native born. A clash seems obvious; the newcomer remains foreign, different. Howells muses whether these immigrants will ever be assimilated into the American commonwealth. Just three or four blocks to the west, where the new Grand Central rose, and along Madison and Fifth avenues, lay another America, into which few Russians, Neapolitans, Germans, or Scandinavians ventured unless they worked as servants for the self-styled American aristocracy—the Vanderbilts, Morgans, and Astors.

The Grand Central complex exerted a greater influence on the social, residential, and commercial structure of Manhattan Island and New York City than any other building project in the city’s history. With perhaps the exception of Pierre L’Enfant’s and later James McMillan’s plans for the nation’s capital, no other building project ever produced as great an effect on an American city.

At the dawn of the twentieth century, the New York Central set out not only to build a magnificent new terminal but also to develop its extensive real estate holdings in Midtown, with new office buildings, hotels, and apartments over the new underground terminal and train yard to the north. Whether intentionally or not, the ownership of the railroad became the major real estate developer in midtown Manhattan while remaining the proprietors of the second largest railroad system in the country.

### *Air Rights*

William Wilgus premised his entire plan for the new Grand Central on the development of the “air rights” over the new station and the electrification of the train yard. Wilgus believed that “the use of electricity dispenses with the necessity for the old style trainsheds. . . . there is no reason why we should not utilize all of the valuable ‘air’ rights now covered by trainsheds, aggregating over 200,000 square feet of surface area.”<sup>2</sup> Wilgus had first suggested developing the air rights directly above the arched train

shed of the old Grand Central. These rights alone, according to Wilgus's calculations, would pay for the construction of the new Grand Central and the depression and electrification of the entire train yard. As the Grand Central projected unfolded, it became obvious to Wilgus, President William Newman, and the other officers of the Central that the opportunity existed to develop not just the air rights over the terminal area, but also over all of the railroad's extensive holdings in midtown Manhattan.

The railroad's property stretched north from 42nd Street to 54th Street, between Madison and Lexington avenues. Acquired over time, first by the Harlem Railroad and later by the New York Central, the property had initially served as only a train yard for the railroad's operations in Manhattan. When the Harlem first purchased property at 42nd Street in the mid-1800s, the location stood well north of the city's developed area, which was concentrated on the southern end of Manhattan Island. The Harlem did not acquire the land because of any farsighted plan to develop the real estate; rather, the railroad bought the property for a train yard precisely because the location was far removed from the city proper. As a result, the railroad encountered little opposition as it steadily expanded its facilities at 42nd Street.

As time passed, the neighborhood around 42nd Street emerged as a thriving midtown business, commercial, and residential area. By the time the New York Central began planning for the new Grand Central, the railroad's property at 42nd Street had become extremely valuable, not as a rail yard, but as real estate. Wilgus pointed out to the railroad that his proposed twelve-story office building, with 2,300,000 square feet of rental space, would generate net revenue of \$1,350,000 per year.<sup>3</sup> If a single office building could generate in excess of one million dollars in profit per year, what would be the potential financial gain to the Central if it built office buildings, hotels, and apartments over all of the railroad's property in Midtown? For the 1901–2 fiscal year, revenue of the New York Central, from all its vast railroad operations stretching from New York to Chicago and St. Louis, totaled \$61 million. By developing just a small portion of the railroad's acreage in the city, the railroad stood to gain almost \$1.3 million in additional *profit*. Potentially, the New York Central's property at 42nd Street represented a tremendous asset, once the air rights development got under way.

The term *air rights* embodied a new concept in property ownership. An article in *Railway Age* observed that the Grand Central project “introduced in our system of railroad economics the conception of a new value of railroad property; namely, that of air rights over railroad tracks and new facilities.”<sup>4</sup> Hugh Thompson, writing in *Munsey's Magazine*, defined precisely what air rights involved and explained their potential value: “Air rights simply mean the right to build over ground you own. Most people do not stop to consider that ordinarily there are three rights in the ownership of property—the ground right, giving possession of the surface; the lower right, giving power to excavate or mine; and the upper right or air right. . . . the air rights will doubtless prove immensely valuable.”<sup>5</sup> Thompson could not have foreseen just how valuable the New York Central's air rights would prove to be. Today, the air rights over the underground terminal remain the most valuable real estate in the world.

Taking advantage of air rights would allow railroads to become significantly involved in real estate development. However, Joshua D'Esposito, in the *Railway Age* article on air rights, advised that real estate development should remain a sideline for railroads: “It is important to keep in mind one cardinal principle: that the railroad needs are always paramount, and the air rights incidentals. After all, the principal duty of a railroad is to manufacture and sell transportation, and every other activity should be subordinated to this primary requirement.”<sup>6</sup> Irony abounds in these remarks. In 1970 the Penn Central, successor to the New York Central, declared bankruptcy—the largest corporation to that date in American history to do so. Yet the railroad's real estate holdings in midtown New York continued to be immensely valuable. The railroad's painful decline had reversed Pope's dictum; the Penn Central's air rights development, no mere “incidentals,” composed the company's major assets, but its efforts to sell transportation had led to bankruptcy.

### *A Civic Center in Midtown*

Recognizing the potential financial gains, the railroad set out to construct a “terminal city” utilizing all of the company's air rights from 42nd Street to 56th Street. When completed, the result was a vast real estate empire. Wilgus, writing in 1940, summarized the development of the

Image not available.

Central's real estate in Midtown and called the cluster of buildings a "Superimposed Civic Center": "It will be recalled with the coming of electricity as motive power, and the opportunity thereby presented for the enjoyment of air rights which until then necessarily had lain fallow, it was proposed that buildings should be erected over the terminal that would produce revenue. In fact, steel columns beneath had been designed sufficiently strong for that purpose. Gradually, in time, primarily under the guidance of Mr. Newman, this has been brought about to a degree that has far exceeded the fond expectations of the writer." Over the underground tracks rose world-class hotels—the Biltmore, the Commodore, the Roosevelt—and office buildings—the Graybar and the New York Central building. In addition the air rights included special-purpose buildings—Grand Central Palace, the Yale Club, and the U.S. Post Office—and stately rows of apartment buildings of the highest class along Park and Lexington avenues as far north as 50th Street and along Madison Avenue and Vanderbilt Avenue as far north as 48th Street and 49th Street, respectively. Wilgus concluded, "The Grand Central Zone has become a self-contained city clearly evident to the casual onlooker who little

*Painting of Terminal City which appeared on the cover of New York Central's brochure celebrating the opening of Grand Central in February 1913*

knows that beneath it are the terminal yards of two great railroad systems.”<sup>7</sup> Wilgus’s description applies to many of the hundreds of thousands who work and stroll through the Grand Central zone today.

Plans for Terminal City moved beyond the size and scope of any other building project ever undertaken in New York or in any American city. In the first place, a single entity, the New York Central Railroad, directed the entire effort. In a thirty-block area of Manhattan, a single company built a complex of buildings all linked to a central core, Grand Central. Tunnels and underground passages allowed people to move from the terminal to hotels and office buildings without venturing onto the city streets. Most importantly, the overall control exercised by the railroad ensured a harmonious blend of architectural style and elevation. Just as Haussmann had imposed a uniformity of design and elevation along the boulevards of Paris, the Central planned a harmony of design for its Terminal City, earning the applause of urban planners in the City Beautiful movement, such as Robert Pope.<sup>8</sup>

Bemoaning the lack of consistency amidst the building frenzy in America’s cities, city planners and advocates of the City Beautiful pointed out that no zoning regulations or building codes shaped the type of structures that could be constructed right next to each other. No powerful monarchy as in Europe controlled the architecture of cities by decree or used the resources of the state to construct harmonious buildings infused with a sense of monumental glory. In the United States, by contrast, a strong tradition of privacy of property meant that one owner could build totally at odds with his neighbors. However, because the New York Central owned so much property around Grand Central, the company could impose harmony of design and detail. As the *New York Times* wrote when Grand Central opened in 1913: “They undertook to fashion anew that entire section of the city where the old station stood, to build or cause to be built thirty blocks of buildings in Manhattan, all guided by one hand that would supervise their purposes and direct the general harmony of architecture. The result is a real estate development of monumental proportions.”<sup>9</sup> With the exception of Rockefeller Center and the urban renewal projects after the Second World War, no other development in New York’s history covered such an extensive area of the city with a harmonious blend of buildings.

City Beautiful advocates urged property owners when building to be guided by the comprehensive plans fashioned by the new planning professionals. In almost all cases, the plans fell by the wayside as each property owner built as he pleased. With Terminal City around Grand Central, the New York Central ensured harmony. Writing even before the railroad completed the first phase of the project, historian Edward Hungerford grasped the significance of the plans for Terminal City and recognized that they exemplified the push for civic planning at the turn of the century: “in midtown has begun to rise the most important single development that New York has ever known. . . . And the city of New York gets at a fell swoop a civic center such as is the aim and hope of every progressive American town of today.”<sup>10</sup>

A second reason for Terminal City's success lay in the size of the railroad company's financial resources. Through its investment bankers, J. P. Morgan and Company, New York Central tapped the financial market for the capital necessary to build the new Grand Central and the electrified underground train yard, as well as to develop the air rights over all of its midtown property.

### *New York State Terminal Realty Company*

The New York Central decided to form a real estate company to oversee the development of Terminal City. At a meeting of the executive committee of the board of directors held on December 15, 1903, the directors voted to establish the New York State Terminal Realty Company, whose purpose would be “to construct, acquire, own and manage buildings and structures of all kinds of property including depots, offices, stores, hotels and apartments.” The board voted to issue a thousand shares of stock at \$100 par. William K. Vanderbilt subscribed to 950, William Rockefeller 10, J. P. Morgan 10, and the remaining shares were purchased by other directors.<sup>11</sup> The stock distribution ensured that the new company would remain under the control of the railroad.

The new company separated the Central's real estate development around Grand Central from its railroad operations. Later the Central added a partner to its efforts at 42nd Street—the New York, New Haven and Hartford Railroad. The tripartite lease with the New Haven and the

Harlem required the Central to share its terminal facilities and to include the New Haven in any real estate projects undertaken in Midtown. Each railroad contributed capital to the realty company, which in turn managed the real estate development projects. Terminal Realty paid the parent companies interest on their investment and eventually returned the initial capital they had advanced. Having a separate real estate company simplified bookkeeping for both the Central and the New Haven.

Terminal Realty proceeded to develop the Central's real estate around the station, either by constructing buildings which it then rented out or by leasing air rights to private developers. For example, it constructed a new U.S. Post Office building, on the corner of Lexington Avenue and 43rd Street, at a cost of \$931,000 and rented it to the U.S. Post Office for \$18,620 a year. For the Biltmore Hotel, the real estate company entered into a lease with the United Hotels Corporation, which erected the thirteen-story hotel boasting one thousand rooms. United Hotels would contribute \$3,000,000 toward the projected total cost of \$6,200,000; Terminal Realty provided the balance. United Hotels' lease ran for twenty-one years at a minimum rent of \$280,000 a year to Terminal Realty.<sup>12</sup> The Biltmore represented an excellent investment: lease payments from United Hotels represented a return of over 7 percent on the capital the railroads planned to commit toward the construction of the Biltmore.

