

I

Public Transportation growth, 1827-1923

“For most of recorded history a majority of people worked at home. Most households produced food, shelter, and clothing under their own roofs, and merchants, blacksmiths, crafts people, and other who offered services for sale did so at their homes. This was true in the United States until well into the nineteenth century...”¹

U.S. public transportation began when America’s major cities’ growth as trading and manufacturing centers allowed dispersion of dwellings beyond walking distances. In the early 1800s, workers could only walk to their jobs, since there was no public transportation, and this limited a city's growth to about two miles from its center — a little less than an hour’s walk in busy city traffic. This was not a problem in the early part of the 19th century since cities were so small.

Population of ten U.S. Cities, 1800-1950			
	1800	1850	1900
New York	60,515	515,547	3,347,202
Chicago	----	29,963	1,698,575
Philadelphia	41,220	121,376	1,293,697
Los Angeles	----	610	102,479
Boston	24,937	136,881	560,892
Houston	----	2,396	44,633
San Francisco	----	34,776	342,782
Atlanta	----	2,572	89,872
Portland	----	821	90,426
Honolulu	----	14,484	39,306

It is instructive to pause awhile at this table because much of what was happening in the transportation field was because of how tiny the U.S. cities were in 1800 and how swiftly they grew first in the subsequent 50 years and then in the following 50 years after that. Our cities today are virtually stagnant in comparison to the growth of these cities.

However, as cities grew, the development of public transportation allowed the distance that one could travel in an hour to gradually lengthen to three miles with the introduction of the horse-drawn omnibus, then four miles with the horse-car on rail, and six miles with the electric streetcar.²

The limit of urban and suburban growth has always been the distance that commuters are willing to commute to their jobs in one hour and this has been a constant throughout the whole development of public transportation.³ Even today, fewer than five percent of U.S. workers commute more than one hour each way.⁴

A result of this extension of public transportation was a spillover of the then increasingly more congested city population to the suburbs. The ability of public transportation to shift population to the suburbs was seen at the time as a major public benefit because it relieved population pressures and provided a healthier environment for the suburbs’ new inhabitants. In those days this expansion was described by the more neutral term *dispersion*, whereas today we are more likely to use the pejorative, *sprawl*.

The forces that led to the mid-19th century development of urban public transportation was principally:

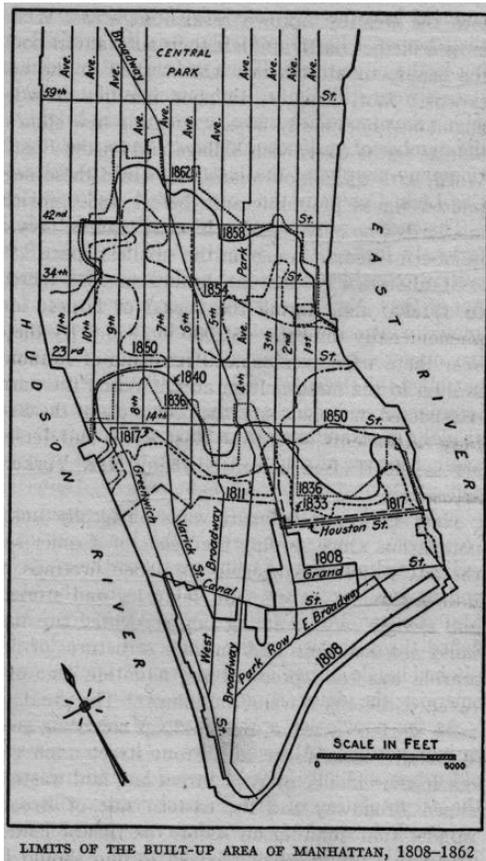
- Urban population growth.
- Growth in personal incomes.
- The desire for better housing.
- Changes in transportation technology.

Urban population growth

In 1810, the U.S. total urban population was 525,000 and by the end of our period it would grow to 54.3 million.⁵ At the start, the labor force was 74 percent farm and 26 percent non-farm. Only 40 years later it was 55 percent farm and 45 percent non-farm. By 1900, farm work would be only 40 percent and non-farm 60 percent, with the primary growth being in manufacturing and trade.⁶

Non-farm work lay, for the most part, in the core of the compact towns and cities of the time. Increasing population densities and incomes led to a desire for better homes. The only areas available were the less expensive lands at the city's edge. What constrained people from moving there was the time and expense of traveling to work.

However, incomes grew rapidly during this period and provided the incentive to develop new transportation technologies for commuting longer distances.



economic activity among U.S. cities.⁹ From then on, the City averaged a 50 percent growth rate per decade through the end of the century.

The influx of the 19th century immigrants combined with a lack of affordable public transportation led to very high population densities with multistory factories, warehouses and housing. New York's peak population density in the late 1800's was the highest the world had seen since the packed city of ancient Rome.

The growth of the three largest U.S. cities is particularly interesting because of its rapidity. However, most workers could not live further than two miles from their workplace because they could not afford transportation. Thus, in the early part of our period these cities larger populations could only be achieved by increasing their density.

In the early 1800's factories and warehouses had to be physically close to navigable waters to take advantage of lower transportation costs and the availability of waterpower to drive machinery. Land transportation was then so expensive that moving goods 30 miles overland by wagon cost as much as shipping the same amount of goods to Europe by sailing ship.⁷

The need for direct communication between businesses also limited their dispersion. Sellers had to call on buyers, the transfer of goods had to take place, and the paperwork discussed and completed. Often bankers and lawyers needed to be consulted in the transaction, and post-sale problems attended to. The lack of remote telecommunication of any kind — even telegraph — meant that close physical contact was essential.

New York was the largest and fastest growing city in the U.S. and logically it would be the first to develop public transportation. It grew faster than the other cities primarily because of its great port facilities and the opening of the 363-mile Erie Canal in 1825.⁸ New York's position as the final terminus of the Erie Canal and with Manhattan surrounded by sheltered deep water made it a natural to take the lead in

In 1830 New York City only took up the first two miles of the island of Manhattan.¹⁰ As with most of the larger cities of the time, at the center were the public buildings, the churches, and the homes of the well to do. Next were the homes of merchants and leading craftsmen, and further out were the homes of lesser skilled workers. Initially, there was a tendency for poor people to live at the furthest ring of the city, not at its core.¹¹ Over time, particularly in New York and the larger cities, that would change and the poor would live at the center.

