

Horsecars: City Transit Before the Age of Electricity

by John H. White, Jr.

Horsecars were the earliest form of city rail transit. One or two horses propelled light, boxy tram cars over tracks buried in the streets. Only the tops of the iron rails could be seen; the rest of the track structure was below the surface of the pavement. The rails offered a smooth, low-friction surface so that a heavy load could be propelled with a minimal power source. The cars moved slowly at rarely more than six miles per hour. They were costly to operate and rarely ventured much beyond the city limits. There was no heat in the winter nor air-conditioning in the summer. Lighting was so dim that reading was impossible after sunset. Horsecars were in all ways low-tech and old wave, yet they worked and moved millions of passengers each day. They were indispensable to urban life. The public became enthralled with riding and would not walk unless the cars stopped running. Horsecars were a fixture in American city life between about 1860 and 1900. Even the smallest city had at least one horsecar line.



Grand Street, New York, at Night, 1889.
From *Harper's Weekly*.

Basic Statistics for U.S. Street Railways in 1881

415	street railways in operation
18,000	cars
100,000	horses
150,000	tons of hay consumed each year
11,000,000	bushels of grain consumed each year
3,000	miles of track
1,212,400,000	passengers carried
35,000	employees
\$150,000,000	invested

Source: *Railway Review*, December 23, 1882

Millions on the Move

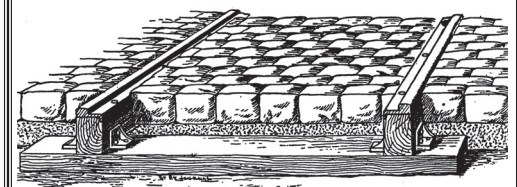
The earliest cities were designed for walking. Everything clustered around the town square. Churches, shops, taverns, schools were all next to one another. Apartments and homes were a few blocks away. Citizens might journey across town in a few minutes. But as municipalities expanded, so did travel time. It now required time and energy to move about the urban landscape. If the terrain was hilly, the effort involved became considerable. The children, the elderly and the disabled faced greater challenges. But even the very fit would rather ride than walk, human nature being what it is. Then as now, the number of trips required per day is considerable when we consider the reasons for going around town. They range from the essential to the frivolous, but all combine to create a

huge travel market that at one time was handled by public rather than private transport. This system worked very well so long as the travel was largely limited to going to and from the city center.

Why Track and Rails

Track offered a distinct advantage over roadway by greatly lowering the friction generated by the car's forward motion. Smooth iron rails provided a low-friction pathway for a smooth iron wheel. Any street surface, even a very good one, is, on the other hand, rough and uneven. A common horse can pull ten tons on a level track but only three tons on a good road and just a half ton on a poor road. Increasing the speed on any surface will naturally raise the power requirement. This is why all horse drawn vehicles generally ran at speeds of 5 M.P.H. or less. Only a very large, powerful horse has the strength to match James Watt's formula for one horsepower, which is to raise 33,000 pounds, one foot in one minute. The average horse can rarely generate more than half a horsepower.

Horse Car Track 1860 - 1880's



Rail 30 lbs per yard Ties on 5 foot centers
Cost \$18,000 per mile of double track
From Fairchild's *Street Railways*, 1892.

The Origins of Public Transport

The very wealthy did not require public transit and could easily afford a private carriage. The poor walked by necessity, but there was a limited demand for getting around by semi-public means. For-hire transport included human burden – that is, one person carrying another person. This one-on-one carriage has its obvious limitations, and litters enable two bearers to move a passenger over larger distances in more comfort. Such conveyances appeared in Asia around 1000 A.D., but they were not used in the west until late Roman times. These bed-like carriers often had a canopy and side curtains for greater privacy. Their use was limited to more affluent riders, but it established a system of

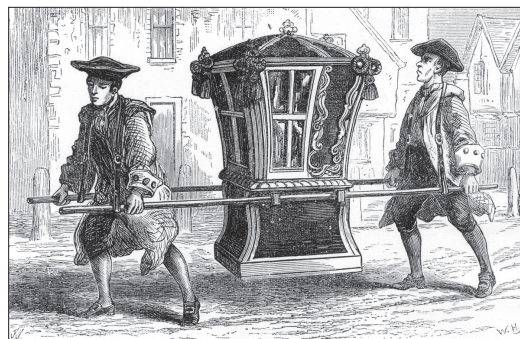
conveyance for a rental fee and so freed the user from also owning his own vehicle.