In the spring of 1912, the board of directors of the New York Central established a "sinking fund" to account for both the capital advanced to Terminal Realty and the payments received in return. Payments went directly to an account at Guaranty Trust of New York where the money was invested in railroad bonds. Guaranty Trust kept a separate account for each real estate project and, when the account totaled the amount of capital the Central and New Haven had originally contributed, transferred the funds to the two railroads—a very conservative form of financial management. Neither railroad recorded the income on their books until the capital initially advanced for each building had been fully returned with interest.

### *The Building of Terminal City*

Terminal City proceeded in three phases; the first involved the construction of the buildings directly around the new Grand Central. As the

new terminal neared completion, construction commenced on the hotels and office buildings immediately adjacent: the Biltmore and Commodore hotels, the Post Office building, and the Adams Express building on Lexington Avenue. The second phase, beginning several years after Grand Central opened, involved apartments and office buildings on Park Avenue north of the new terminal buildings. Development along Park Avenue, directly over the new underground train yard, continued through the 1920s and into the 1930s. The Waldorf-Astoria Hotel at Park and 49th Street was completed in 1931. During the Depression years of the 1930s, only one additional building rose, 330 Park Avenue, in 1938. A final phase commenced after World War II.

William Wilgus, preparing his history of the Grand Central project, compiled a list of twelve buildings completed in Phase I and estimated their replacement cost as of 1939–1940 (see Table 4.1).

*Preparation for the first air rights development along Park Avenue, looking south from 50th Street with Biltmore Hotel construction to the right of Grand Central, 1913*

Image not available.

## *New York's Grand Central*

Beginning in 1908, just after the completion of the electric zone, and continuing till 1918, these twelve new buildings rose skyward. By 1918, Terminal City already included almost twenty million dollars' worth of new construction and was far from complete. Since Terminal Realty Company's lease payments averaged a 6 percent return on capital, the first phase generated at least a million dollars of revenue a year. In addition, the New York Central received revenue from the heat and electricity it sold to the lessors and tenants of the buildings from its new power plant located on Park Avenue at 49th Street.

With the completion of the first of the air rights buildings around 42nd Street, the immediate area around Grand Central quickly emerged as a fashionable hotel and business district. Soon, the old train yard disappeared, replaced by a collection of the most harmonious and stylish buildings in the city. Even the usually staid *Engineering News-Record* lavishly praised the first phase of the development of the Central's air rights: "The term 'Grand Central' no longer designates a mere railroad station, but a large and impressive civic center. The story of its development in the last twenty years is a romance. . . . The terminal area itself, because of its

*Air rights development  
under way on Park  
Avenue, looking south  
from 49th Street, 1918*

Image not available.

TABLE 4.1  
Terminal City - Phase 1

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Image not available.

attractiveness, has become the heart of still greater development, radiating from it in every direction. In fact the whole surrounding neighborhood now goes by the name of the Grand Central District, and is one of the chief business centers of the metropolis.”<sup>13</sup>

The description of Terminal City as “radiating” outward proved appropriate. At the center stood Grand Central, the hub of the entire development. With its superb transportation facilities, Grand Central provided smooth entry and exit to the new midtown district arising around 42nd Street. No other business or residential area in New York boasted such a superb transportation network at its core, a prime goal of the City Beautiful.

Commenting on the first phase of the air rights building, the *Engineering News-Record* added a note of praise for the management of the Central: “As a civic as well as a railroad-terminal development, it is unique and stands as a monument to the foresight and ability of the New York Central’s officers.”<sup>14</sup> After being vilified in the press for years for its failure to build new facilities at 42nd Street, the Central now garnered praise from many quarters with the completion of Grand Central and the first phase of Terminal City. Not only did New York have a magnificent new rail terminal, but the air rights property around Grand Central became decidedly upscale with high-rent office buildings, fashionable hotels, and the Yale Club, where the city’s elite could meet in sedate comfort to plan the future.

The second phase of the air rights development carried through the

TABLE 4.2  
*Terminal City - Phase 2*

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Image not available.

decade of the 1920s with construction shifting to Park Avenue north of Grand Central, soon to be regarded as the most beautiful and fashionable avenue in America (see Table 4.2).

Development of the air rights along Park Avenue north of the new terminal provided a number of engineering challenges. Support columns for the new buildings reached down to the bedrock at the lower level of the two-story underground train yard, in some places seventy feet below the surface. The engineers, concerned that the heavy trains passing below would vibrate and transfer the vibrations to the buildings above, isolated the support columns. Wherever a support column passed through the underground structure, the engineers left a clearance space around the column to prevent train vibrations from affecting the buildings above—a costly but absolutely necessary step.

Another challenge involved providing for the necessary utilities. In conventional construction, the heating and water systems occupied the basement, which the air rights buildings lacked; trains, platforms, and tracks filled the area directly below ground. As part of the overall project, the railroad constructed a coal-fired power plant on Park Avenue between 49th and 50th streets, the future home of the Waldorf-Astoria, to provide steam and hot water to the new Grand Central and all of the air rights buildings at the same time, solving the missing-basement problem.

Image not available.

The railroad sold steam and hot water to the buildings composing Terminal City, earning a steady profit while offsetting the cost of the power plant. At one time, the power plant provided for twenty-eight air rights buildings running from 42nd to 50th streets between Lexington and Madison avenues.

As construction of additional air rights buildings continued, the power plant at 49th Street reached capacity, and in 1918 the railroad built a second power plant one hundred feet underground at 43rd Street and Lexington between the Commodore Hotel and the Graybar office building. Ingeniously, the designers concealed the smokestack of the second power plant in the northwest corner of the Commodore Hotel, constructed at the same time. In 1929, the railroad contracted with Consolidated Edison to provide power to Grand Central and dismantled the power plants, the facility at 49th making way for the Waldorf-Astoria Hotel.

Together, the total investment in the first two phases of the air rights

*Power plant at Park Avenue and 49th Street, future site of the Waldorf-Astoria Hotel, 1914*

*New York's Grand Central*

*Waldorf-Astoria  
Hotel, at Park Avenue  
and 49th Street, con-  
structed in 1931*

Image not available.

development around Grand Central reached nearly eighty-five million dollars. Never before in the history of New York had a single development led to the investment of such enormous sums in such a brief period of time, representing a massive commitment to the future of the midtown business and residential district.

As early as 1906, before the air rights development got under way, the *New York Times* pointed out that the two new terminals being built in New York, Grand Central and Pennsylvania Station, increased property values in their proximity as opposed to depressing property values, as

TABLE 4.3  
*Assessed Value, in Millions of Dollars*

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Image not available.

open train yards and steam operations had done: “Proximity to a railroad station in many cases has been a rather doubtful recommendation for a property, but at the back, front, and both sides of New York’s great transportation center there is apparently no question as to the increased value and utility of every square foot of ground.”<sup>15</sup> Wilgus, methodical as ever, developed a detailed analysis of the impact of Grand Central on property values. Wilgus’s research focused on the increase in assessed value of property in the Grand Central Zone, defined as the area from 42nd to 96th streets between Lexington and Madison avenues. For comparative purposes he included data for the City of New York, the entire Borough of Manhattan, and Section 5—designated by the City of New York’s Tax Assessment office as most of upper Manhattan on the east side (see Table 4.3).

Wilgus argued that if Grand Central had not been built and the open train yard had remained between 42nd and 56th streets, the value of the property in the Grand Central zone would have increased at a rate no greater than that for the Borough of Manhattan in general, which between 1904 and 1930 was 175 percent. In fact, with the construction of Grand Central and Terminal City, the value of property in the Grand Central Zone increased by 374 percent, from \$268,000,000 in 1904 to \$1.2 billion in 1930. If the property had only increased at the same rate as

Image not available.

*Aerial view, ca. 1920,  
illustrating Grand  
Central's role as a cat-  
alyst for development*

all property in Manhattan, its value in 1930 would have been \$735,000,000 or \$533 million less. Wilgus calculated the impact on the city's tax revenue to be over \$14 million a year.

This rapid growth in the value of real estate brought great benefits to the City of New York and to the Central Railroad. As the midtown business district grew, the value of New York Central's own real estate increased; however, the railroad was less concerned with its assessed value than with the value the property commanded on the rental market.

### *Catalyst to Development*

The Commodore's Grand Central Depot, built at ground level, blocked the north-south flow of the city's traffic on the east side at 42nd Street, interrupting the pattern of development in midtown Manhattan

that the city's grid pattern encouraged. The open train yard, stretching north to 56th Street, effectively blocked the development of high-class commercial and residential property to the north and east of the terminal. This separation continued up the east side, because steam, smoke, soot, and noise bellowed up from the tracks, which ran under Park Avenue in the roofed tunnel all the way to 96th Street.

To the west of Park Avenue, especially along Fifth Avenue, the area evolved as the most fashionable residential and commercial district in New York. By contrast, to the east of Park Avenue, the Upper East Side remained a tenement district, home to vast numbers of the city's poor. Factories, breweries, and slaughterhouses intermingled with four- and five-story cold-water tenements.

New York's first subway line started from the Battery, at the southern tip of the island, and traveled north on the east side of Manhattan, where the city's population and commerce were concentrated. The IRT continued north under Park Avenue until it reached the impenetrable barrier

*The open train yard that ran from 42nd to 56th streets, spreading soot and noise, 1899*

Image not available.

## *New York's Grand Central*

of Grand Central: As part of the planning for Grand Central, the railroad had obtained the underground rights to its property at 42nd Street. This blocked development under Park Avenue north of 42nd Street for ten city blocks and left the subway builders no choice but to turn the subway west toward Times Square before resuming its journey to the northern tip of Manhattan.

In addition to increasing property values, Grand Central strongly influenced a number of crucial changes in the social geography of midtown Manhattan. With the placement under ground of the train yard that had inhibited the growth of midtown Manhattan along the axis of Park Avenue, Wilgus's "Chinese wall" separating the upper east side of Manhattan into two separate and distinct districts moved east. Grand Central became a catalyst rather than a hindrance for urban development. Private developers constructed hundreds of buildings to accompany the railroad's air rights development. Terminal City spread to encompass an even wider area around the new rail facility, many blocks in all directions.

The Chrysler Building provides a clear example of Grand Central's stimulus. Designed by William Van Alen, a graduate of the Ecole des Beaux-Arts and built on the east side of Lexington Avenue at 42nd Street directly across from Grand Central, the Chrysler Building stood as the tallest building in the world until the completion of the Empire State Building in 1931. The Chrysler Building dramatically increased the commercial space available at 42nd Street and added thousands of jobs, and commuters, to the Grand Central district. The increased flow of people

*The open train yard in a 1906 photograph contrasted with a drawing predicting vast improvement after the yard's electrification*

Image not available.

to the Chrysler Building and the other commercial buildings in the area could easily be accommodated by the superb transportation facilities provided by Grand Central.

Other new buildings followed the lead of the Chrysler Building as the axis of development on Manhattan shifted to the east. Third Avenue now marked the line separating the wealthy and poor on New York's east side above Midtown. Until the removal of the Third Avenue El in the early 1950s, the area from Third Avenue to the East River remained a tenement and mixed industrial area, while the area from Lexington to Fifth Avenue increased in prestige, especially Park Avenue to the north of the new terminal.