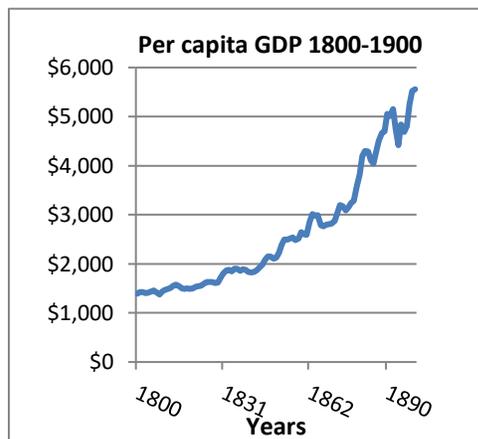
By 1850 New York had still not expanded much above 14th Street even though its population had grown seven-fold since the beginning of the century. As the city became more dense and noisy the wealthy migrated out to the northernmost part of the city.

Growth in Personal Incomes in the 19th Century

The 19th century, particularly the later part, was a time of zero net inflation, declining transportation prices¹² and rising real wages¹³. Whereas real incomes had risen somewhat before 1880 taking 67 years to double from 1800, it only took the next 33 years for it to double again.¹⁴

In short, the average U.S. worker had quadrupled their living standards during this 100-year period with much sharper growth at the end of the period.

In 1850, all U.S. city workers walked to work because they had little left over after providing for the bare necessities of food, clothing and shelter. By 1900, some of the better-paid were enjoying the luxury of a streetcar ride home.



During the last 20 years of the century, a continuing increase in city populations combined with increases in discretionary spending resulted in a rapid development of the nation's sports and entertainment industries.

Baseball, basketball and football all became professional sports and stadiums were built to house them, cycling became a craze, vaudeville began in Boston, Emile Berliner invented the gramophone, Edison showed his first movie, the first Ferris Wheel opened, and they ran the first Boston Marathon, the first Kentucky Derby and P.T. Barnum invented the three-ring circus.¹⁵

Initially, many venues such as sports stadiums and race courses were built at the edge of cities and to visit these attractions one would have to get there by public transportation.

In addition, as a further indication of growing incomes, while only 13 American magazines were published in 1800, by 1900, more than 3,500 magazines were published in the United States, including about 1,500 weekly magazines and in excess of 2,000 monthlies and quarterlies. Whatever you can think of today in entertainment had its roots in the last part of the 19th century.

The Desire for Better Housing

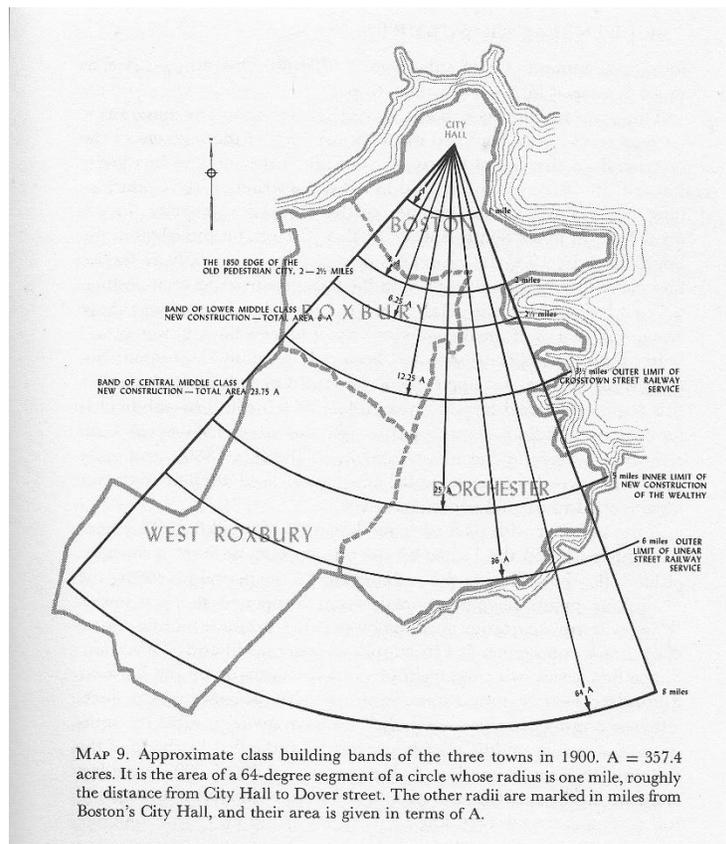
A driving force in the lives of most people is a desire for the largest possible home and lot. This dream has changed over the years with the home becoming more spacious as incomes rose. In 1850 that home was a 1000 square foot two-story home on a three thousand foot lot. By 1900 it had become a 1600 square foot home on a five thousand foot lot. By 1950 the dream was a 2500 square foot home on a 10,000 square foot lot.

One of the primary factors in determining the price of housing has always been the size and price of the available land. Generally, land prices decline the farther one is from the city center.

Thus, the affordable home for the upper middle class was at some distance from the center of the city. Therefore, one of the primary concerns among prospective suburbanites in the 19th century was the availability of public transportation.

On the one hand, people wanted to get far from the city center to take advantage of less expensive and/or more spacious homes. On the other hand, there were limits to the cost and time of commuting. Fundamentally, a one-hour commute from a city center determined the outer limits of that city. The average worker living halfway between the city center and the city limits commuted for half an hour. This average commuting time has not changed significantly over the last 150 years.

This map of Boston shows the basic growth of the city from a public transportation perspective. The two-mile radius shows the original walking city, the three mile radius expansion allowed by the omnibus.



The development of public transportation resulted in dramatic increases in the value of new suburban properties. Such opportunities involved real estate developers in public transportation throughout its expansion period. In the days before the automobile, public transportation was a public utility as necessary as water and it had to be provided before lots or houses could be sold. Consequently, many rail lines were installed before the first house was sold. Sometimes the transit company provided it but with the initial expense underwritten by the developer.

Changes in Public Transportation Technology

Until the 1850's few U.S. cities had any public transportation. The wealthy used carriages; the workers walked. Because

workers walked to work, it limited the distance between dwelling and workplace to about two miles, something less than an hour's walk.

The horse drawn omnibus was quite common by 1840 and this was followed by the horse-car on street railways, which predominated from 1860 until about 1890 when the electric streetcar took over.

For a short while after 1870, cable cars were thought to be the replacement for horse cars but the electric streetcar proved far less costly.

During this time New York, Philadelphia, Boston and Chicago — the largest U.S. cities — developed elevated rapid transit. But the streetcar became the dominant form of U.S. public

transportation until the motor bus won out in the 1930's. These various changes in technology were each typically faster, quieter and less expensive to operate than their predecessors.