Sedan chairs introduced around 1500 were an improvement over the litter for patrons might ride in a seated position. Some were privately owned but others were on call for common carriage. By the time of Queen Anne, fares were fixed by law to one shilling per mile or 12 1/2 cents. Sedan chairs were used in colonial America to a limited degree in the larger cities.

An 18th century Sedan Chair,
from the *Book of Traveling*, 1877.

The Hackney Coach or Taxi

Horse-drawn carriages had been used for upper-class transit since ancient times, but poor folks rarely experienced such travel unless it was in a rude farm wagon. In about 1605, for-hire carriages began to appear in London. They were called Hackney coaches after a district in northeast London that was home to drivers of such vehicles. They were typically secondhand vehicles that were best described as serviceable, if no longer elegant; but they offered a form of intra-city travel not before available to middle-income patrons. A specific vehicle for this trade was created in 1834 by an English architect, Joseph A. Handsom (1803-1882). This two-wheeled carriage became something of a standard design for London taxis and its use spread to New York City by 1840. The comfort, speed and greater capacity of the Hackney coaches made the sedan chair obsolete in most western cities, but some remained in use elsewhere in the world for some time longer.



The Omnibus – Travel for All

The litter, sedan chair and taxi were all steps leading toward public transit. The originator of what is likely the first true transit service was a Parisian professor of philosophy, Blaise Pascal (1623-1662). Pascal was a famous mathematician and scientist, but he was also a do-gooder who felt more should be done to improve the life of ordinary people. And so late in life he introduced a system of horse-drawn vehicles that ran over a regular route on a fixed schedule and charged a modest fare. He gave the vehicle a Latin name, omnibus or “for all,” meaning everyone was welcome to ride. However, Pascal’s plan was subverted by a charter requirement limiting use to only “people of merit;” hence, common folks such as servants and laborers were not allowed access. For all its merit, the experiment was short-lived.



An Omnibus of about 1850.

In 1819 the scheme was reinvented in Paris and this time it would succeed. By then, Paris was much larger than in Pascal’s time and democracy had been established with the end of the monarchy a quarter-century earlier. The public nature of the omnibus seemed to suit citizens of the Republic. Within a decade the omnibus had appeared in both London and New York.

By 1840 New York had nearly 400,000 residents. One hundred omnibuses rumbled over its streets. Within thirteen years Gotham had almost 700 buses in service and was carrying 120,000 riders daily. The fare was set at a shilling (12 1/2 cents) since foreign coinage was legal in the U.S. until 1857. The fare later dropped to six cents. Philadelphia started bus service in 1831, Boston followed in 1835, and within a few years other American cities had such vehicles in operation. The driver sat on the roof and collected fares through a small opening in the roof just under his seat. Passengers entered through a rear door. It was a difficult climb up a narrow iron stairway. Bench seats on both sides held twelve passengers.