### *Gateway to New York*

By the turn of the century, most New Yorkers regarded the Commodore's old Grand Central Depot as a totally inadequate entry port to the greatest city in the country. A traveler arrived at the old terminal after enduring the Park Avenue tunnel, choked with steam and smoke, which spoiled the keen anticipation of New York. Today, landing from abroad at Kennedy Airport's International Arrival Building provides a parallel experience; the traveler plunges into a series of narrow, crowded corridors, with low ceilings and all the architectural charm of a laundromat.

By contrast, the new Grand Central completely transformed the experience of entering New York. A traveler who arrived at the Incoming Station and the Grand Concourse entered a secular cathedral; passengers knew, without any doubt, that they had arrived in a special place. The Grand Concourse enclosed the largest interior space in the country and served as the focal point of the railroad's magnificent contribution to the newly vitalized midtown business district. The daily commuters from the city's northern suburbs enjoyed their own concourse on the suburban level. While not as monumental as the space directly above, the suburban concourse provided a vast improvement over the facilities it replaced.

With Grand Central's connections to the growing city subway system, the elevated railroads, and the street railways, it emerged as the most important transportation hub in the city, serving as an easy link to the city's circulatory system. As a direct result, the midtown business district

## *New York's Grand Central*

around the terminal prospered. Robert Pope, writing in 1911, predicted the role Grand Central would come to play in the city's transportation system: "This Grand Central point will be perhaps the greatest traffic center in the world."<sup>16</sup> The ground-level and underground transit system of which Grand Central was the hub continued vertically, as people rode elevators directly from the station to a number of high-rise buildings, including the Biltmore and Commodore hotels and the Graybar Building. Until the building of Rockefeller Center in the 1930s, no other place in New York, or in any other city in America, included a transportation center with both horizontal and vertical dimensions. Construction of the Pan American building in 1963 added another type of vertical transportation to Grand Central: escalators carried people directly from the Grand Concourse one flight up to the building's elevators.

That this unique combination of the horizontal with the vertical occurred first in New York, where the skyscraper flourished, is logical. Manhattan's geography, offering limited space, forced real estate developers and builders to consider taller and taller buildings. During the Age of Energy, the application of the steel frame construction techniques freed the architect and builder from the height limitations imposed by masonry construction, in which thick walls on the lower floors supported the weight of the floors above. With the steel frame to carry the weight of the structure and the use of electric elevators to reach the upper floors quickly, skyscrapers replaced a city of four- and five-story masonry buildings. Daniel Burnham's Flatiron Building (1902) on Madison Square and Henry Flagg's Singer Building (1908) in lower Manhattan served as the forerunners of the skyscrapers soon to dominate the Manhattan skyline and give New York its singular visual image. Grand Central, linking the skyscraper directly to the city's underground and surface transportation system, allowed people to travel both horizontally and vertically between home and office, a uniquely American innovation.

## *Park Avenue*

Grand Central's greatest localized impact came on Park Avenue north of 45th Street. When Grand Central Depot and the open train yard were in place, Park Avenue from 42nd to 49th streets simply did not exist.

North of the train yard, Park Avenue ran on both sides of the four-track open cut and tunnel that carried the Central's tracks north toward the tip of Manhattan Island. Park Avenue, formerly known by its more utilitarian designation, Fourth Avenue, remained decidedly unfashionable. Four- and five-story walk-up apartments, loft buildings, and factories lined the street: at 50th Street the Schaefer Brewery occupied the entire block between 50th and 51st streets; the Steinway Piano factory stood on the corner of 52nd Street. From 45th to 49th, the open train yard stretched between Depew Place and Madison Avenue, and only pedestrian footbridges at 45th, 46th, and 47th streets allowed people to cross.

A first step in removing the barrier separating the upper east side of Manhattan into two sections involved restoring the north-south flow of Park Avenue. The first plans envisioned by Wilgus and by Reed and Stem carried Park Avenue around the new Grand Central on an elevated roadway and then north over the underground train yard. Reed and Stem added a bridge to carry Park Avenue over 42nd Street to link Park Avenue north and south of the terminal. Wilgus noted that after Whitney Warren entered the design process, the Central abandoned the elevated roadway. As the architectural battles continued, the fate of the elevated roadway and bridge over 42nd Street remained in doubt. At the insistence of the New Haven Railroad and a number of key Central officers, final plans included the elevated roadway carrying Park Avenue around the new station. Wilgus noted with satisfaction, "Subsequent to the writer's severance of connection with the improvements, the elevated driveways and 42nd Street bridge crossings, which had been omitted contrary to his recommendations, were restored."<sup>17</sup> Wilgus viewed the Park Avenue elevated roadway around the terminal as one of the key features of the entire Grand Central project. The *New York Times* echoed Wilgus's view of the importance of the elevated roadway to the city: "A handsome bridge crossing Forty-second Street will give the city another main artery of travel from the top of the Bowery to the Harlem River. . . . Where Fourth Avenue changes its name to Park northward to the end of the tunnel [96th Street] the street will be one of the finest in the borough. Real estate values will be greatly increased, and the city will benefit by the increased tax yield."<sup>18</sup>

Park Avenue north of Grand Central, already the widest north-south

Image not available.

*New York's "Grand Boulevard," Park Avenue, in the 1920s, looking north from 50th Street with St. Bartholomew's Episcopal Church at right*

avenue in Manhattan, became the city's showcase. Its increased width exceeded 140 feet. By comparison, Madison Avenue averaged 55 feet in width and Lexington Avenue only 42 feet in the Grand Central area. Over the new underground train yard, Park Avenue included a landscaped median, enhancing the sense of width and space and stretching north for forty City Beautiful blocks. When the plans were announced, an article in the *Times* caught the drama these changes would introduce into the otherwise crowded confines of Manhattan: "It is proposed to continue Park Avenue at about its present width to the north end of the new terminal, beautifying it with small parks in the center to divide the two roadways."<sup>19</sup> To this day, Park remains the only major avenue in the city without public bus service and the Park Avenue Association carefully tends the gardens on the median dividing the two roadways. With its dramatic width, Park Avenue provides one of the grand vistas in the city.

Standing at 69th Street and looking south offers one of New York's most inspiring views; the skyward sweep of buildings does not dwarf the wide expanse of the avenue. Dramatically, the vista ends at Whitney Warren's New York Central Building, now the Helmsley Building, with two wings curving out as if to touch the buildings on either side of the avenue.

The New York Central carefully reviewed design of the buildings constructed along both sides of Park Avenue north of the terminal during Phase 2. Many of the buildings constructed by private developers leasing air rights from the New York State Terminal Realty Company were designed by Whitney Warren to harmonize with the terminal building. Warren's designs ensured that all the buildings shared the same Beaux-Art architectural style; their uniformity of design and scale proved unique in New York, where buildings often had little or no architectural or aesthetic relationship to their neighbors. Until Rockefeller Center went up,

*Park Avenue immediately north of Grand Central and the New York Central Building in 1936, showing uniformity of design in the original air rights buildings*

Image not available.

these buildings along Park Avenue formed the most harmonious group of structures in the entire city.

Once the electrification of the Park Avenue tunnel eliminated escaping smoke and steam, new buildings rose all the way to 96th Street. Elegant apartment buildings replaced block after block of four-story apartments, low-rise commercial buildings, and factories. This fine architecture has endured. In fact, the stretch of Park Avenue from 69th to 96th Street closely resembles what it looked like in the 1910s and 1920s.

The new hotels became the most fashionable in the city; the Park Lane, Marguery, and the Waldorf-Astoria acquired connotations of glamour, power, and wealth. The famous and the infamous stayed at the Waldorf, including diplomats, heads of state, and European royalty. When President Franklin Roosevelt stayed at the Waldorf, his train would stop on the upper level of the underground train yard directly under the hotel. This enabled the president's aides to carry the paralyzed Roosevelt through a special door and then by elevator directly to his room, avoiding the public altogether. Park Avenue became the street where the most successful, talented, and hard-driving citizens of New York came to reside.

### *The International Style*

After World War I and with the onset of the Great Depression, the Beaux-Arts movement lost momentum. World War I killed the flower of an entire generation of men on the bloody fields of Flanders and Verdun and destroyed Europe's primacy as a source of inspiration for American architects and planners. Critics of the use of Beaux-Arts design in the United States became more vocal in their condemnation of an architectural style that they judged to be too imitative of the bankrupt aristocratic style of Europe and too fixated on the classical past.

In the 1930s a new architectural style emerged and swept the Beaux-Arts aside. This new form came to be called the International Style, and after World War II, it completely dominated the architecture of New York. With origins at the Bauhaus School in Weimar, Germany, founded by Walter Gropius in 1919, the International Style attempted to break completely with the past, to fashion a new aesthetic that was simple and "pure," lacked any references to classical antiquity, and was completely

devoid of ornamentation. The International Style diametrically opposed the architecture inspired by the Ecole des Beaux-Arts.

In 1932, the newly formed Museum of Modern Art in New York mounted a show of architectural drawings and models to introduce Bauhaus design and its leading light, Walter Gropius, to America. The show's catalogue, written by Henry-Russell Hitchcock and the young director of the museum's architectural division, Philip Johnson, provided a ringing manifesto for the new style and dismissed the architecture of the nineteenth century and early twentieth century: "The nineteenth century failed to create a style of architecture because it was unable to achieve a general discipline of structure and design in terms of the day. The revived 'styles' were but a decorative garment to architecture, not the interior principles according to which it lived and grew. . . . Today the strict issue of reviving the styles of the distant past is no longer one of serious consequences."<sup>20</sup> No longer would the aspiring American architect journey to Paris to study monuments from Classical Greece and Rome or France's *ancien régime*; these new principles had no foundation in the classical past. With the evolution of the steel frame structure in the United States, architects could break from strict adherence to the Beaux-Arts principles of plan, section, and elevation.

According to Hitchcock and Johnson, the fundamental principles of the modern style included architecture as volume, the proper surfacing material, regularity, and the avoidance of allied decoration. The first principle, a focus on volume, reflected the freedom the evolution of the steel frame allowed. As the catalogue authors noted, "the effect of mass, of static solidity, hitherto the prime quality of architecture, has all but disappeared; in its place there is an effect of volume, or more accurately, of plane surfaces bounding a volume. The prime architectural symbol is no longer the dense brick but the open box. Indeed, the great majority of buildings are in reality, as well in effect, mere planes surrounding a volume. With skeleton construction enveloped only by a protective screen, the architect can hardly avoid achieving this effect of surface of volume."<sup>21</sup> A glass-walled building without any surface ornamentation perfectly reflected the new principles. Beaux-Arts buildings such as Grand Central, Pennsylvania Station, and the New York Public Library represented the antithesis of the type of buildings the International Style demanded.

The Museum of Modern Art's exhibition of the International Style exerted enormous influence, and the movement gained further momentum when Walter Gropius, Mies van der Rohe, and other luminaries from the Bauhaus came to reside in the United States in the late 1930s as refugees fleeing Nazi Germany. Gropius became head of the Architecture Department at Harvard University. Van der Rohe went to the Armour Institute in Illinois, where he designed an entirely new campus in Chicago which became the Illinois Institute of Technology. Philip Johnson left the Museum of Modern Art to study architecture under Gropius at Harvard.