The Omnibus

*Fundamentally, it was the kind of service (and only incidentally the type of vehicle) which differed from that previously afforded by the short-stage coach.*¹⁶

There is general agreement about the origin of the word 'omnibus.' In 1826 in the French town of Nantes, a Monsieur Baudry began operating his vehicles and he was taken with the shop sign of a hatter named Omnes which read "Omnes Omnibus," Latin for 'everything for everyone.'

Baudry subsequently began service in Paris in 1828 with an omnibus line called *Les Dames Blanches (the white ladies)* that opened on April 11, 1828 in Paris using the first vehicles that can be reasonably defined as public transportation as we know it.¹⁷ M. Baudry called his vehicle a *voiture omnibus* — a vehicle for all. This was subsequently shortened to *omnibus* and later, plain *bus*.

The following year London's first omnibus appeared followed two years later by New York's first. Considering that London's population was twice that of Paris and ten times that of New York one would expect that the omnibus would have appeared in London first. However, London's regulations favoring the hackney coach prevented its earlier introduction. Only when we consider the hackney carriages, short stages and omnibuses in the aggregate, do we find a reasonable comparison between these three cities.

The Omnibus in London

On July 4, 1829, Mr. George Shillibeer, a coach builder who had studied Baudry's Paris operation, introduced in London a 22-passenger omnibus, drawn by three horses, plying the route from the Bank up to the New Road and from thence to the *Yorkshire Stingo*, a public house in Paddington, for a fare of one shilling each way.¹⁸

Shillibeer was quoted in the Morning Herald of October 1829: "In an omnibus there is no delay in taking up and setting down; no calling at booking offices; no twenty-minutes-waiting at 'The Cellar'."¹⁹ In short, you got on or off at will and did not have to book in advance.

OMNIBUS.
<p>G SHILLIBEER, induced by the universal admiration the above Vehicles called forth at Paris, has commenced running one upon the Parisian mode, from PADDINGTON to the BANK.</p> <p>The superiority of this Carriage over the ordinary Stage Coaches, for comfort and safety, must be obvious, all the Passengers being Inside, and the Fare charged from Paddington to the Bank being One Shilling, and from Islington to the Bank or Paddington, only Sixpence.</p> <p>The Proprietor begs to add, that a person of great respectability attends his Vehicle as Conductor; and every possible attention will be paid to the accommodation of Ladies and Children.</p> <p>Hours of Starting:—From Paddington Green to the Bank, at 9, 12, 3, 6, and 8 o'clock; from the Bank to Paddington, at 10, 1, 4, 7, and 9 o'clock.</p>

At the time of their introduction the regulations did not differentiate between short-stage coach lines and omnibuses and this prevented the omnibuses from operating efficiently. Shillibeer pushed for an end to the Hackney Coach monopoly in 1831 urging new rules for their use, "*Omnibii as in Paris ... especially to the middling class of trades-people whose finances cannot admit of the accommodation of a hackney coach and therefore ... lose ... time in walking ...*"²⁰

On January 5, 1832, the amendments to the Hackney Coach regulations took effect allowing omnibus passengers to board and exit where they wished.

Almost immediately fights began between hackney coach and omnibus drivers. In February, a witness detailed in court "that he had frequently witnessed the blackguard conduct of the hackney drivers towards Shillibeer's omnibus as it passed."²¹ But in short order the hackney coach drivers accepted that the omnibuses would remain and relatively quickly they became the dominant form of transportation in London.



This led to an overabundance of suppliers, frequently experienced with highly successful new technologies. On September 10th, 1831, the operators on the Paddington-Bank route formed an association with Shillibeer as first chairman. They agreed to a reduction on the number of vehicles plying that route and employed inspectors to see that the omnibuses kept to the agreed schedules.²² This was the world's first route association of which we shall hear more in a later chapter.

By 1834, 376 omnibuses were licensed. And while the fare was much lower for the omnibus rider the sixpence fare was still too expensive for any but the middle classes. The *Penny Magazine*, of March 1837, found that the people using the short stages and omnibuses were those with incomes of £150-£600 annually, or three to twelve times the average wage of a skilled tradesman.²³ Even then a sixpence daily one-way fare amounted to nearly ten percent of income for those earning £150 annually if used for daily commuting.

By 1838, there were 625 omnibuses operating in London while the 416 short stages operating in 1825 had declined to 105.²⁴ By 1850, omnibuses in service increase to 1,300 and increased their average passenger capacity to 22.

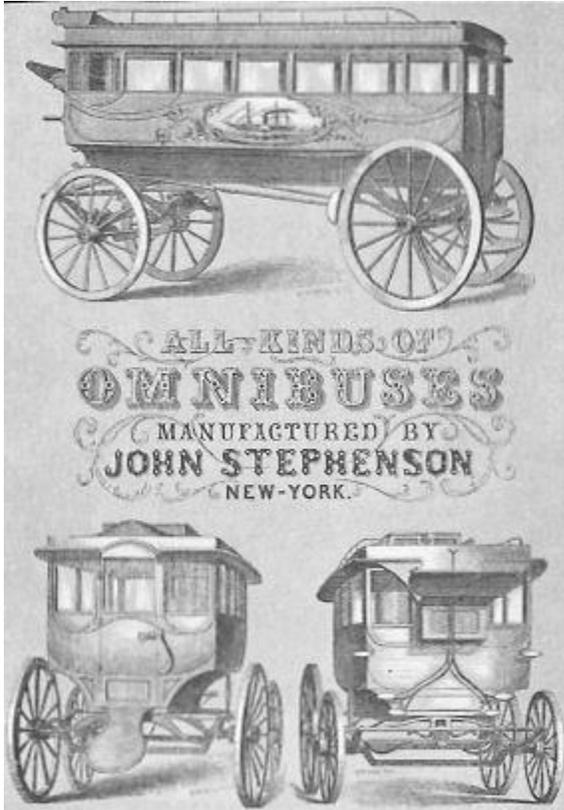
Thus, in London in the 1830s, omnibuses had replaced many of the short stage line vehicles, although in aggregate there was still a significant increase in vehicles because of the lower omnibus fares.²⁵

The Omnibus in the United States

In the U.S., true publicly accessible transportation started in 1827 in New York City when Abraham Brower introduced a single twelve-seat horse-drawn vehicle he called, *The Accommodation*, built by New York coachbuilder John Stephenson. It was different from a stagecoach in that it was designed to pick up and drop off passengers over a shorter distance — the length of Bleeker Street to Broadway. The fare was 12½ cents, regardless of distance.²⁶