It Started in Manhattan

The New York and Harlem Railroad is often cited as the first streetcar line, but it was originally intended as a conventional steam-powered railway. The first cars were horse propelled and ran along 4th Avenue from Prince Street to 14th Street at Union Square. Operation began in November 1832. By 1838 the tracks reached Yorkville (86th Street), and within a year the N.Y. & H. reached the Harlem River. The lower end of the line was a very slow-speed, stop-and-go horsepowered operation. At 27th Street steam locomotives took over and trains were much like those on other American railroads. The success of the 4th Avenue line suggested that other intra-city rail lines might be a good thing. Most people would rather ride than walk, and so the 6th Avenue railway was organized in 1851. It opened a year later. More charters were granted and soon street railways were running on 2nd, 3rd, and 8th Avenues. By 1860 New York City and its neighbor Brooklyn had 142 miles of track and were carrying 45 million passengers a year. By 1893 the original Harlem line operated 8.5 miles of track, with 187 cars and 1,604 horses, and carried 21.8 million passengers. The property of this one line was valued at \$24.9 million. This profitable enterprise had been part of the Vanderbilt family rail empire since the 1860s.

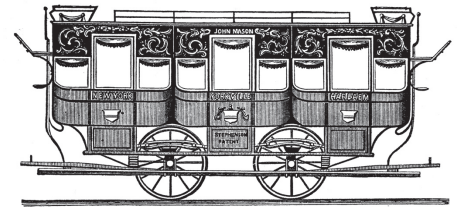
New York Herald

October 2, 1864

Modern martyrdom may be succinctly defined as riding in a New York omnibus. The driver quarrels with the passengers. There are quarrels about getting on, quarrels about getting off. There are quarrels about change and quarrels about the ticket swindle. The driver swears at the passenger and the passengers harangue the driver through the strap hole. Reputable clergymen in white chokers are obliged to listen to loud oaths. Thus the omnibus rolls along a veritable bedlam on wheels.

City Railroads Go National

Other cities were soon duplicating Gotham's railway network. Boston opened its first line in April 1856. Philadelphia's first horse railway started up in January 1858, and before the end of the year it had five other lines in service. By 1860, the City of Brotherly Love boasted of no less than eighteen streetcar lines and 155 miles of track. Baltimore and St. Louis joined the rush for modern transit in July 1859. Cincinnati adopted it in September of that year. The nation's capital held off until 1862. Smaller cities such as Louisville and Dayton opened their premier lines in 1864 and 1870 respectively. Tiny communities, such as Maysville, Kentucky, not wanting to be considered old-fashioned, adopted horsecars in 1883. By this time, almost every city of any size in the nation had at least one horsecar line in operation.



A Rail Car for the New York and Harlem Railroad, 1832, from *Stephenson* advertisement of 1873.

Horse Cars Go International

Transit ideas tend to jump national borders as entrepreneurs show a penchant for the latest technical innovations. Mexico City opened its first line in 1857 and so responded more quickly than some big U.S. cities. Faraway Java started a tramcar line the following year. England was at first reluctant to accept new ideas from America, but by the 1870s the British Isles were committed to expanding their city railway system. When the first such line opened in Paris in about 1853, it was called the "Chemin de Fer Américain." Victorian travelers soon found American-style horsecars operating in the Near East, India and China.

Traffic, Operations and Safety

The job of public transit is to move a large number of passengers over a short distance in comparative comfort and safety at low cost. It was not intended to be deluxe or fast service. Most lines ran from dawn to about 11:00 P.M. In a few very large cities, late-hours cars were run but on infrequent schedules and at a double fare. During rush hours, cars ran every two to three minutes and some lines carried over 100 cars per hour. Managers understood that if service was too infrequent patrons would walk and so cars generally ran at five to ten minute intervals during the off-peak hours. Some cities had no Sunday service in observance of the Sabbath.

The number of passengers was impressive considering the size of early American cities. In 1860 New York had one million residents yet its fledgling horse-car lines carried 36 million passengers in that year. Within a decade the population increased to 1.4 million but the horse-car traffic grew to 115 million. Similar numbers were recorded for other U.S. cities. By the early 1880s horse railways were carrying over one billion Americans each year.