The triumph of the International Style had to await the end of the Great Depression and World War II. The Beaux-Arts style did not simply disappear from the architectural horizon. The New York Beaux-Arts Society, founded in 1916, continued to sponsor the Beaux-Arts Institute of Design in New York, modeled after the Ecole des Beaux-Arts and offering classical training to aspiring architects. Each year the institute held the Paris Prize Competition for architectural students with a first prize of admission to the first class at the Ecole des Beaux-Arts without examination and with sufficient funds for two years of study in Paris. Every year, the society held a yearly Beaux-Arts ball to raise money for the institute. In 1925, Whitney Warren, acting director of the institute, and his wife served as official patrons of that year's ball. Beaux-Arts balls continued into the 1930s, and in 1935 the society's gala, held in the newly completed Waldorf-Astoria, chose as its theme "George III Regrets." In recognition of the hard times the Depression was causing for architects in New York, some of the money raised at the ball went to a fund for destitute architects.<sup>22</sup>

Once the Second World War ended and American society began to prosper, the real estate market in New York, ravaged by the Depression and dormant during the war, revived and the demand for office space increased dramatically, nowhere more strongly than in Midtown. The original air rights buildings along Park Avenue, from 45th to 52nd, stood only eight or nine stories. Postwar zoning laws allowed for the construction of taller buildings with more interior volume, and the Central quickly realized that the construction of new, taller buildings would generate significant additional revenue. Raw business logic proved in-

escapable: the “old” must be replaced with the new. If the railroad’s real estate could add increased income, then any aesthetic considerations would be ignored. In the space of two decades, the 1950s and 1960s, new construction replaced almost all of the Beaux-Arts buildings constructed as part of the first two phases of Terminal City. All of the office towers built over New York Central’s air rights reflected the International Style. Modern glass-curtain skyscrapers replaced the classical Beaux-Arts buildings whose facades displayed a harmony of design and uniform height. An air of inevitability accompanied the change, which encountered only modest public opposition, from architectural traditionalists and preservationists and from those alarmed by the heedless pace of the change.

North of the Central’s air rights, the triumph of International Style over the Beaux-Arts continued, as developers constructed more glass-curtain buildings farther up Park Avenue. In 1952, the firm of Skidmore, Owings, and Merrill designed one of the most famous of the new glass towers, Lever House, at Park and 53rd Street, as headquarters for the Lever Brothers soap company. Lever House, celebrated as one of the best examples of the new style, was completely devoid of external ornamentation; the exterior walls consisted of glass plates that revealed the stark simplicity of the interior structure. All exterior planes were unbroken, as the modern style demanded.

Six years after Lever House’s completion came the most famous of the International Style buildings: the Seagram Building, the epitome of the modern. Designed by Mies van der Rohe with Philip Johnson as his assistant, the building stands back from the streetscape, its bronze-clad frame visible for all to see. In stark contrast, straight across the street from the Seagram Building, McKim, Mead and White’s New York Racquet Club retains its Beaux-Arts facade. Perhaps nowhere else in New York can the public appraise the old and the new styles so directly. Separated by Park Avenue, the ornamentation and lushness of the Racquet Club’s stone facade can be seen reflected in the sleek glass of the Seagram Building across the way. The Racquet Club itself barely survived the relentless development pressure. With the exception of the New York Central Building and the Waldorf-Astoria, the new modernist style heavily influenced the design of all the corporate skyscrapers built during Terminal City’s last phase (see Table 4.4).

TABLE 4.4  
*Terminal City - Phase 3*

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Image not available.

In the course of the third phase of the air rights development around Grand Central, the character of Park Avenue just north of 45th Street changed from residential to commercial. A number of commercial buildings had been constructed as part of Terminal City, but on Park Avenue from 45th to 51st streets, the original air rights buildings consisted largely of hotels and apartments.

In the 1980s, development pressure even threatened St. Bartholomew's Church, on Park and 50th Street, just north of the Waldorf-Astoria. Developers proposed dramatic changes for the church's property. Realizing that a storm of criticism would greet any effort to demolish the church building itself, the builders planned for a high-rise office building on the site of the church's community house, just off Park Avenue on 50th Street. A bruising battle ensued, dividing the St. Bartholomew's congregation and triggering the firestorm the developers had hoped to avoid. In the end, the New York City Landmarks Commission refused to approve any alteration to either of St. Bartholomew's buildings, and plans for the high-rise have been dropped—for the time being.

Pressure to utilize the property along Park Avenue to its maximum continues, and every angle is being worked to accomplish this. Just across the street from St. Bartholomew's Church stands 320 Park Avenue, a high-rise office building constructed in 1961, just before passage of Midtown zoning laws that would have prohibited construction of a building of its volume. Mutual of America Life Insurance Company bought the building from the ailing Olympic and York real estate conglomerate in 1992 for \$130 million. Mutual plans to renovate rather than rebuild,

thereby circumventing the limitations in the zoning law. The existing building has 620,000 square feet of space, but under current zoning a new building on the same lot could have only 441,000 square feet. Mutual of America gains 179,000 square feet more rental space than it would have if it were to tear down the older building and construct a new office tower. Richard Hayden, the architect for the building, characterizes the project as “zoning calculations with the skin strapped on.” The project rests not on esthetic considerations but on exploiting the zoning law. New York City officials seemed pleased with Mutual’s plans; the company’s alternative, to relocate to Long Island, would result in major job losses.<sup>23</sup>

Grand Central, since its conception, has served as a catalyst, transforming a key area of Midtown into the planned, integrated, harmonious urban development envisioned by the City Beautiful at the turn of the century. Unfortunately for New York and other American cities, few other projects have been as comprehensive and imaginative as Grand Central. Too often New York’s relentless growth has consisted of a hodgepodge of isolated developments, one next to the other, with no overall coordination or architectural integration. They lack an essential ingredient, the driving force of a single corporate entity as powerful as the New York Central Railroad.

### *The Commuter Railroad*

With its new electric service to the Bronx and beyond into Westchester and Fairfield counties, Grand Central also stimulated growth of the city’s outlying boroughs and the suburban communities to the north, as did New York’s growing subway system. The process of suburbanization has continued unabated throughout the twentieth century, forever altering the character of New York City and the entire metropolitan region. Steadily, persistently, population has spread outward from the city’s original urban core on Manhattan Island. At the end of the twentieth century, New York stands in the center of a vast metropolitan complex stretching from Suffolk County on Long Island north through Fairfield County, Connecticut, and west across northern New Jersey to the Pennsylvania border. It is home to some twenty million residents. While William Wilgus predicted that the Grand Central project and the electrification of

the railroad's service to the Bronx and Westchester County would increase the company's suburban commuter business, he could not have foreseen the consequences that unbridled suburbanization would have for New York and the region beyond the city.

In 1831, when the New York and Harlem Railroad incorporated and received the all-important franchise to operate down the east side of Manhattan, the railroad planned to link the southern tip of the island, where the bulk of the city's population resided, with the "village" of Harlem, 6.5 miles to the north. The railroad finally extended to Harlem in 1837; in 1849 the railroad effected a connection with the New Haven Railroad at Woodlawn junction in the Bronx; and then it continued construction north into Westchester County and beyond, reaching Chatham, New York, 131 miles from New York City in 1852. Almost all of the Harlem's early traffic moved between Manhattan, the Bronx, and the embryonic suburbs north in Westchester County. Long-distance passenger traffic proved negligible; the railroad's core business remained its commuter service to Manhattan, the Bronx, and Westchester.

At first, the construction of the Harlem Railroad stimulated the growth of Manhattan Island and the Bronx, and to a lesser extent the eastern part of Westchester County. Rather than providing a link between New York and other major cities, as the longer trunk railroads did, the Harlem, from its first days, functioned as a commuter railroad within the city and its immediate suburbs, allowing the population of Manhattan to continue to spread up the island, into the Bronx, and then on into Westchester. Soon Harlem lost its identity as a separate community and became just another neighborhood in New York, although certainly a famous one.

In fact, the Harlem Railroad, soon joined by the Hudson River and New Haven commuter railroads, served a far narrower portion of the population than did the omnibuses, elevated railways, streetcars, or New York's first subway lines. Commuter rail lines provided a relatively expensive form of transportation. A ride from City Hall to Harlem in 1839 cost twenty-five cents at a time when many people survived on a dollar a day or less. When the IRT subway opened in 1904, a passenger could ride from lower Manhattan to the Bronx for a one-cent fare. Commuter railroads like the Harlem served the more affluent citizens; the opening of

the Harlem gave birth to the suburban commuter, the middle-class executive whose workplace remained in Manhattan but who could now live in a more bucolic setting removed from the bustle and congestion in the city's core. As New York's commuter lines extended farther into Westchester, Fairfield, and Nassau counties, the affluent commuter had more choices of a place to reside in suburban comfort. In 1903, when the plans for Grand Central became public, the *New York Times* foresaw the impact the improved commuter service would have on the residential patterns of the area: "The country lying between the Sound and the Hudson in Westchester County will be brought into such a close touch with the business part of the city that it will attract a tremendous influx of people who now live in the heart of the city."<sup>24</sup> In truth, the people moving from the heart of the city formed a very selective segment of the city's diverse population.

Soon the communities in Westchester and in Fairfield served by the new "electric zone" became synonymous with affluence and exclusivity. *Century Magazine* in 1907 identified Grand Central as the best place to view this new species of rail traveler: "At the Grand Central Station, in New York, the 'substantial banker' is likely to show 'Greenwich' on his monthly ticket, whereas the man behind, who is like him, but with less substance, will probably go on to Stamford. Similarly the horsiest and yachtiest commuters are apt to live in Larchmont, while the not quite so pronounced get off in New Rochelle."<sup>25</sup> The "Neapolitans, Russians, and dull Germans" observed by William Dean Howells's character March while riding the Third Avenue El did not follow him to Grand Central to board trains for Greenwich, Larchmont, or Scarsdale.

Commuter railroads contributed to the forces of decentralization, but in a selective manner. With the introduction of fast, efficient electric service on the Harlem and Hudson divisions of the New York Central and the provision of a separate suburban concourse and tracks at the new Grand Central, the affluent and the middle class could move far from the teeming masses in the city. For the "Neapolitans" or "Chinese" whom Howells described riding the El, little choice existed except living in crowded tenements on the Lower East Side or Upper East Side of New York. They could not afford the cost of a daily ride on the Harlem to Scarsdale, nor could they afford the housing there. An article in the real

estate section of the *New York Times* in 1910, after completion of the electric zone, spoke of the “charms of Bronxville” and identified this Westchester County community as the “ideal suburban community,” where “a tract of sixty acres of high wooded land has been purchased by L.D. Garrett, who will develop it as a restricted residential district.”<sup>26</sup> The *Times* did not explain exactly what a “restricted residential district” was, but L.D. Garrett didn’t plan housing for the “huddled masses yearning to breathe free” on his sixty acres in Bronxville.

Most histories of the American railroads have focused primarily on the building of the trunk lines linking the country’s cities and the truly heroic tale of the completion of the transcontinental rail lines. Yet, the intra-urban and early suburban services deserve as much attention. Even major railroads like the New York Central and Pennsylvania, with their sprawling systems stretching from the East to the Midwest, also operated extensive suburban commuter service. In fact, from the very first day they opened, both the new Grand Central and Pennsylvania Station served more commuter passengers than people traveling on the glamorous trains to Boston, Chicago, and St. Louis. The Long Island railroad, in the first year of operation to the new Pennsylvania station at 33rd Street, carried over six million commuter passengers. By 1893, each workday, the New York Central operated more than forty trains each way between New York and Peekskill on the Hudson Division and twenty-five to White Plains on the Harlem Division.