Brower's *Accommodation* was so expensive for ordinary people that it was two years before there was sufficient demand for him to be able to build and operate a second vehicle. In 1829 Brower had Stephenson build him another vehicle, the *Sociable*, with a rear entrance and seats running lengthwise.²⁷

In 1831, Brower had Stephenson build the first American vehicle that was called an omnibus and this became, with minor modification over time, for many years the major form of public



transportation in New York.²⁸ Other operators soon introduced omnibuses in New York with seats running lengthwise and rear entrances. Their exteriors were “adorned with fantastic figures ... in gorgeous colors” with names such as *Lady Clinton*, *Lady Washington*, *Phoenix*, and *Blue Bird*.²⁹

The fare for the two miles from Battery to Bond Street was 12½ cents. Since the average daily wage of the time was \$1.00 for laborers and \$1.73 for artisans it meant that commuting would consumed 14-25 percent of these workers' wages. Commuting by omnibus was therefore, only for the affluent.

Fares on the omnibus declined to 5¢ over the next thirty years as competition increased and operators became more efficient. Lower fares combined with rising incomes made the omnibus more affordable and ridership grew steadily.

New York had 255 omnibuses in 1846 and 588 by 1856.³⁰ By 1860 the average time between vehicles on Broadway was 15 seconds. New

York was not alone as Boston also began service in 1829, Philadelphia in 1831 and Baltimore in 1844.

A contemporary New York physician described his fellow passengers as,

*“... a load of men, women and children, in silks and rags — bankers and brokers, tinkers and tailors, laborers and lawyers ...”*³¹

And the noise he described as,

*“...the continual rumbling of ponderous wheels on flinty tracks — the clattering of legions of iron-bound hoofs, as though rushing to battle — the metallic rattling of bars of iron and roads of steel on the dray-man's cart — the gong-like, tornado-like, oceanic, unceasing roar and tumult of this bustling street...”*³²

And the traffic grew to where,

*“uptown-bound traffic congealed into a solid mass.” and you could sing as loud as you wanted in the “...heavy dense uninterrupted street bass of Broadway.”*³³

Steam vehicles on the roads

*“... the steam road-wagons, which, since 1784, have appeared and reappeared on the scene at intervals of about thirty years; in each instance springing into a brief notoriety, only to vanish by reason of their inherent defects.”*³⁴

Some mention needs be made of steam on the roads, which while not succeeding in the end, did promise at times to be of importance in public transportation and does show that entrepreneurs were busily trying everything.

During the 1820-40's a few entrepreneurs experimented with steam driven coaches on the roads.³⁵ In 1830 Sir Goldsworthy Gurney of Great Britain designed a large stagecoach driven by a



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steam engine that may have been the first motor-driven bus.³⁶ However, it blew up the following year.³⁷

In 1836 Walter Hancock's steam carriages were put in regular service on the road from Paddington to the City of London. Over 20 weeks, 13,000 passengers were carried on 700 round trips.³⁸ While convincing of steam's potential the carriages were discontinued.

Mechanical problems, opposition from landowners together with regulatory issues and fear on the part of the general

public appeared to prevent any widespread and continuous use of steam on the roads.

Steamers held the land speed record through 1906 and were still used for heavy trucking as late as 1917³⁹ and for uses on macadam-surfaced roads the last steamroller was manufactured in 1948.⁴⁰

While steam driven cars were active in the U.S. particularly by the Stanley Motor Carriage Company's Stanley Steamers, there is no record of any successful American attempt to develop steam vehicles for public transportation.

Ferries

Ferries were important in the very early days before the bridges and tunnels linking both sides of Manhattan to Brooklyn on one side and New Jersey on the other.

Ferries were Manhattan's earliest commuting method and for some years may well have carried more commuters than all others combined.

Ferry service began with a Royal Charter in 1700 but it was not until the early 1800s and Manhattan's spectacular growth that Brooklyn and Jersey City became attractive as homes for Manhattan workers.



In 1855, an estimated 7 million people a year used the Jersey City ferries. They did not all come from Jersey City which at that time had a population of fewer than 10,000. The New Jersey Railroad brought passengers from Philadelphia and elsewhere to its Jersey City terminal. Soon, 850-ton ferries, carrying 2,000 passengers each, as well as horses, wagons and carriages, crossed the Hudson every 10 minutes, 15 minutes at night.

The traffic across the East River was even greater and more frequent. A fleet

of six ferries combined for 1,250 ferry crossings a day from Williamsburg to Peck Slip every 10 minutes and every five minutes to Grand Street.

In the year 1860, the East River ferries carried nearly 33 million passengers. That would increase to 50 million a year by 1870. In 1860, a third of Brooklyn's 300,000 population commuted to New York City each day.

That all changed with first, the Brooklyn Bridge in 1883 and then a series of other bridges over the East River. The peak year for the Brooklyn ferries was 1907.

Then in the early 1900s a series of tunnels were built under the Hudson River. The Uptown and Downtown tube tunnels brought the trains to Manhattan and the Holland tunnel brought the bus, truck and automobiles.

Thus, the Manhattan to New Jersey ferries peaked in 1927, and today, with the exception of the free Staten Island ferry, and some small operators, there is very little ferry traffic left.

Commuter ferries have developed elsewhere in the U.S. particularly in Seattle's Puget Sound, and to a lesser extent in the San Francisco Bay Area.

Commuter rail

"In spite of the widespread tendency to think of commuter rail as cheap rail transit, experience throughout the world demonstrates that the notion that commuter rail services can provide low-cost commuter transportation is largely illusory. Few, if any, examples of unsubsidized commuter rail operations exist, and in most instances the subsidies for commuter rail operations per passenger carried are enormous, typically exceeding those required for even light and heavy rail transit." U.S. Department of Transportation.⁴¹

Commuter rail is a service provided by passenger trains operating between city centers and suburbs and beyond to commuter towns. The term *commuter* stems from the practice of the early steam railroads to commute the fares of regular riders. Railroads issued *commutation tickets* and *commuters* were those who used them.

Beginning in the 1830s steam train lines were built with terminal stations at or close to the edge of the largest cities. Typically, both costs and regulation prohibited building closer to city centers. For example, all during the 1800s the closest train station to the center of New York was Central Station at 42nd Street, four miles from Wall Street. In London, the rail stations formed a starfish pattern around the built-up extent of the London that existed in the mid-1800's as rail was developing.