With so many patrons, it might be assumed that profits were high. Most lines paid a dividend of eight percent, yet some produced much weaker earnings because of high operating costs that were generally figured at about 25 cents per mile. Fares were fixed by charter agreements at five cents. Passengers that rode the full length of the line did so at less than one cent per mile, which was a great travel bargain. Children rode at reduced fares and thrifty patrons could save on adult fare by buying tickets or tokens. These generally sold for about four cents each in lots of twenty-five for one dollar. Bogus tickets and coins offered an illegal way to ride for free. Tickets were popular on some systems – in Cincinnati, for example, 58 percent of the riders used tickets in 1881.

The earliest street railways started with a large number of independent operators. A city might have a dozen or more small street railways. This made cross-town trips costly because of multiple fares. Consolidation led inevitably to a large single monopoly. By the 1890s most cities' transit operations were run by a single independent operator. In a few cases, municipal operations were in place or under consideration.

Because of the inherent slow speeds of the railway, accidents did not lead to many passenger deaths. Injuries, however, were more frequent, and the majority of these were self-induced because so many patrons attempted to get on or off moving cars. Passengers on board cars were sometimes bounced off the end platforms when the car jolted over a rough piece of track. Horsecars were hit while crossing over the much larger steam railroad tracks, generally with disastrous results. A run-away team could prompt passengers to jump off a fast moving car. Pedestrians would occasionally walk in front of a moving car. Children were run over. There were always plenty of opportunities for injury as is true with any form of vehicular travel.



An overcrowded car, from *Leslie's*, Nov. 16, 1872.

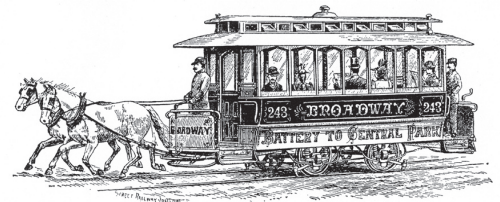
Cars for Summer and Winter Travel

The horsecar was a light, boxy wooden vehicle whose construction was based on earlier carriage and coach building techniques. Each part was made as small as possible to reduce weight. The best woods were selected for the same reason – oak and ash for the framing, poplar or cedar for panels, and cherry for sash and doors. A standard two-horsecar had a sixteen-foot-long body with seating for twenty

passengers. During rush hour up to ninety passengers might cram into this small space. The car itself weighed just over two tons but a full load of passengers could make the total weight three times as great. Side, bench-style seats had cushions in winter. There was no heating, and lighting was often limited to a small oil lamp at each end. Better cars had a large center lamp.

Open cars were often used during warm weather months; some cities, in fact, required their use. Smaller single-horsecars were used on lightly traveled lines. They required only a driver because a self-service fare box rather than a conductor. These fare-box or bob-tail cars were not popular with passengers but were well liked by operators because they reduced labor costs. A bob-tail car weighed only about 2500 pounds.

Horsecars were very beautifully painted with elegant striping and lettering. Gold- or silver-leaf letters were outlined in black. Interiors were varnished and the clerestory windows were glazed with color or cut glass panes. A full size car generally cost about \$1000 and was good for fifteen years of very hard service. The cars were swept out after each trip. They were washed down each night and the windows were polished. Their exteriors were varnished once a year to protect the fancy painted surfaces.

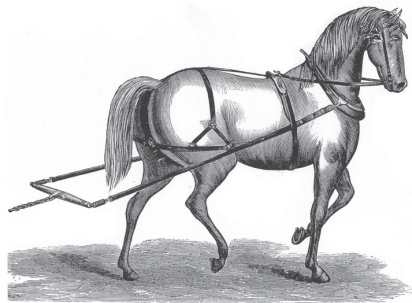


The Broadway Line, New York City.

Horse Power: A Living Motor

It was understood almost from the first day of the street railway that the horse was the weak link in its operational chain. Its limited power meant speeds were never more than a walk. It could be worked no more than four hours per day and was likely to perform for only about fourteen miles. Illness and foot problems meant idle days in the stable “hospital.” The horse needed help surmounting hills and reduced hours in hot weather. This meant that nine horses were needed to operate one car. Hence, large reserves of horses were needed to keep the cars running. This also meant large stables and staff to house and service the herd of high bred and mettlesome beasts. Horses required considerable rest, grooming, and high grade feed. Edison remarked that they were the poorest motor ever made and yielded a thermal efficiency of only two percent.