The Central railroad actively promoted the growth of the suburban areas in the vicinity of its stations in the Bronx and Westchester counties. Under the innovative leadership of George H. Daniels, general passenger agent in New York, the railroad began publication of informational pamphlets, the “Four-Track Series,” in 1890 to promote its suburban business. One of the early publications in the Four-Track Series, entitled “Suburban Homes North of the Harlem,” listed each of the stations and communities served by the Harlem and Hudson divisions and provided a brief description of each. The promotional piece included detailed maps of Manhattan, the Bronx, and the area from Westchester County north to Albany along the east side of the Hudson River served by the railroad.

Each entry listed the distance from New York, the number of daily trains each way, the commuting times, regular fares, monthly commuta-

tion, and family trip ticket costs. Listings included prosaic descriptions of the delights of each town. For example, on the Hudson Division:

*Irvington*, named in honor of Washington Irving, whose gifted pen immortalized many of the neighboring localities, among them the far-famed "Sleepy Hollow" and "Wolfert Roost," is 23 miles from New York. Twenty-one trains each way; on Sundays 13 trains from New York, 12 trains to New York; time about 45 minutes. Regular fare 44 cents; monthly commutation 10½ cents per ride; 50 trip family tickets 28½ cents per ride.

*Tarrytown*, delightfully situated on an elevated plateau overlooking the wide expanse of the Tappan Zee and the surrounding country for many miles, is 25 miles from New York. Twenty-seven trains each way; on Sundays 16 trains from New York, 15 to New York; time about 45 minutes. Regular fare 50 cents; monthly commutation 11 cents per ride; 50 trip family tickets 30½ cents per ride.

*Sing Sing*, a handsome little city of 10,000 inhabitants . . .<sup>27</sup>

The entry for Tarrytown included a picture of Washington Irving's home, Sunnyside, at Irvington-on-Hudson.

A later edition in the Four-Track Series, published in 1904 under Daniels's supervision, "Real Rapid Transit: to Ninety Suburban Towns located in the Commutation District," included an opening page bearing the rhetorical question "Where to go, what to see, and where to find a near-by home in the country?" The updated descriptions of the towns and districts served included lot and home prices, along with rental costs, and the pamphlet directed the reader seeking further housing information to real estate agents either in New York or in the local community. The Central railroad formed a series of marketing arrangements with local real estate agencies to promote housing sales and new construction.

On the Harlem Division, the entry for the Melrose section of the Bronx listed lots for sale between \$800 and \$10,000, houses selling for between \$3,000 and \$25,000, and house rentals from \$300 to \$1,000 per year. All houses were described as "equipped with modern improvements. Water, sewer, gas, electric lights, electric cars, asphalt and macadam streets and flag sidewalks." The entry listed two real estate agents: "T.S. Barnes, opposite New York Central Station, Melrose, N.Y., or D.L.

Woodall, Morrisania, N.Y.”<sup>28</sup> Further on into Westchester County, the promotional brochure listed lots in Scarsdale selling for between \$200 and \$500, with houses running from \$2,500 to \$12,000. To the modern eye these prices seem absurdly low, but at the time such costs remained beyond the reach of all but the most affluent. Laborers working on construction of the new Grand Central earned between a dollar and a dollar and a half for a day’s labor—ten long and hard hours. Even skilled craftsmen, carpenters and masons, received less than three dollars a day, a yearly income of far less than a thousand dollars. A home in Scarsdale, in an era before the advent of long-term, low-interest mortgages, remained a distant dream for most of New York’s working population.

Wilgus, in a 1904 report to William K. Vanderbilt, detailed the growth of the railroad’s commuter service to the Bronx and Westchester County: In 1899, the Harlem and Hudson suburban trains had carried a total of 4,146,239 passengers, and by 1903 the total had risen to 6,239,399, an increase of 50 percent in just four years.<sup>29</sup> Despite continued criticism of the railroad’s antiquated facilities at 42nd Street and the more heated condemnation of conditions in the Park Avenue tunnel, in 1906 the railroad carried nearly ten million suburban passengers. Commuter traffic on the Central’s Harlem and Hudson divisions came to exceed through passengers by a substantial margin.<sup>30</sup> Between 1913, when the new Grand Central opened and the electric zone came into full operation, and 1920, commuter passengers increased by another 127 percent—a phenomenal increase in just seven years.

While the city’s society pages breathlessly reported the arrival and departure of important long-distance travelers on the Central’s famous trains like the world-renowned Twentieth Century Limited, a more important development unfolded on the suburban concourse. Grand Central now provided the crucial transportation link that allowed for the rapid growth of the affluent suburbs to the north and northwest. Not only did the Central’s suburban traffic grow exponentially, but the New Haven’s service to Westchester and lower Fairfield County expanded as well. The New Haven carried three million suburban commuters in 1903, and that number increased to over eight million in 1920.<sup>31</sup> Wilgus’s prediction in 1903, that the new electrified service would lead to a substantial increase in the railroad’s suburban commuter traffic proved to be

more than accurate; in fact, growth exceeded even his most optimistic projections. But Wilgus did not foresee all the consequences of the railroad's increased commuter business. Soon, the relentless growth of the suburbs came to threaten New York City's very survival as the core of an ever-expanding metropolitan region.

### *The Rise of New York's Suburbs*

With the coming of the commuter railroad, residential development spread farther from the urban core on Manhattan Island than the omnibus, elevated railway, street railway, or even the subway had allowed. Once the Harlem Railroad reached White Plains, New York, in 1844, it became possible for the affluent commuter to move to any of the small towns along the Harlem's path from Grand Central to White Plains, or later on the Hudson Division to Croton-on-Hudson. A trip from White Plains or Croton to New York took less than an hour and transformed once rural farming communities in Westchester and Fairfield counties into nascent suburban retreats where family life flourished far removed from the industrial and commercial world of the city. By 1900 New York had more suburbs within a twenty-five-mile radius of its center than any other city in the world, and more than 118,000 suburban commuters rode to Grand Central each day.<sup>32</sup>

The opening of Central and New Haven's electric zone to the north of New York exerted a dramatic impact on the population of the Bronx, Westchester, and lower Fairfield County. In the Bronx, population exploded. At the turn of the century the entire borough included only 200,507 residents and it remained a place of small farms and woodlands. In the space of a single decade, the population doubled to over four hundred thousand and then almost doubled again in the next decade, reaching 732,016 in 1920.<sup>33</sup>

Westchester County also grew at a phenomenal pace as soon as the railroads improved their suburban service and made commuting from the county to Manhattan a reasonable daily journey. From a population of less than 185,000 in 1900, the number of residents reached 283,055 in 1910, an increase of more than 50 percent for the decade; the population increased by another 87 percent in the next ten years.<sup>34</sup>

In order to assess the impact of the Grand Central project on Westchester County, Wilgus again analyzed the growth in property values. He proceeded from the premise that without Grand Central and the new all-electric commuter service to the county, property values in Westchester would not have grown as dramatically as they had. Wilgus estimated the proportion of the increase in assessed value of property in Westchester County attributable to the changes at Grand Central at almost one billion dollars for the period from 1906 through 1930.<sup>35</sup>

In this early stage of metropolitan development, the suburbs remained strongly tied to the urban core. New York thrived as the place to which the commuter traveled each day to work; wealthy shoppers traveled to the city to browse in the fashionable stores on Broadway and Fifth Avenue. Without employment in Manhattan and efficient commuter rail service, the affluent suburbs could not have grown so dramatically. The vitality of the entire metropolitan area depended on the commercial and industrial life of New York City.

Across the Hudson River, the growth of the Jersey Central Railroad enabled New York's suburbanization to spread westward to the counties in northern New Jersey. To the east, on Long Island beyond Brooklyn and Queens, lie Nassau County and then Suffolk County, which extends another eighty miles to Montauk Point. With the opening of the new Pennsylvania Station in 1911, the Long Island Railroad, with extensive service to 33rd Street, evolved into the busiest commuter railroad in the country. As the Long Island Railroad extended its electrified lines into Nassau County, suburban growth exploded in the communities strung out along the Long Island's right of way. Port Washington and Manhasset on the North Shore and Valley Stream and Garden City in the center of the county became as fashionable suburban addresses as Scarsdale, New York, and Greenwich, Connecticut.

At Grand Central's opening in 1913, stories in the press pointed out the significant movement of commuters to and from New York City each day: "More than a million commuters come into New York every morning from points within a radius of twenty-five miles, and a considerable part of this human stream pours through Grand Central. It must be handled without interfering with the through business. . . . This present work began with a study of possible improvement in managing this near-

by traffic.”<sup>36</sup> William Wilgus realized the importance of this revolution in transportation: “The electrification of the passenger traffic of two of the most important steam railroads in the world [the New York Central and the Harlem], for the distance of from 25 to 35 miles, radiating from a terminus in the greatest city in the Western hemisphere, may well be termed the marking of the commencement of a new epoch in the history of transportation.”<sup>37</sup>

It would not be long before the suburbs lost their dependence on the city they surrounded. The coming of the automobile and truck and the building of an extensive highway system in New York’s metropolitan region combined to lessen the ties between New York and its suburban ring. Once the link broke, residents of the suburbs could both live and work outside the city; their energy and vitality strengthened the communities where they lived and worked at the direct expense of the city. As the suburbs continued to grow, they accounted for an ever-increasing share of the region’s people, economic activity, and taxable wealth. For New York, the long-term consequences proved to be disastrous.

In the period after World War II, businesses and the middle class followed the affluent to the promised land of the suburbs. Fashionable stores opened branches or relocated to suburban shopping malls in Westchester, Nassau, and Bergen counties, leaving many retail districts in New York in shambles. Millions of square feet of new office space arose on campuslike settings miles distant from the downtown and midtown business districts. Even manufacturing enterprises, once tied to New York’s waterfront and railroads, relocated to the suburbs, where trucks, traveling on the new highway system, delivered raw materials and hauled away finished products.

By 1970, the process of suburbanization seemed complete. In that year the census reported that, across the country, more Americans lived in the suburbs than in the country’s once vital and flourishing core cities. For New York City, the times could not have been worse. The decline became painfully obvious throughout the city, from the graffiti-filled subways, to the city parks filled with drug addicts, to a city treasury lurching toward bankruptcy, to neighborhood after neighborhood once again crowded with the poor and downtrodden, to the abandoned tenements in the Bronx burning through the long nights. Wilgus’s electrifica-

tion scheme had succeeded in dramatically increasing the railroad's commuter business, but at the same time it had contributed to the forces propelling the vitality of the region out of the city and pushing New York towards collapse.