While it was not their primary business, the railway companies offered commuter service. Economics would only allow a stop every 1½ miles or so mainly because of the cost and operation of the necessary rail stations. This led to new villages growing up within walking distance around the rail stations sometimes forming a string-of-pearls effect. Most of the stations were within ten miles of their city centers.

The first of such lines was the New York and Harlem Railroad that opened in downtown New York City in 1832 with the eventual intent to reach the Harlem River. The permitted rate of expansion of the line and the limitations placed on it give us an indication of the burgeoning growth at that time of not only New York but all U.S. cities.

The line opened offering service between Prince and 23rd Streets just two miles apart, with locomotives down to 14th Street and below that regulation required that the line operate horsecars so as not to disturb local residents. In the ensuing few years, as the locomotive rail lineage moved further uptown to meet residential growth, the horsecar regulatory requirement also moved up, first to 23rd street, then 32nd Street, and finally in 1850 to 42nd Street, where it remained. By 1850, the line expanded in stages both south to City Hall and 127 miles north to Chatham where it met other lines and provided service through to Albany, the State Capitol.

By 1835 Boston had eight commuter rail lines. They offered low-priced commutation tickets but never did cover their costs. By 1848 there were 83 commuter stations within 15 miles of downtown Boston.

It is difficult to determine the volume of urban transportation the steam trains provided because operators commingled passenger counts with those of their longer distance passengers. In London, the passenger volume was greater because the government required railway companies to subsidize urban commuters. In the U.S. however, commuter rail was usually for the more affluent.

1850-1888, the horsecar takes over

The first U.S. horsecars — horse drawn cars on street railways — ran on the New York & Harlem Railroad as a regulatory required adjunct to its locomotives in Manhattan in 1832.⁴² New Orleans followed with a line the same year but both must have been a little premature because there was little further growth of the U.S. horse-car rail lines until the 1850's.



From the 1850s on,⁴³ horsecars expanded rapidly. The car on rail needed a third to a half the horsepower (literally) to carry the same load. For example, an innovative French horsecar line was convertible from flanged steel wheels running on rails to regular wheels when the rail line ceased as it entered central Paris. However, as it did so it had to add a third horse to pull the same load.⁴⁴

Since the cost of horses and their maintenance was a major part of the total expense, they proved less expensive to operate than omnibuses.

A significant decline in the cost of iron and steel during this period led to the displacement of the omnibus by the horse-car. The difference was simply that the horse-car used flanged iron wheels and ran on iron rails.⁴⁵ This offered a much smoother, quieter, more energy efficient and faster ride than the omnibus with its iron-shod wooden wheels rolling over cobblestone streets.

Underlying these were the changes in the fundamental technology of steel making and electricity generation. Steel production was quite low until the invention of the Bessemer process, which both improved the quality and lowered costs.

Experiments in the UK and U.S. in the 1860s showed that steel rail outlasted iron rails several times over.⁴⁶

In 1870 only 77,000 tons of steel were produced in the U.S. By 1875 that increased to 376,000 tons, and by 1890, 4,800,000 tons. Clearly, 1870-80 was the period when steel came alive in the U.S.

These new steel processes, principally the Bessemer process, allowed grooved flush rails to be produced at a much lower cost.

The generation of electricity was born at the same time. In 1880, we find no listing for electricity generating plants in the census data. The next count was in 1889 and there were 120 plants and the following year 447. The primary use of electrical energy in these early days was for streetcars, with many of the streetcar companies owning the electrical utility.⁴⁷ This was a major factor in the awarding of franchise agreements since there was typically not enough business in most towns for two electrical utilities.

While the horsecar replaced the omnibus in most places by the 1880's, omnibuses continued to operate for many years afterwards where street railways were not allowed such as along Fifth Avenue in New York.

Street railways were not welcome in fashionable neighborhoods either in London, Paris or New York. Affluent residents claimed they would reduce the value of their property and make the finer shops less exclusive.⁴⁸ In London the authorities had forbidden the use of street railways anywhere in the center of the City.

The primary transportation in 1905 in these exclusive areas was the horse-drawn omnibus a vehicle which had largely disappeared in the U.S. by that time.

In 1900, London's largest omnibus company, the London General Omnibus Company, still owned 17,000 horses and 1,400 omnibuses and the Thomas Tilling Company owned 7,000 horses and 500 vehicles. In London, the prohibition allowed the omnibus to have business not only in central London but also in the suburbs for those people who had to cross central London since they did not need to change vehicles.

The last horse-drawn omnibus finally left London's streets in 1911 and in New York's a little later — and then only when after the motor bus had proved itself.

The exclusion of surface rail from central London was, therefore, the driving force in the development of the motor bus much earlier than was the case in the U.S. except in New York where a similar situation existed, but only along Fifth Avenue.

Boston installed a street railway from Harvard to Union Square in 1852⁴⁹ and Baltimore in 1859. From this point on horse-car lines grew steadily throughout the U.S. in most towns of any size. From very little mileage in 1850 there were over 400 miles of track by 1860.⁵⁰

While the term horsecar was used generically, a great use was made of mules especially in the hotter climates. Generally, mules stood the heat better, and horses the cold. Horses being stronger were better for dense traffic and greater inclines although they were more expensive to keep than mules.⁵¹

The faster speed of the horse car on rail pushed the outer limits of a commute out to four miles from the three miles that it had been using an omnibus. The addition of a new one-mile outer ring meant that the new area suitable for suburban use nearly doubled in size.

However, the new property could not be developed until the horse car lines were actually in place since they were the only way to get to work. They were as essential to real estate development as any other utility. Thus, developers invested in public transportation throughout the initial expansion period into the early 1900's. At times, they either owned the companies or subsidized construction.

In the 1850's the horse-car was still not affordable as a commuting vehicle for the average worker. New York City, as an example, was still quite small. Its 500,000 population was densely packed into a 3-mile length of Manhattan with only the affluent living farther out since they could afford the horse and carriage necessary for the journey.

By the 1880's, throughout the U.S. there were a total of 100,000 horses and mules pulling 18,000 cars on 3,000 miles of track⁵². In 1882, there were a total of 412 different horse-car lines in the U.S. and Canada.

Fifth Avenue omnibuses reached up to 42nd or the horsecars on 3rd, 6th, 7th and 8th Avenues and Broadway which all ran up to 59th St. by the late 1860s.⁵³

In New York City alone, the city government had had to remove 1,250 tons of manure, 60,000 gallons of urine and 40 dead horses daily.⁵⁴ This was a major sanitary problem for the larger cities.

However, no one realized the impact the electric streetcar was about to have. The horse-car was at its peak and would shortly be replaced by the streetcar.