The Victorian era is often local transport remained horse electric motors were harnessed for and horsecars. The surface of New York City streets received Some 2700 street sweepers were cleaning problems but the task as a source of revenue – the 3rd



At their peak, around 1917, thousands were urban residents a year. They rarely lasted more

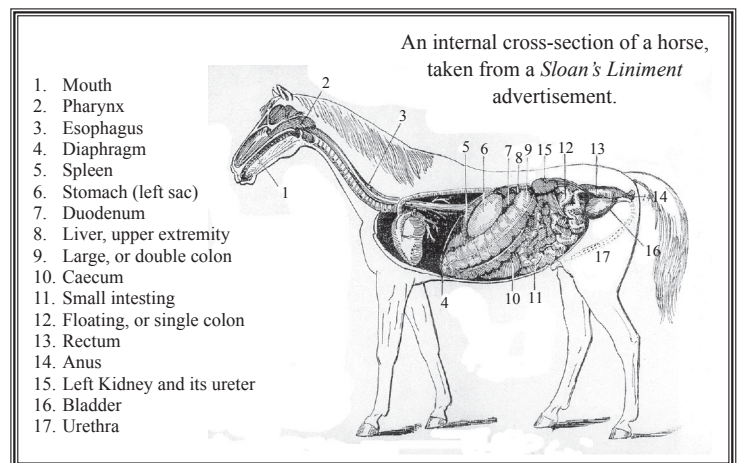
About 80 percent of horse ailments were foot related. Shoes lasted about twelve to sixteen days, so blacksmiths were constantly replacing shoes. Temporary shoes were carried on the cars should a shoe come loose during the trip.

The best horse for city railway use weighed between about 1050 and 1150 pounds. It was not too leggy and averaged five to six years old. Nervous and balky animals were rejected. The same was true for biters and kickers or animals easily spooked. Temperate, calm animals worked best in car service. It took two months for most to become used to street traffic and about a year to be considered seasoned. Horses were paired for compatibility and worked best with the same driver because the animals became accustomed to his smell and voice. Some aged beasts were kept on long past the normal four-year tenure. The Jersey City railway kept “Old Frenchy” in harness past his fifteenth year and he worked every day. He would, however, slip out of his halter at night and roam the stable to steal feed.

Horses were fed three times a day. A typical feed consisted of ten pounds of cut hay and fourteen pounds of ground oats and corn. A regular time for feeding was important and quantities were regulated because horses tended to overeat. Wheat was too costly and rich for horse feed.

John Harris, the General Manager of the Cincinnati Street Railway, started his career as a stable boy. He had spent his life working with horses, but when asked about the future of street railway in January, 1890, he said without hesitation that the day of the electric car could not come too soon.

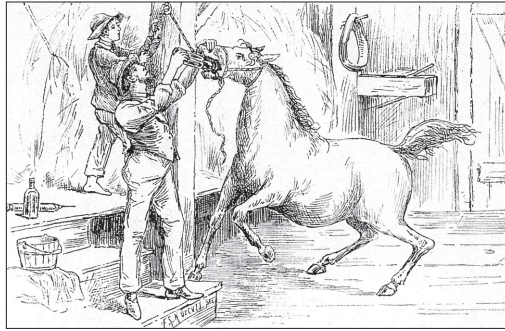
called the age of steam and so it was in most areas, but propelled until the 1890s when internal combustion and this service. City streets were filled with carriages, wagons, those same streets was coated with urine and feces. In 1881, 2.5 million tons of manure and 60,000 gallons of urine. employed to clean up the mess. Smaller cities faced smaller remained significant. Street railways looked to stable refuse Avenue Line in New York received \$14,000 a year for manure. the U.S. had 30 million horses. Most were used on farms, but as well. Street railways bought an average of 25,000 horses than four years because the hard pavement wore them out.