New York City increasingly provided home to the very rich and the very poor, while the affluent middle class stayed in the suburbs. Theodore Dreiser observed at the turn of the twentieth century that "the drama of the city is at its extremes,"<sup>38</sup> and New York became the exemplar of that drama. Fifth Avenue and Park Avenue remain among the premier addresses in America, boasting the most expensive apartments in the city. But beyond the glitter of Fifth Avenue, Park Avenue, Museum Row, and the Upper East Side lies another New York, a New York at the other extreme. The two New Yorks today are the New York of the rich and that of the poor, the New York of an affluent white population and that of a poor African-American and Hispanic one that has absorbed a million immigrants from the developing world. Tom Wolfe, in his acerbic novel *Bonfire of the Vanities*, creates a fictional clash of the two extremes to illustrate the drama that fascinated Dreiser a hundred years earlier: The mayor of New York, attempting to hold a town meeting in Harlem, leaves the stage, forced off by the anger of the people without wealth, without resources, who increasingly make up a major portion of the city's population. As a TV crew films the confrontation, the narrator exults: "It'll be on TV. The whole city will see it. They'll love it. Harlem rises up! . . . He's only mayor of some of the people! He's the mayor of white New York. Set fire to the Mutt! The Italians will watch this on TV, and they'll love it. And the Irish. Even the Wasps. They won't know what they're looking at. They'll sit in their co-ops on Park and Fifth and East Seventy-second Street and Sutton Place, and they'll shiver with the violence of it and enjoy the show. . . . Open your eyes! The greatest city of the twentieth century! Do you think money will keep it yours?"<sup>39</sup> Wolfe's central character, Sherman McCoy, lives in a luxurious co-op on Park Avenue, the very boulevard created by Grand Central's electrification. His friend Rawlie Thorpe reminds him that the only way to survive in New York is to "insulate, insulate, insulate" from the teeming hordes passing below on the city's streets.<sup>40</sup> McCoy, a Wall Street bond trader and "Master of the Universe" seems unaware of the vast social changes

under way in New York. However, for Sherman McCoy and the truly wealthy of New York, an alternative remains—a trip to Grand Central and then a commuter train to Bronxville or Chappaqua in Westchester County or Darien in Connecticut. Wilgus, Vanderbilt, Reed and Stem, and Whitney Warren planned Grand Central as the gateway to a great city, not as an avenue of escape from the city.

## *Epilogue*

At the turn of the twentieth century, as the New York Central Railroad began planning for the new Grand Central Terminal, the railroads reigned supreme. Railroad companies, including the New York Central and its rival the Pennsylvania Railroad, ranked among the largest business enterprises in the country. In 1900, the railroads operated 192,556 miles of main line track, 37,633 locomotives, 34,713 passenger cars, and 1,365,531 freight cars. They transported 576,831,000 passengers a total of 16,038,000,000 miles and generated revenue of \$323,716,000.<sup>1</sup> Four major trunk lines, the Baltimore and Ohio, the Erie, the Pennsylvania, and the New York Central, offered through rail service from the East Coast to Chicago and the Midwest. Both the Central and the Pennsylvania invested heavily in passenger service between New York and Chicago; their all-reserved trains, the Twentieth Century Limited and the Broadway Limited, embodied speed, efficiency, and luxury.

Over the next fifty years, the railroads declined precipitously. Revenue steadily fell; costs, especially labor, increased year after year. Across the country, highways filled with passenger cars and trucks captured a major share of the transportation business once provided solely by the railroads. In New York, Grand Central and Pennsylvania Station entered a period of slow, steady deterioration as both railroads cut back on essential maintenance and capital improvements. The crisis reached a peak in

*A streamlined steam  
locomotive from the  
1930s*

Image not available.

1965, when the Pennsylvania Railroad tore down Pennsylvania Station to build a new Madison Square Garden. Long-distance Pennsylvania passengers and commuters now shuffled through second-rate facilities tucked below the Garden; all sense of glamour and majesty disappeared as travelers moved through narrow, dirty passageways to and from their trains. Across town, a similar fate awaited Grand Central; the New York Central, as starved for revenue as the Pennsylvania, considered demolition and redevelopment.

## *Epilogue*

How did the seemingly all-powerful railroads of 1900 arrive at such desperate straits a few decades after a time when they dominated the transportation landscape?

### *Regulation, Competition, Decline*

Although they represented a triumph of technology and enterprise, the railroads from their inception generated public suspicion, if not hostility. Social critics branded the railroads “monopolies,” and the railroads came to symbolize the profound change that characterized the Age of Energy. Reformers demanded that the political system curb the monopoly power of the railroads and regulate their activities in the public interest.

Certainly, the railroads engaged in practices that inspired public outrage; most notoriously, the railroads covertly provided rebates to their largest customers, ensuring them a decided advantage in the marketplace. John D. Rockefeller’s Standard Oil received secret discounts from both the New York Central and the Pennsylvania railroads.<sup>2</sup> With clandestine rebates secretly in hand, Rockefeller sold his oil and kerosene at a cheaper price and drove his competitors out of business. By 1900, the Standard Oil Company had formed a classic monopoly, aided by these arrangements, which the railroads exchanged for the company’s shipping business.

With the passage of the Interstate Commerce Act, in 1887, Congress outlawed rebates and “pooling” arrangements whereby railroads divided a given transportation market into fixed shares for each participating railroad, thus avoiding fare wars. In 1906, Congress passed the Hepburn Act, permitting the Interstate Commerce Commission to set maximum rates for freight and passenger service and prohibiting the railroads from appealing the I.C.C. rate decisions to the courts. “Maximum” rates became the base rates charged by all the railroads, and in effect the federal government, through the I.C.C., controlled the rates the railroads charged.

Strong government regulation set the stage for the decline of the country’s railroads. The I.C.C. rarely granted the railroads’ repeated requests for rate increases. Between 1900 and 1915, the general level of prices in the country increased by 35.1 percent, railroad wages by 50 percent, and the taxes paid by the railroads by 200 percent. During the

entire time period, the I.C.C. granted only one freight rate increase—5 percent in 1913. Locked in a web of regulation that prevented them from raising prices, the railroads proved incapable of meeting rising costs, let alone generating surpluses for reinvestment in their infrastructure. Progressive regulation that had been designed to bridle the power of the railroads eventually strangled them.

Not only did the railroads face fierce demands from the reformers for ever-increasing government regulation, but, as ominously, competition from the automobile and truck loomed on the horizon.

In the syndication books of J. P. Morgan and Company, in an entry following the details of the New York Central's massive \$100 million bond issue of 1897, appears a much smaller bond issue—only \$2 million. Morgan raised the two million for the fledgling Dodge Brothers Manufacturing Company of Detroit, Michigan, among the pioneers in still another transportation revolution, one just getting under way at the turn of the century.<sup>3</sup>

Although the internal combustion engine had first powered a horseless carriage decades earlier, the development of a reliable automobile required a considerable period of time. In 1900, American companies manufactured 4,100 vehicles and registration of motor vehicles totaled only 8,000 for the entire country.<sup>4</sup> With limited production, the American automobile industry hardly represented a mortal threat to the railroads, who in that same year transported nearly six hundred million passengers more than sixteen billion passenger miles!

This new transportation revolution found a powerful ally in federal, state, and local governments. Government, at all levels, spent billions of dollars to subsidize the rise of the auto and the truck—at the direct expense of the railroads. Eventually, a massive road and highway system crisscrossed the country, extending into the most rural byways. Between 1917 and 1921, the country built a total of 12,919 miles of highway; and by 1941, just before World War II, the federal highway system totaled 316,432 miles, exceeding the main line track of all the nations' railroads combined (244,263 miles).<sup>5</sup>

Even the Great Depression did not seem to slow the onslaught of the automobile. *Railway Age* reported that in 1935 the railroads transported

Image not available.

*The advent of the highway age: George Washington Bridge crossing the Hudson River from Manhattan Island, with tracks of the New York Central in foreground, 1932*

2,443,532 fewer passengers to and from New York City than in the previous year, while traffic on the newly completed George Washington Bridge increased by 3.9 percent and in the Holland Tunnel by 5.6 percent from 1934 to 1935.<sup>6</sup> The competition from automobiles, fostered by federal aid to the country's highway system, accelerated after the Second World War with the decision, in 1956, to construct the Interstate Highway System. In partnership with the states, the federal government financed the construction of more than 40,000 miles of limited-access, high-speed thruways linking all the major cities in the country. By the 1960s, federal highway construction averaged more than four billion dollars a year and provided the railroads with subsidized competition they simply could not hope to beat.

The loss of traffic to the automobile and truck severely affected the New York Central, as it did all highly capitalized railroads, because of their desperate need for a steady cash flow to service their enormous debt. In 1911, the par value of the Central's stock had stood at \$222 million and its bonded debt at \$299 million. Just three years later, as the new Grand Central opened, the debt of the railroad rose to \$377 million, reflecting the enormous sums required to complete the station and train yard and to begin construction of Terminal City.<sup>7</sup>

In 1932, as the impact of the Great Depression accelerated, the Central reached a crisis point. First the railroad tried to float a new bond issue to meet expenses and to pay off maturing bonds. Wall Street investors proved unwilling to purchase the company's securities: the bond issue failed miserably. With no recourse left, the Central suspended payment of dividends for 1932. The once powerful New York Central, a symbol of the proud American railroad industry, stood humiliated. Long castigated for its arrogance and power, the railroad assembled by the Commodore and expanded dramatically by his son William Henry could not afford to pay a dividend to its stockholders.

World War II provided a brief reprieve for the Central and other railroads. The country mobilized for war, and demand for passenger and freight service increased dramatically as American industry recovered from the Depression years and proceeded to turn the country into the "Arsenal of Democracy." But the Second World War afforded only a brief hiatus from the underlying problems the nation's railroads faced. As soon

## *Epilogue*

as the war ended, the shift of transportation from the railroads to the highways resumed and the airline industry began to offer additional competition for the long-distance passenger.

For the New York Central Railroad, competition from the newly completed New York State Thruway proved disastrous. When planning for New York's portion of the Interstate Highway System, engineers had examined the topography of New York State and recognized the most logical route for the thruway to follow—along the Hudson River north to Albany, up the Mohawk River Valley, and then across the flat plains of upstate New York through Utica, Syracuse, and Rochester to Buffalo. In other words, the New York State Thruway followed the exact route of the Erie Canal and the New York Central Railroad across the state. In numerous places in upstate New York, it is possible to view, in one scene, the Erie Canal (now the New York State Barge Canal), the former main line of the New York Central Railroad, and the thruway, all built along the “water level route,” the flattest and most efficient route from the East to the American Midwest.

## *Merger and Bankruptcy*

From their very beginnings, the Pennsylvania and New York Central railroads competed vigorously and built and operated more passenger and freight capacity than necessary. Both railroads rejected talk of a merger before World War II and resisted any serious discussions of their shared problems into the mid-1950s. Proud companies, once among the most profitable in America, they remained fierce rivals; but competition from the truck and automobile only increased.

With tortuous twists and turns, the two railroads moved inexorably toward a merger and in 1968 finally agreed to join forces, forming the Penn Central Transportation Company, the largest transportation company in the country. Of course, the New York Central's valuable real estate empire in midtown Manhattan, including Grand Central, constituted a prize asset of the new company.

Unfortunately, the times proved inauspicious for the new railroad company. Between 1967 and 1970 the economy grew at a modest 2.7 percent, putting severe pressure on the revenue of all railroads, including

the new Penn Central. Two years after the merger, which had been greeted with great fanfare by the press, politicians, and the public, Penn Central filed for bankruptcy protection, on June 22, 1970—the largest bankruptcy in American corporate history. In the final days before the bankruptcy, officers of the railroad hurried to Washington to argue for federal loan guarantees, without which the banks refused to lend Penn Central any more money.

Congress expressed outrage at the state of affairs and called for an investigation into the collapse of the railroad. All of the federal and state investigations could not alter a fundamental fact: private railroad transportation simply could not survive the combined effect of onerous government regulation and a publicly financed highway system. Only one viable alternative, not long in coming, remained—to replace the private railroads in New York and the Northeast with a public railroad system.