Cable cars

Cable cars also played a significant but brief role during the 1873-1890 period. Essentially, they provided an interlude of horse-less travel before the introduction of the electric streetcar. They are now used solely in San Francisco where they are charming but highly expensive to operate.



Cable cars are propelled by a moving one-inch diameter wire cable that is threaded through city streets in a conduit about 9" below street level. A steam-driven winch drives the cable through the conduit at a continuous steady speed of about 8 mph. The car operator uses a grabbing device on the car to hold the cable that then pulls the car along. The operator stops by letting go the cable and applying brakes.

This San Francisco cable car is no different than it was a hundred years ago. While it has to be very heavily subsidized it earns its keep as a great tourist attraction.

Cable cars were a great improvement over the horse-cars. They were much faster and far better at climbing steep grades. They were introduced to hilly San Francisco in 1871 and property values on Nob Hill doubled overnight.

By 1890, 500 miles of cable track had been installed in the U.S. and 5,000 cars were operating on them carrying 400 million passengers annually in 16 cities. Chicago was the biggest system with 86 miles of track, then St. Louis with 45 miles and Denver with 44 miles.

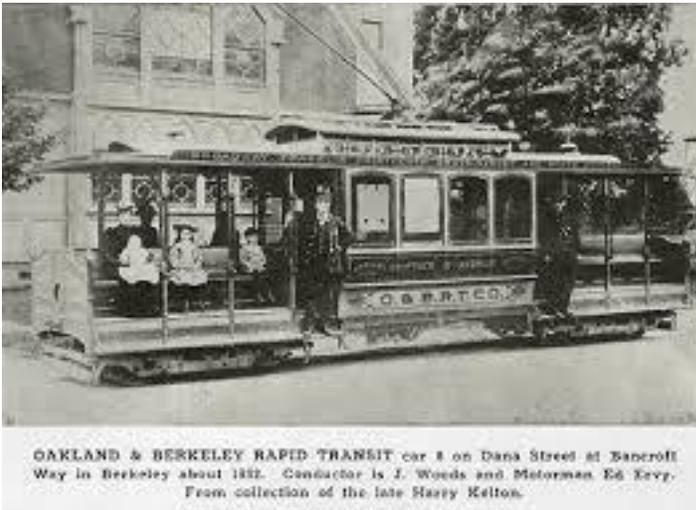
Streetcars replaced cable cars in Providence and Philadelphia in 1895, Baltimore in 1897, Washington in 1897 and St. Louis in 1902. San Francisco has cable cars to this day but they are more for tourism and charm than for efficiency. Other than San Francisco, the last city to replace them was Chicago in 1906. The brief life of the cable car as a practical means of transportation was over.

Streetcars 1888 - 1955

The development of electric streetcars spelled the end of the horse-car. The advantages of the electric streetcar were overwhelming. Without the clatter of steel-shod horses' hooves and their manure the streets were much quieter and cleaner. Streetcars also ran at twice the speed of horse-cars thus allowing commutes that opened up vast tracts of suburban land that had formerly been inaccessible. The horse-car virtually disappeared within ten years after the introduction of the streetcar.

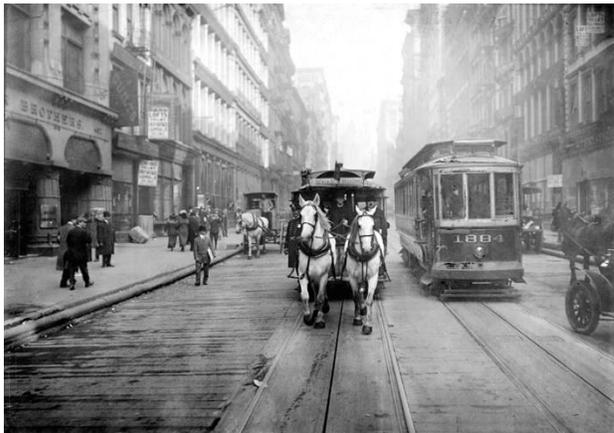
There had been various attempts to develop electrically driven versions of the horse car from the late 1870's on. The first city to have all-electric transportation was Montgomery, Alabama in 1886. The system was not very practical and did not catch on.

By 1887 electric streetcars were what one historian describes as "a faltering fact" even though an 1888 review of U.S. transportation systems does not even mention them.⁵⁵ At this time there were only 60 miles of track and less than 100 streetcars in all America. This hodge-podge of vehicles operated on high and low voltages, received their electricity using third rails, underground conduits, or from overhead trollers. Their motors were sometimes on or under the cars or even out in front. The drive was by belts, chains or gears. To complicate the issue small steam engines⁵⁶ on 534 miles of street railway line also carried 287 million riders annually for a brief period.⁵⁷



— a nearly twenty-fold increase — whereas horse car lines had shrunk to 250 miles, a twenty-fold decrease.

In England, the authorities accepted streetcars with reluctance. The first service did not begin in London until April 1901 because there was concern with the unsightliness of rail's overhead electrical wiring in the city's streets.⁵⁸



The result was that the authorities banned street railways from the central core of London altogether. In the outer London area, they allowed only half of the street railway mileage to have overhead wire. The others took their electrical power from conduit buried well below the street surface.

Streetcars normally use a trolley pole to collect their power supply from overhead wires. Note in this photo that the streetcar has no trolley pole above it, nor are there any overhead wires. Instead, it collects its

electric power from the buried conduit line which is the line between its rail lines. It uses a probe inserted in the rail to engage with the power line.

The British were critical of the American disregard for the aesthetics.⁵⁹ They said, "...there were many places in America — small towns and suburban districts — where the cheap, overhead wiring could be slung above the streets without veto from the local authority."⁶⁰

Even in those areas of London that allowed streetcars, half of the rail mileage used underground conduit to transfer electric power to the vehicles.⁶¹

In the U.S. the only underground electrical conduit systems in U.S. were installed in New York and by the Metropolitan Railroad of Washington DC in 1895.⁶²

The problem with conduit operation was not only the higher cost of installation but also the cost of far more maintenance from the difficulty of clearing snow from the conduit to the mischief of small boys inserting metal items to short circuit the lines.⁶³

Then Frank Sprague developed the first practical electric streetcar system in Richmond, Virginia in 1887. It was in full operation by 1888 and its success would totally transform the American city. Boston's adoption of Sprague's concept in 1888 broke the dam and by the end of the year there were 200 electric streetcar systems either in operation or under construction. Within two years there was 1,260 miles of electrified track in the U.S. compared to 5,700 miles of track for horse cars. The next twelve years saw dramatic changes. By 1902 there was 22,000 miles of streetcar track

Since the streetcar doubled the land area accessible to the city population, new house lots naturally became larger than the existing ones.⁶⁴

At first, housing construction only took place within walking distance of either side of the main streetcar routes radiating out from the central city. Accordingly, real estate development took on a starfish shape. The areas between the arms of the rail lines remained as farm land long after areas on either side had been highly urbanized.⁶⁵ Then, over time, operators built cross town rail lines to fill in the areas between the main radial lines.