The Epizooty

Horses were subject to major and minor illnesses. Rest and mild medication cured most of these ills, but occasionally epidemics rendered large numbers of the equine population too sick to work. A virulent flu-like disease struck North American horses in the fall of 1872. It caused a general weakness, a hacking cough, and a watery discharge from the nostrils. Rest was the best cure. Veterinarians recommended going light on nitrate of potash, antimony, and Some animals were wrapped in

The disease started in States. By early November, to other major cities. Thousands generally about one percent. All shut down. Those accustomed cars were pulled by teams of could find no other employment. the recovering horses were once



The Great Epizootic of 1872

feed and heavy on the water. Medications made from digitalis were administered morning and evening. blankets. Flaxseed tea was recommended as well. Canada and quickly spread to the northern United 1872, it had reached New York City; soon it traveled of horses were affected but the fatality rate was vehicles dependent on horse power were temporarily to riding were once again pedestrian. In a few cases, men – mostly former drivers and conductors who And then after a few weeks, the crisis was over and again back in harness.

A.S.P.C.A.

The American Society for the Prevention of Cruelty to Animals was founded in 1866 specifically to protect horses. Most of us think of it as a cat or dog organization. Its founder, Henry Bergh (1811-1888), was a wealthy New Yorker who devoted much of his life to this cause. Draft animals, including those in street railway service, were overworked, which Bergh and his associates believed was abuse or torture. A police force of S.P.C.A. inspectors patrolled the city streets looking to prevent such incidents. Water troughs were set up around town by the organization so horses might find a drink. As electric traction and motorized vehicles replaced draft horses, the group turned its attention to protecting other animals.

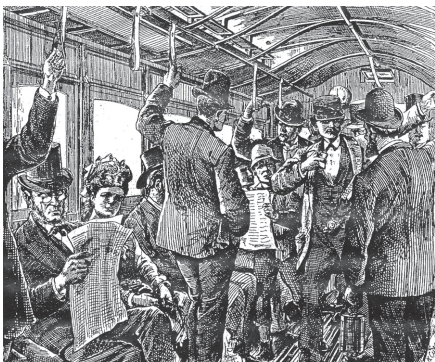


A drinking fountain for horses made by the Composite Iron Works of New York City; *Leslie's*, Sept. 14, 1872.

Drivers and Conductors

The driver stood on the front platform of the car to handle the horses, and the handbrake and to watch out for other vehicles. He had little contact with the passengers who were expected to enter or leave the vehicle from the rear platform. The conductor stood at the rear of the car to collect fares, assist patrons on and off the vehicle as required, and offer directions to those uncertain of how to get around town. He signaled the driver on when to start and stop by pulling on a rope that worked a small bell mounted under the roof canopy at the head end. He was the busiest of the car men for he had to make change and deal with the public.

It was surely not the worst job available to an unskilled worker. The pay was fairly good at \$2.00 to \$2.50 a day. The work was steady, for even during depressions the cars continued to run while many other workers were out of a job. It was not a dangerous occupation, such as mining or lumbering. The chance of being injured was small. While the cars were not heated, you were under a roof and out of the weather. And unlike that of most railroad workers, the job was close to home so you could sleep in your own bed every evening. There was no heavy lifting so strain and ruptures were not a hazard.



An interior of the 3rd Ave. Line Horse Car, 1875.

However, being the conductor, or the “Knight of the Punch,” surely had its down side. It was a very routine occupation, for you rattled over the same route every day facing the same quarrelsome customers and repetitious questions about destinations, transfer points, and “does this car go to City Hall?” Standing all day causes leg, feet and back problems. Meals were taken on the fly and eaten standing up. Food was generally delivered in a tin pail by one of the crewman’s children. Having a hot meal came only a few times a year.