### *Grand Central at Risk*

As the fortunes of the New York Central plummeted, the railroad turned a cold eye to its flagship terminal on 42nd Street; maintenance declined precipitously, the roof leaked, the underground train tracks accumulated piles of garbage, the destitute of New York found their way into the terminal's labyrinth of tunnels. Architectural disfigurement invaded the Grand Concourse: a massive Kodak display filled the east balcony, blocking the natural light from the concourse's soaring windows facing Lexington Avenue; and Merrill Lynch opened a glass-enclosed office steps away from the famous information booth in the heart of Whitney Warren's Beaux-Arts temple.

Threats to Grand Central had unfolded even before the disastrous merger of the New York Central and the Pennsylvania railroads. In 1958, the railroad entered negotiations with the developer Erwin Wolfson to demolish the railroad's baggage building just north of the terminal and erect the fifty-nine-story Pan American building. Ironically, the building housed the headquarters of Pan American Airways, whose planes carried the long-distance passengers once served by Grand Central. Still desperate for revenue, the railroad explored the possibility of constructing another office tower on 42nd Street to mirror the Pan Am building. In

*Marcel Breuer—  
designed building  
proposed for con-  
struction on top of  
Grand Central in  
1968*

Image not available.

Image not available.

*Transverse section of  
building in Breuer  
proposal*

March of 1969, Penn Central and the developer Morris Saady announced plans for a Marcel Breuer–designed fifty-five-story office building on top of Grand Central. The ruin of the world-renowned building seemed but days away. Before the company could proceed, formidable opposition arose.

Efforts in New York to preserve the city’s historic past, being led by Jacqueline Kennedy Onassis, Brendan Gill, and other prominent New Yorkers, galvanized. In 1965, New York City had passed its Landmarks Preservation Law, spurred by the destruction of Pennsylvania Station. The law, designed to foster “civic pride in the beauty and noble accomplishments of the past” and to promote “the use of historic districts, landmarks, interior landmarks and scenic landmarks for the education, pleasure and

Image not available.

*Revision of pedestrian traffic flow in Breuer proposal, which would have destroyed the elegant engineering of traffic patterns in Grand Central*

welfare of the people of the city,” established the Landmarks Preservation Commission to designate buildings as landmarks.<sup>8</sup> After a building’s designation as a landmark, the law required the building’s owner to keep the exterior in “good repair” and empowered the commission to approve any plans to alter the exterior of the building or to make any other substantive alterations. On August 2, 1969, with great fanfare, the commission designated Grand Central Terminal a landmark.

Penn Central, by 1967 sliding toward bankruptcy, refused to abandon efforts to destroy Grand Central and appealed to the courts. After a decade of litigation, the case reached the Supreme Court, and in October of 1978 the Court issued a truly historic decision. With Justice William Brennan writing for the majority, the Court first noted: “The Terminal, which is owned by the Penn Central Transportation Co. and its affiliates (Penn Central), is one of New York City’s most famous buildings.

Opened in 1913, it is regarded not only as providing an ingenious solution to the problems presented by urban railroad stations, but is also a magnificent example of the French beaux arts style.”<sup>9</sup>

The Supreme Court carefully weighed the Penn Central’s argument that the application of the Landmark Preservation Law to Grand Central represented a taking of their property. Above all, the company argued that if the City of New York wanted to preserve Grand Central as it was, the city would have to pay the company “just compensation.” Of course, in the view of Penn Central, the compensation should be based on the value of its property on 42nd Street with the planned 55-story tower above. The Court rejected this argument.

In the final analysis, the Court’s decision represented a turning point; in the future, citizens and their governments might preserve the urban environment and not have to yield to commercial pressure. With the Supreme Court’s ruling, it became possible to strike a balance between the forces of change and the desire to preserve great buildings that provide grace and style to the American city. No finer representative existed than Grand Central and it seems fitting that the Supreme Court’s historic ruling involved this masterpiece.

For the moment, the Supreme Court had saved Grand Central, but monumental challenges remained. Penn Central, mired in bankruptcy, stopped spending money even for the most pressing needs. Years of neglect lay ahead: the leaking roof worsened, cracks appeared in the marble walls, and the star-studded ceiling of the Grand Concourse began to fall in places. While the Supreme Court ruling had upheld Grand Central’s landmark status, the ruling did not magically produce the money needed to prevent this magnificent building from continued deterioration.

### *The Public to the Rescue*

Efforts to rescue the railroads proceeded on multiple fronts. In 1971, Congress passed legislation establishing the National Railroad Passenger Corporation, Amtrak, to take over Penn Central’s long-distance passenger operations and eventually the long-distance passenger service of all railroads across the country. Penn Central reorganized, concentrating on freight operations; but losses mounted, forcing Congress, in 1976, to

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establish a second public-private rail organization, Conrail, to deal with freight and operate the commuter service of the bankrupt railroads in the Northeast, including the Penn Central.

Conrail concentrated its energy on improving freight operations in the Northeast, devoting little effort to commuter operations in the New York metropolitan region. Conditions on the commuter trains became deplorable. Trains were filthy, broken windows went unrepaired, lavatories were never cleaned, and conductors became more surly as service declined. These conditions forced action. With some reluctance, the political leadership of New York City and State recognized their responsibility. If private railroads could no longer provide commuter trains to New York's flourishing suburbs, this vital rail service must become a public responsibility.

On January 1, 1983, the State of New York, in partnership with Connecticut, created the Metro-North Commuter Railroad, as a subsidiary of the Metropolitan Transportation Authority. Metro-North absorbed the lines in the Bronx, Westchester, and Fairfield counties originally established by the Harlem, Hudson River, and New Haven railroads over a century before. The new commuter rail line's assets included more than three hundred miles of track in New York and Connecticut and 118 passenger stations. The queen of train terminals, Grand Central, also became Metro-North's operational responsibility. One crucial problem remained: ownership of Grand Central and the railroad's real estate empire in midtown Manhattan remained in the hands of Penn Central. Like the proverbial phoenix rising from the ashes, the Penn Central Transportation Company, after emerging from bankruptcy, metamorphosed into a real estate development, entertainment, and oil pipeline company, relocating its corporate offices to Cincinnati, Ohio. Later Penn Central became a part of American Premier Underwriters, Inc., primarily an insurance company, who retain ownership of Grand Central. Metro-North's lease includes an option to buy.

Metro-North Commuter Railroad recognized the daunting challenge Grand Central represented: the terminal's decline continued. George Walker, general manager of Metro-North, recalled that when Metro-North had taken custodianship of Grand Central in 1983 they had hardly

grasped the extent of the deterioration. Equipment from the turn of the century was literally falling apart and replacement parts proved impossible to obtain. Every part of the terminal, from mechanical systems to the leaking roof over the Grand Concourse, demanded immediate attention.<sup>10</sup> Metro-North had to arrest the rot and decay before any thought could be given to restoring the terminal to its former glory.

A major challenge confronted Metro-North. Revenue from commuter service did not cover operating costs; commuter service remained a money-losing operation. With no alternative, the railroad turned to the New York State legislature for needed capital. After a number of bruising battles in Albany, the state began to provide much-needed funds for capital improvements. Between 1983 and 1993 Metro-North undertook thirty million dollars' worth of repairs to Grand Central's basic infrastructure.

No one can accuse Metro-North of lacking imagination and ambition for Grand Central. In 1988 the railroad commissioned Beyer Blinder Belle, architects, and the engineering firm of STV/Seeyle Stevenson Value and Knecht of New York to undertake a detailed study of the work needed to restore Grand Central. Jessica Stern, writing in *Railway Age*, reported the estimated cost of complete renovation to be \$400 million.<sup>11</sup> Even the most ardent supporters of the restoration stood aghast—four hundred million dollars! As generous as New York's politicians might be, there was little chance of the New York legislature ever appropriating \$400 million for Grand Central. Metro-North did not even own the building, and the old Penn Central Company kept making noises about not receiving fair value from its real estate on 42nd Street. Plans would have to be scaled back and creative financing secured if even a portion of the ambitious agenda stood a chance of completion.

Beyer Blinder Belle completed its meticulous inspection of every square inch of Grand Central in 1992. Its report included a detailed historical analysis of the building's past, which involved examining the original architectural and construction drawings, housed at the Smithsonian Institution in Washington. By 1994, an alternative scheme emerged, one that stood a real chance of receiving approval from the M.T.A. and the state legislature. First, Beyer Blinder Belle, in consultation with Metro-North, scaled back restoration plans to a more realistic \$200 mil-

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lion cost. After years of hard bargaining Metro-North reached a long-term lease arrangement with the Penn Central Company. In 1994 the M.T.A., Metro-North's parent organization, signed a 110-year lease for Grand Central with the right to buy the terminal outright in twenty-five years. As part of the deal, Penn Central finally relinquished rights to develop the air rights above the building.

While negotiations with Penn Central dragged on, Metro-North and the M.T.A. developed an innovative plan to finance a major portion of the renovation by redeveloping all the retail space in the terminal. For a model, Metro-North turned to the widely heralded restoration of Union Station in Washington, D.C., and its transformation into a major upscale retail and commercial venue. Union Station had suffered the same slow, painful decline as Grand Central and Pennsylvania Station. As the railroads using the station in the heart of the nation's capital had gone into slow, steady death spirals, Daniel Burnham's classic Beaux-Arts station, a short walk from the Capitol building, had suffered. An ill-fated attempt in the 1960s to turn the once-magnificent station into a National Visitors Center failed miserably. Salvation came via the combined efforts of LaSalle Partners of Chicago and Williams Jackson Ewing of Baltimore, who conceived of financing the restoration of Union Station by generating higher lease revenue. Filled with trendy restaurants and smart shops, Union Station now serves as both a busy rail facility and as one of Washington's most popular attractions.

In March of 1994, the M.T.A. approved an agreement with LaSalle Partners and Williams Jackson Ewing to begin a \$100 million retail development program, hoping that the partnership could replicate the magic of Washington's Union Station at 42nd Street in New York. In turn, the M.T.A. planned to issue \$84 million in bonds backed by the anticipated revenue from the renovated and expanded retail space, with the remaining costs for the renovation work coming from the M.T.A.'s capital budget. Plans involved increasing retail space from 105,000 square feet to more than 150,000, with one-third devoted to restaurants and cafés. LaSalle Partners projected rental income rising from the \$7 million it was earning to \$13 million a year, after leasing of all commercial space. This would provide more than enough funds to service the M.T.A.'s bonds.<sup>12</sup>

*Restoration*

Any restoration of Grand Central's interior had to await completion of repairs to the roof. The building's deterioration included numerous leaks in its 81,000-square-foot roof, which was covered with over an acre of copper sheeting. Water dripped down the massive columns surrounding the Grand Concourse, leaving visible stains. In August of 1986 Metro-North engaged the firm of Simpson, Gumpertz and Heger of Arlington, Massachusetts, to complete a \$4.5-million reconstruction of the roof. A series of sloppy repairs that had been made over the years complicated the work. In the end, the most economical plan involved replacing all fifty tons of the original copper sheeting, even as copper prices rose to 84 cents a pound.<sup>13</sup>

Along the edge of the roof, an ornamental frieze surrounds the top of the building. To accomplish its restoration, the contractor located a number of craftsmen who had worked on the original construction. Because replacement of the original frieze would be too costly, repairs began to the stamped copper original. First workers cleaned the frieze; then they removed it in six-foot sections, to install a waterproof membrane underneath it. The cleaned frieze and the new copper roof will together acquire a rich patina and look the same age, as though installed together. This painstaking attention to detail in restoring the roof may be lost on the thousands of people passing far below each day, but it signified Metro-North's commitment to restoring Grand Central to its former glory. When Beyer Blinder Belle performed their detailed evaluation, they praised the work of the roofers.<sup>14</sup>

At the front edge of the roof, Jules Alexis Coulan's magnificent sculpture of Mercury, Minerva, and Hercules surrounded an ornate clock. The sculpture group stands fifty feet tall, spans almost sixty feet, and weighs fifteen hundred pounds. Coulan had constructed the sculpture by crafting individual stone blocks twenty inches in depth and assembling them in courses connected by copper clamps. Over the years, water had seeped into the joints between the courses and eroded a number of the clamps holding the sculpture together. Metro-North commissioned skilled stone

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*Restoration of Jules  
Coulan's statue of  
Mercury atop the 42nd  
Street facade, with the  
Grand Hyatt Hotel  
and spire of the  
Chrysler Building  
in background*

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Image not available.

masons to repair all of the clamps and thoroughly clean the statues. Today, the restored gods of ancient Rome, adorning the top of Grand Central, catch the eye of all who travel up Park Avenue toward 42nd Street, just as Whitney Warren and Jules Coulan intended.