The streetcars were still for the middle class and not for the truly poor. The poor remained in the central city within walking distance of jobs; streetcars were still too expensive for them for regular daily travel.

Special variants of the streetcar lines were the interurban lines⁶⁶ that ran between the cities and towns all over the U.S. They ran along the streets when in town and on their own right of way transiting between towns. At one time, it was possible to travel from Boston to New York by interurban electric streetcar. To travel from Boston to New York by streetcar meant using 12 different streetcar lines and 20 hours travel time and cost \$2.40.⁶⁷ New York to Chicago was a much longer trip once made merely to prove the point by the editor of *Electric Railway Journal*.

It is instructive to leaf through one of the many pictorial histories of the streetcar to realize how much the streetcar pervaded the lives of everyone at the turn of the century. Even towns with populations of only 25,000 had streetcars.⁶⁸ Streetcar companies developed cemeteries at the ends of their lines and so, naturally, there were special funeral streetcars charging \$15 for a three-hour usage. It is difficult for today's American to envision using public transportation to bury a loved one.

Streetcar lines always preceded suburban development because it was the only way that average people could travel around. Thus, at the end of any streetcar line there was open country. What followed was the building of parks, cemeteries, fairgrounds and ball parks all encouraged by the streetcar companies. In those days, the busiest day for the streetcars was Sunday. "Take me out to the ball game," meant, take me out there by streetcar.

America had become mobile. By 1917 streetcar systems consisted of 80,000 passenger cars on 45,000 miles of track and the following year saw the peak for miles of track. Note that the peak of rail mileage was a few years before the peak of *ridership* and maybe before anyone could foresee that future ridership declines would prove to be a major problem.

The Els and the Subways



*"New York's most important manufacturing industry was the mass production of ready-made clothing, and this was founded on the 'ghetto.' If, late at night, you rode uptown from Chatham Square on the Second Avenue elevated, every window of the big tenements, lining both sides of the way like continuous brick walls, gave you a glimpse of men and women hunched over sewing machines or, half-naked, wearily pressing garments in a cloud of hot steam. The elevated was a gangway through a vast workroom where multitudes were forever laboring, morning, noon and night."*⁶⁹

In most of the towns and cities throughout the U.S. the evolution of public transit was from the omnibus to horse-cars, maybe cable cars, then streetcars and later, motor buses. While this was the norm in most cities, in the bigger cities *rapid transit* played a major role. Rapid Transit is a

term of art for heavy rail transit. This is typically high-occupancy trains, gathering their power from a third high voltage rail.

The story of New York's elevated rail lines is an example of politics getting in the way of evolution. London had successfully operated subway service beginning in 1863 and it was only logical that New York do the same. However, the powerful horse-car lobbies intervened and managed to block their development. They were not, however, able to block the development of elevated rail lines — the Els — even though inner city residents were on their side and had resisted the Els as being for the affluent suburbanites — to the discomfort of inner city residents.⁷⁰



Objections to the proposed elevated rail lines came from shopkeepers and residents affected by the noisy steam trains that would cut out the light to their stores and come by their windows. However, the strong public demand for rapid transit service separated from the street level traffic overcame all their objections. After some abortive attempts, elevated service began in New York in 1871. By 1876 there were forty steam trains daily from Battery to 59 St. The fare was 10 cents — 5 cents in the rush hour. The Els expanded quickly throughout the late 1800's with the last extension built in 1920. Operators substituted electric power starting in the late 1890's. Boston, Chicago and Philadelphia only allowed Els after electrification.⁷¹

Subways provided the same advantage of transportation service separated from street traffic. The underground cars were inaudible from the street whereas the Els were of iron or steel and incredibly noisy. The subways were out of

sight whereas the Els were a constant visual blight. Once the first subway opened and its advantages became obvious, cities with Els began replacing them with subways. By the end of the 1950's the Els no longer existed in any city core area other than the Chicago Loop.

Today's city residents cannot quite believe that the Els were ever built. One transportation expert recently said:

*"How the elevated railroads could ever be built, let alone endure for as long as they did, is astonishing for the public and private outrage against racing, dirty, noisy locomotives down the middle of four of the principal avenues of the city was enormous...the worst seems to have been the noise — the deafening, bewildering racket of countless trains thundering along the overhead iron bridge, every sound and vibration intensified and reflected downward by the huge sounding board of the structure and the car bottoms."*⁷²

However, the EIs were a U.S. phenomenon almost exclusively. Chicago opened its first elevated in 1895 and completed the Loop in 1897. Kansas City, Chicago, Boston and Philadelphia also built elevated rail lines during the late 1800's but only in New York was it the dominant form of public transportation.

Big city traffic congestion continues



Traffic congestion began to be a serious problem in London and other European cities in the early 1800s and then began to seriously impact New York City in the 1850s with its burgeoning of population. These occurrences of transportation gridlock were long before the advent of the automobile.

Traffic congestion was simply caused by a rapidly increasing density of population with little or no increase in road space.

The lack of adequate inexpensive public transportation meant that the workers all had to live within walking distance of their work. This led to multi-story tenement buildings and greater density than any city since Ancient Rome. It was understandable that this would produce such a congestion of people and traffic.

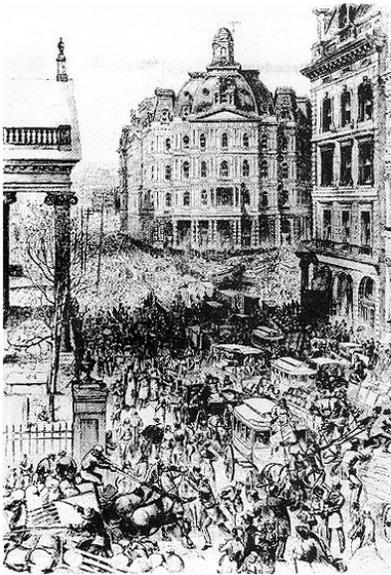
The accounts of the 1850s, and later, paint a picture of horse-drawn vehicles choking streets slippery with horse manure and urine. Just crossing the street was a dirty

and dangerous undertaking.