The men were expected by many lines to buy uniforms and hats, which proved a big expenditure for a working man. Conductors had to furnish a bond for \$1000 plus a \$25 cash deposit as insurance against stealing cash fares. The bell punch used to register fares was a vexation to most men, but it was part of the job. Company spies, called spotters, were employed as another safeguard against the theft of fares.

But the worst aspect of the job was the hours. Car men worked longer hours than just about any other American worker did. It was a seven-day a week job at fifteen to seventeen hours a day, except for Sunday; that was only fourteen hours. These men were truly Slaves of the Rails. Most other workers labored ten to twelve hours a day and had Sunday off.

How Street Car Conductors Live

We average about sixteen hours' work a day. The car that goes out first comes in first. I breakfast at home, and one of my children leaves me my dinner on my noon trip up town. I either eat it in the car on the last stretch near Druid Hill Park, if the car is empty, or at the stables; or, if I am hurried, I wait until the down trip, and eat when there are few or no passengers, as we approach Patterson Park. My supper is sent to me in the same way. I don't get home until midnight, or after; but I hear from home when my dinner is brought me, when they meet me to get my basket and when they bring my supper. At night I take the basket home myself. I have one day to myself in each week, for which I am not paid. I generally spend it with my family at home in winter, or in the parks during the summer.

Citizens Passenger Railway –
Baltimore, *Railway Age*, Sept. 2, 1880

Strikes

There were labor disputes from the beginning of the street railway industry. Drivers in Cincinnati walked off the job demanding higher wages in March 1860. New York drivers struck six years later. Most such strikes were short lived because it was so easy to hire replacements in an age when handling horses was common. The New York dispute lasted eight days and service was seriously disrupted but there was little violence. Police escorts were employed to maintain what service there was and new drivers were found. Once again, capital prevailed and workers lost the strike. The Knights of Labor supported far more militant strikes in the mid 1880s. St. Louis streetcar strikers resorted to dynamite to blow up cars and so discourage the public from riding. Brooklyn and New York witnessed a major strike in 1886 when 10,000 men walked out. Streets were blocked, cars were overturned and burned and it took 900 policemen to maintain a semblance of order. This time the workers won. Part of the settlement included a twelve-hour day and thirty minutes for lunch.

Segregation

It might be assumed that anyone willing to pay the fare could ride on the cars, but this was not true for African Americans. Many lines, even in the north, ran special cars marked for “Colored People.” Elsewhere persons of color were expected to ride standing on the platforms. Philadelphia, a city famous for tolerance, was slow even to adopt special cars and debated the issue into the time of the Civil War. Finally, the Pennsylvania State Legislature outlawed segregated cars in 1867. The U.S. Congress had passed a similar law two years earlier for the District of Columbia, but it was not enforced. Individual conductors would refuse to pick up black persons or require them to ride on the platforms. The firebrand Sojourner Truth staged a one-person ride-in to end the practice. Truth had the support of the street railway president and other prominent whites, including some horsecar riders, but many of the conductors and drivers would not cooperate. It was an uphill battle

with many nasty confrontations and a few personal injuries but Truth persisted. After a year long struggle, she prevailed.

In the American south segregation was more institutional. New Orleans ran “Star Cars” for free colored persons and slaves. However, even during the Confederacy, educated and high ranking military blacks could ride in any car. Segregated seating finally ended in June 1958, many decades after the last horsecar operated over the streets of the Crescent City.

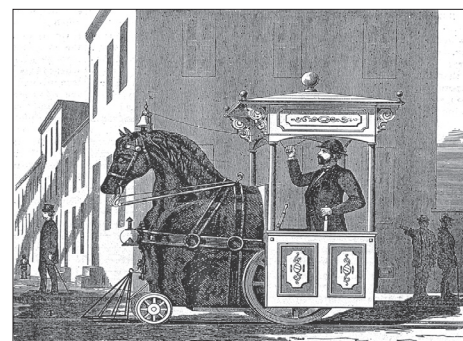
Efforts to Emancipate the Horse

Starting with A. B. Latta's steam dummy in March of 1860, mechanics looked for ways to eliminate the horse as a motor. Dozens of other inventors followed this effort. Their inventions were compact and carefully designed but proved too heavy for the track or more costly to operate than the hay burners. Their worst fault, however, was that they tended to frighten the horses and so caused runaways.