*Restoration of sculpture on the 42nd Street facade*

Metro-North proceeded with major changes to the Grand Central's pedestrian circulation system. First, in the terminal building itself, major repairs to the 42nd Street entrance ramps on the east and west ends were undertaken. The east passage from 42nd Street adjacent to the Grand Hyatt required the most extensive changes, including a dramatic widening of the cramped, narrow width and reopening of the ramp to the lower-level concourse, which had been blocked off for many years. Just off the Grand Concourse, on the both the east and west sides, the railroad installed escalators between the upper level and the suburban concourse on the lower level.

Whitney Warren's original plan for the Grand Concourse included dramatic stairways, modeled after the main stairway in the Paris Opera, on both sides, sweeping up to the second-floor balconies. On the Vanderbilt Avenue side, the west side, the stairs led to the covered entrance-

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*Regilding of the clock  
on the 42nd Street  
facade*

way and taxi stand. For some reason, the New York Central had never completed the stairway on the east side of the concourse. After some diligent detective work, Metro-North located the quarry that had provided the marble for the west stairway and commissioned artisans to duplicate Warren's design on the east side of the Grand Concourse, adding another element of Beaux-Arts symmetry.

By far, the most dramatic changes to the terminal's circulatory system came in September of 1999, with the opening of completely new entrances directly to the underground train yard and platforms from the north, along Park. At 48th Street and Park Avenue and 47th Street and Madison, street-level vestibules now lead to stairs descending to a new cross-passage, under 47th over the upper-level platforms. Stairs lead further downward to the train platforms. Two long passageways connect the new uptown entrances to the Grand Concourse farther south. Additional entrances link with the new passageways in the Helmsley Building at 45th Street and Park Avenue.

The new entrances and passageways required sophisticated engineer-

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*Alterations made by Metro-North to Grand Central's pedestrian circulation system, published in the New York Times on October 2, 1998*

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*Restoration work on  
the east balcony*

ing to fit within the existing structure, and first estimates placed their cost at over \$70 million dollars.<sup>15</sup> Metro-North calculated that forty thousand of the daily commuters using the terminal work at destinations to the north of the terminal; the new entrances would save them fifteen minutes of time each day. Now they would be able to enter Grand Central and walk directly to the train platforms without the long walk down to Grand Central and then through the track gates on either the upper or lower level.

Metro-North faced another daunting challenge when they turned their attention to Grand Central's structural and mechanical systems, installed at the turn of the century and, in some cases, little altered. While the public sees the soaring spaces of the Grand Concourse and the marble and sandstone interior of the Vanderbilt waiting room on 42nd Street, hidden from sight, often far underground, are the building's essential mechanical systems.

Water proved to be the source of almost all structural problems uncovered in the building itself and in the underground train yard. Over

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*New entrances to the station and the underground train platforms at 47th and 48th Streets and through the Helmsley Building, formerly the New York Central Building*

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time, neglect of the roof had exerted a high cost. Beyer Blinder Belle found rusting structural members throughout the facility and recommended that when the full restoration began, serious effort be devoted to repairing the damages to the structure.<sup>16</sup> Of course, the repairs to the roof would halt the water infiltration at its source.

The study of the terminal published in 1992 concluded: “Some systems are operational, but are beyond normal life expectancy. Some systems are no longer functional. None of the systems comply with current performance or safety codes.”<sup>17</sup> A truly complicated task confronted Metro-North—replacing or extensively upgrading all of the terminal’s mechanical systems. Initial estimates placed the cost of this work at almost \$20 million dollars. When official New York and the public celebrated Grand Central’s rebirth, few dignitaries descended 100 feet below ground, under the new food court off Lexington Avenue, to inspect the original rotary convertors manufactured by General Electric more than eighty years earlier and now replaced by a state-of-the-art electric system. Nor did they view the terminal’s brand new heating and air-conditioning system. Without Metro-North’s commitment of significant resources to upgrading the building’s essential infrastructure, the celebration would have been a hollow one.

In the restoration of the interior spaces of Grand Central, Metro-North faced not only physical and structural repairs but a disheartening human problem. As work began on the waiting room, the railroad and public officials confronted another symbol of Grand Central’s decline; homeless New Yorkers wandered throughout the terminal, loitered in the waiting room, and had taken up residence in the labyrinth of tunnels formerly used to move baggage.

New York City tried to address the problem in myriad ways—increasing the number of beds available in the city’s shelters and moving aggressively to pass antiloitering laws, so that the homeless could be arrested for sleeping in public transportation facilities unless they provided a “satisfactory explanation” for their presence. Advocates for the homeless challenged the constitutionality of the antiloitering law in the courts. In February of 1988, New York’s Court of Appeals ruled the law, banning loitering in public transportation facilities, to be unconstitutional. Much controversy greeted the court’s decision and Metro-North police chief

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John Esposito vowed to continue to eject homeless persons from Grand Central.<sup>18</sup> During the 1990s, sympathy for the homeless and the poor in general seemed to wane, and, with the combination of increased social services and aggressive policing, the homeless have departed from Grand Central—at least for the present.

Metro-North selected the firm of George Campbell Construction to undertake the \$5.9 million restoration of the waiting room. One especially troublesome task involved cleaning the surfaces of the walls. The usual cleaning agents just soaked into the limestone walls, carrying the dirt with them. Eventually the preservation architects and conservators hit on the right formula, employing a mixture of ammoniated latex. Left on the surface to dry for four hours, the mixture peeled off the dirt and grime.<sup>19</sup>

By far, the most impressive piece of the restoration is the vaulted ceiling soaring 125 feet above the Tennessee marble floor of the Grand Concourse. Based on a design by the French painter Paul Helleu, the original ceiling included the constellations of the Milky Way, formed by

*The G.E. rotary converters, which changed alternating current to direct current, have been left in place deep under 43rd Street between the Grand Hyatt Hotel and the Graybar office building*

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*The restored ceiling of  
the Grand Concourse  
with the Milky Way  
visible again from the  
floor*

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more than 2,500 gold-leaf stars; 59 light bulbs lit the major stars. Water damage in 1945 led to the replacement of the original mural with painted panels glued to the ceiling. The concourse's stars generated controversy; astronomers pointed out that the constellations were displayed backward. Grand Central's defenders countered that Helleu intended the ceiling to represent the view of the Milky Way from outside of the solar system.

Craftsmen from the firm of John Canning and Company, based in Connecticut, meticulously cleaned the 25,000-square-foot ceiling. Sixty years of grime befouled the mural; the stars barely shone. When comparisons to the restoration of the Sistine Chapel appeared in the press, John Canning pointed out that Michelangelo had painted on fresco in the Vatican chapel whereas the artisans at Grand Central had used oil paint, but that his firm was employing similar cleaning agents, a mixture of sodium bicarbonate and citric acid in water, to remove years of grime.

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*Epilogue*

*Restored chandeliers in  
the north balcony of  
the Grand Concourse*

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Image not available.

Once the ceiling was cleaned, judicious applications of blue acrylic paint and 23-karat gold leaf restored the brilliance of the stars soaring overhead. Canning commented: “We are totally respecting the original work with minimum intervention.”<sup>20</sup> This portion of the total restoration project, the refurbishment of the ceiling of the Grand Concourse, reminds even the most blasé New Yorker of the splendor of the city’s civic cathedral.

The ten enormous brass chandeliers that hang high above the balconies surrounding the concourse also received meticulous attention. Work crews carefully removed the massive lighting fixtures, weighing

*The heart of Grand Central, the Grand Concourse, restored*

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1,600 pounds each, and shipped them to Utah (the location of the lowest bidder) for a complete overhaul. Patrons dining at Michael Jordan's steakhouse, located on the north balcony, now sit under dazzling chandeliers restored to their turn-of-the-century brilliance.

When the terminal was rededicated, with great fanfare, in October of 1998, the final configuration of the waiting room remained undecided. Plans for the restored great space include restaurants and other vendors. Currently the waiting room serves as a space for temporary exhibits and for catered parties. Rail passengers using Grand Central today have less use for a waiting room. Little long-distance train travel remains in the United States, despite the valiant efforts of Amtrak, and all Amtrak service in New York City operates out of Pennsylvania Station.

Built to serve railroading's glamorous long-distance trains, Grand Central is now, ironically, the focal point of the commuter service to New York's northern suburbs. People no longer leave from Gate 29 on the Twentieth Century Limited, the all first-class luxury train to Chicago; rather they depart to more immediate destinations on the 5:22 to Scarsdale or the 6:25 to New Canaan, Connecticut. Built by private enterprise as a monument to commerce, Grand Central Terminal has always functioned as a magnificent civic structure. It has been saved by a collaboration of private and public efforts, and the public of New York City continues to rush through its tunnels, ramps, and corridors and to mingle on its Grand Concourse. Built in the Age of Energy, Grand Central, all movement and blur, continues to exude the enormous energy and vitality of New York City.

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## A N O T E O N S O U R C E S

The primary archival material for the history of Grand Central Terminal resides in the collections of the Manuscripts and Archives Division of the New York Public Library, Astor, Lenox and Tilden Foundations. First and foremost are the papers of William J. Wilgus, vice president and chief engineer of the New York Central and Hudson River Railroad. Frank J. Sprague, a leading electrical inventor and entrepreneur, served as a consulting engineer for the Grand Central electrification. His papers and those of electrical engineer and consultant Bion T. Arnold are also part of the New York Public Library's manuscript collections.

Following the bankruptcy of the Penn Central Corporation, the New York Public Library acquired the corporate records of the New York Central Railroad and its subsidiary lines, including the Harlem River Railroad. The Manuscripts Division has commenced the challenging task of cataloguing this material.

The Schenectady Museum, in Schenectady, New York, houses an important collection of General Electric Company records in the Hammond Historical Files. In Washington, D.C., the Smithsonian Institution's Warshaw Collection contains New York Central memorabilia and advertising material, and the archives of the American Institute of Architects include details of Whitney Warren's censure.



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