What also exacerbated the congestion problem was that as New York City grew, land became more expensive and led to significant changes in the industries located there.⁷³

With increasing land values those businesses requiring extensive space and bulk handling such as stone cutting moved out (p51) and small manufacturing such as piano and other musical instrument manufacturing (p58) moved in.⁷⁴ These changes led to even greater congestion of population since small manufacturers would employ more workers per square foot than the stone masons and similar businesses they replaced..

New York tried to solve the problem with elevated rail transit but the city's rapid growth constantly overwhelmed it. This was not surprising since the expansion of the elevated rail lines was accompanied by the building of skyscrapers and more dense tenement buildings.



Compounding the problem was that not only could the working class not afford public transportation to move out of the city⁷⁵ but, "It is quite useless to blame a working man for hesitating to move from the city, which is filled with pleasure and excitement, to settle in some small humdrum town."⁷⁶

It is illustrated on the opposite page and was well described by a contemporary,

Carts, vans, grocery and express wagons, mingle with the great drays, which, loaded high with hides, paper bundles, and other bulky materials, drawn by enormous Norman horses, force their way by superior weight and momentum through the press. United States mail-wagons, claiming undisputed right of way, work their way in and out of the throng; and sometimes a hack, in haste to make a short-cut to the boat-landing, venture into the dangerous maze of heavy

vehicles, with the uncertain prospects of emerging on time and unharmed. In the mid-day hours, and notably from two to four in the afternoon, the moving counter-processions tangle up her into seemingly inextricable blockades...So the crush goes on, to continue and intensify until adequate means are found for the transportation of freight through the commercial quarter of town.⁷⁷



Horse-drawn streetcars subsequently made New York's congestion worse because, owing to the rails they rode on, they had no maneuverability. And the arrival of the electric streetcar made little difference since,

"The existence of a double line of [street]cars moving on a fixed track and claiming the right of way over other vehicles is a hindrance to the even flow of traffic, for it both delays traffic and is itself delayed."⁷⁸

Until well into the 1900's street traffic in the larger cities mainly consisted of electric streetcars and horse-drawn wagons. As can be seen from the 1910 photo on the opposite page of Chicago streets, automobiles were not the cause of traffic congestion. The major problem was that streetcars had no maneuverability. The horse-drawn drays were maneuverable but traveled even slower at around 3.2 mph.⁷⁹ In addition, the streetcars had to load and unload in the middle of the street and the drays had to load and unload at the curb.⁸⁰

Trade vehicles		Passenger vehicles	
1 horse (fast)	3	Electric Trams	10
1 horse (slow)	7	Omnibus (horse)	5
2 horse (fast)	4	Omnibus (motor)	3
2 horse (slow)	10	Cabs (horse)	2
Motor (fast)	2	Cabs (motor)	1
Motor (slow)	5	Carriage (horse)	2
Barrows	6	Carriage (motor)	1
Cycles	½		

In a 1916 City Planning Conference in Cleveland, U.S. planners discussed a British table⁸¹ showing their assessment of the weighed causes of traffic congestion, which is produced here. Note that the electric trams (streetcars) are considered the worst cause along with two-horse drays.

It is well to remember that during this period the heavy traffic congestion was in the central part of the cities whereas today the congestion tends to

be heaviest on freeways and highways approaching the central city.

In 1880 New York City removed fifteen thousand dead horses from its streets, and as late as 1912 Chicago carted away nearly ten thousand horse carcasses.⁸²

1900 there were 190,000 horses. Each horse produced seven tons of manure annually. Thus, Manhattan had to cope with a million tons of manure annually together with dead horses in the street.⁸³

Towards the end of our period, it began to be clear to New York’s city planners that just building transit was not working to reduce congestion.

"I believe it has been pretty well demonstrated that rapid transit has increased congestion...to diffuse the population by one means or another is the solving of our present problems in city planning."⁸⁴

Noted planner, Edward Bassett, wrote of,

"supplementing the rapid transit plan by a system of regulatory laws that would prevent overbuilding at locations affording the best transit facilities. The view was expressed that if the new subways produced only increased congestion of living and business conditions, they would be a doubtful benefit to the city."⁸⁵

Some improvements began to appear around mid-decade as horse-drawn drays were replaced by motor trucks, which because of their speed and maneuverability greatly reduced the congestion caused by the slow drays.

At the Peak

In the ten years preceding the 1923 peak in streetcar ridership, the automotive revolution began to affect public transportation.

The automobile was taking commuters away from public transportation. This was offset somewhat by the considerable increase in average wages during this period that allowed more working people to afford public transportation.⁸⁶

The streetcar companies began to experience severe financial difficulties in the decade leading up to their peak ridership in 1923. They had over-extended the rail mileage with very shaky financing. The various municipalities were demanding that the street railways extend their mileage even further into the suburbs. The public was no longer riding as much during the evenings and weekends and so the service became highly peaked during the commute period, which affected profitability. The public was demanding that the streetcar companies maintain the 5¢ flat fare. At the same time, inflation became a problem with the institution of income taxes, the establishment of the Federal Reserve system and the onset of the First World War. At the end, while ridership was increasing it was just before the peak and nowhere near the rate of increases that the rail companies had been expecting.

It was not then surprising that in 1922 it was reported that, “between 1915 and 1920, 91 electric railway companies operating 5,330 miles (or more than one-fifth of the total electric railway mileage in the United States went into receivership.”⁸⁷

Still, the public had no sympathy for the streetcar companies. They regarded them as,

*...heartless monopolists squeezing the last pennies out of widows and orphans who had little choice but to ride their rickety, dangerous cars.*⁸⁸

Workers had no other choice for transportation and it was expensive. Five cents in 1906 was the price of a loaf of bread. In that year, a seamstress would have to work almost an hour to earn her daily carfare.⁸⁹

As an example of the dangers, between March 5 and April 25, 1906, Chicago streetcars killed 21 and injured 86.⁹⁰ By the end of November, streetcar and El accidents killed 132 Chicagoans and injured another 1,314. In New York, 42 people died in one 27-day period from mass transit accidents.⁹¹ Public opinion was quite supportive of public ownership of the streetcar companies as the solution.⁹² Despite many political battles, significant public ownership would not occur until the 1960's and for different reasons.

It was inconceivable at the time for people to believe that within forty years the streetcars would cease to exist. But the wolf was at the door; the automotive revolution would be unleashed in full force. The motor bus would take over public transportation.

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