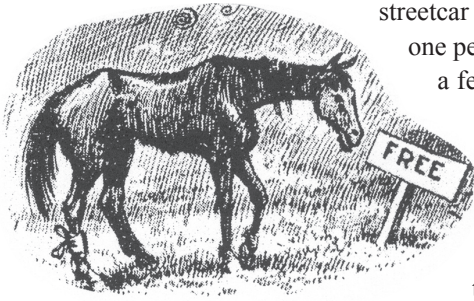
Steam storage motors, ammonia, compressed air, and even giant wind-up spring units were tried with marginal success. Cable cars, first used in San Francisco in 1873, worked well enough; but their high construction and operating costs prohibited a more general use. At their peak in 1895, there were only 360 miles of cable railway in the U.S. which amounted to just four percent of the total mileage. Thomas Edison and a host of other electrical pioneers attempted to solve the problem, but inventing a truly practical electric streetcar proved to be more difficult than was expected. Such cars were introduced by the late 1880s, and they were accepted with remarkable speed. By 1890 it was clear the trolley car had opened a new era in urban transit.

The Horsecar's Last Run

Several workable electric street railways were in operation by 1889, but the Richmond system is generally credited with convincing the industry that the trolley car was indeed the solution to its every need. Electric cars were quiet, fast, and economical. They did not emit smoke, hiss, nor drop unpleasant matter on the pavement. They were easy to operate and went up hills and around curves with ease. Larger cars were also possible because electric motors could generate 25 to 50 H.P. (horsepower) each.



Mathewson's Steam Horse for Street Railways,
from *Scientific American*, Jan. 22, 1876.



The conversion to electrical power was quick and expensive. When it started in 1890, just one sixth of U.S. streetcar lines were electric; within a decade that number had increased to 99 percent. The remaining one percent was cable or animal powered. Curiously, the nation's most modern city, New York, had a few horsecars running until July 1917. Pittsburgh ran its last hay burner in 1923, and Sulphur Rock, Arkansas, shut down the U.S. horsecar era in 1926. Perhaps the very last to run in North America was in Celaya, Mexico, in May 1954.

The industry seemed ready to spend any amount to be rid of the inefficient horse. New, heavier cars required sturdier tracks and bridges. Generating stations were needed to produce electricity and elaborate feeder lines were required because D.C. power could not be transmitted for long distances. Overhead wire, span wire, and poles added millions more to the cost of electric railways. But it was worth every cent required to facilitate this lightning like conversion.



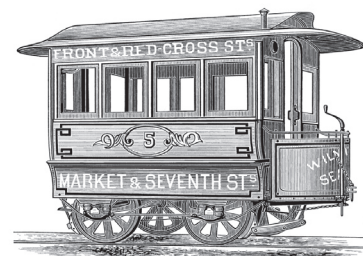
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***We have not included the numerous histories of individual street railways that generally included only a cursory mention of pre-electric operations. A comprehensive listing was prepared by Thomas R. Bullard, Street, Interurban, and Rapid Transit Railways of the United States: A Selective Historical Bibliography, Forty Fort, PA, 1984.



John H. White, Jr. graduated from Miami University in 1958 as a history major. He worked at the Smithsonian Institution for 32 years, primarily in the Transportation History section of the Museum of American History. He has published twelve books and over 130 articles on early transportation, railroad history, and technology. Miami's honorary doctorate of Humane Letters was conferred on John White in March 1996. He is presently an adjunct faculty member in Miami's History as well as Manufacturing & Mechanical Engineering Departments.



A Wilmington, Delaware bob tail car built around 1880 by J. G. Brill.