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Mother nature vs. the Model T : the problem of snow removal in the adoption of the American automobile

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American....

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Mother Nature vs. The Model T:
The Problem of Snow Removal in the Adoption
of the American Automobile

by

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Abstract

American's love affair with the automobile created a dilemma in which automobiles were being widely adopted well before their use could be guaranteed year round. The availability and affordability of the automobile in both urban and rural snow belt areas of the United States led to the demand for snow removal. Snow could seriously disrupt a society that was increasingly dependent on automobiles for transportation. Fortunately, the automobile became the solution to the problem and became the primary instrument of snow removal. However, not until the 1930s, long after the automobile had become a fixture in American society, could all-season roads be reasonably guaranteed to people living in the thirty six snow belt states.

This study examines the historical development of snow removal for year-round road use. It is based primarily on articles in *The American City*, one of the most widely read municipal management journals, from 1901 to 1935. Snow removal reports from the Highway Research Board are also examined for these years in order to survey snow removal efforts on highways and rural roads.

This thesis concludes that millions of automobile were in use well before snow removal techniques could assure navigable year-round roads in the snow belt states. Advocacy for snow removal did not appear until after World War I, and as late as the winter of 1928, only half the roads in the snow belt were cleared for traffic. Government struggled to achieve all-season roads with various means and policies into the 1930s.

Introduction

Integral to the widespread adoption of the automobile and motor truck in both urban and rural snow-belt areas of the United States was snow removal from thoroughfares. Consequently, the automobile became the primary reason for snow removal from roads. Automobiles and motor-trucks became such a part of everyday life that a winter snowstorm could no longer be allowed to shut down society for days or even weeks. As commerce began to depend on the daily deliveries of the motor-truck, as buses replaced the streetcar system, as rural children in consolidated schools were bused to school, and as more people commuted to work from the suburbs in affordably priced Ford Model-Ts, snow removal became imperative. State and municipal governments struggled to keep roads passable and safe with various means and policies into the 1930s. It was not until into that decade, long after the automobile had become firmly entrenched in American society, that all-weather roads could be reasonably guaranteed to everyone living in the thirty six snow belt states.

In the first decade of the twentieth century, an automobile was relegated to the stable every winter, resting on blocks with wheels removed, unable to provide the rapid mobility it was so lauded for during summer months. The automobile's perception as a fair-weather toy was reinforced by the fragility of early automobiles, and the lack of suitable roads on which to operate them. As the sturdiness of cars improved, especially after Ford's work-horse Model-T debuted in 1908, the automobile became effective transportation. The automobile, however, still did not have the winter travel capabilities of the horse-drawn sled or even the horse-drawn wagon. In previous times, the well-to-do urbanite would switch from carriage to sleigh; the city's express delivery companies switched seasonally from carts to sleds; and

the farmer in the outlying regions would hitch his team of horses to a wagon or sledge depending on the season. Horses could be adapted to vehicles appropriate to the season. However, once an automobile was purchased, in most cases, the horse that could have pulled a sleigh in winter was sold. To be a useful replacement the automobile had to be available in all seasons. Its ultimate adoption thus also required the development of new snow removal machinery.

This study examines the thirty six snow belt states as a whole and surveys snow removal technology and automobile use on a large-scale basis. Different communities at different times developed various strategies for snow removal. Only when the snow belt as a whole developed a successful snow removal plan, could they effectively claim they had overcome the obstacles to year-round automobile use.

Winter Transportation in the Pre-Automobile Era

Colonial cities were densely populated; they were “walking cities.” Goods were moved by cart or wagon, and small groups of “cartmen” for hire were responsible for most freight operations. In winter ski-like runners could be attached to their vehicles. Later, these men would use sleighs for the heaviest snows of winter. The cartmen of a town or city would “break out” the roads, by traveling over them repeatedly, often in tandem, to level drifts and compact the snow so it could support loaded sleighs and foot traffic. Any shoveling had to be done with wooden shovels, and clearing walkways was entirely the resident’s responsibility.

By 1760, Colonial America used a succession of winters of mild temperatures and little snowfall to organize its winter preparation more effectively. A fleet of small boats carried firewood from Maine to Boston, from Connecticut and Long Island to New York, and from the Upper Delaware (region) to Philadelphia. By mid-winter, when supplies of firewood

began to run low, sleds filled with firewood would descend on the cities from nearby rural areas to take advantage of the higher prices. In January 1760 during a particularly cold spell, “upwards of 1000 sleds” reached Boston in a single day. Vehicle traffic was increasing in the cities, with over eighty coaches and carriages reported in New York, the third largest city at the time. Imported vehicles such as coaches were only used by officials or the extremely wealthy, but chaises and chairs, with a capacity of just two passengers were fairly common by the 1750s. Wheels would be replaced with runners on many of these vehicles, while others simply switched their teams over to sleighs kept on hand just for winter travel. The urban population, if they had not come to grips with winter travel, could at least attempt to adapt to it.¹

Outside of the cities, the overland routes of travel, roads remained little more than a set of wagon ruts, muddy and impassable in spring and fall, and so hard and rutted by summer that they nearly shook vehicles to pieces. An English traveler during the fall of 1795 had his vehicle sink to the hubs near the same spot outside Baltimore where the President of the United States suffered a similar fate just a few days earlier. The Englishman’s troubles continued when he arrived in Baltimore. He was delayed a week until the road to Philadelphia had frozen sufficiently for the stage to resume running. Another foreign visitor traveling from New York to Philadelphia by stage wrote that some passengers were ill for an hour or more after being slammed around on a particularly rough stretch of the route. The northern regions of New England were even less hospitable. A Connecticut minister who

¹ Bridenbaugh, *Cities in the Wilderness*, 26-27, 34-35, 146; The complete explanation of the crucial role cartmen played in urban transportation can be found in Graham Russell Hodges, *New York City Cartmen, 1667-1850* (New York: New York University Press, 1986) and Wheaton J. Lane, “The Early Highway in America, to the coming of the Railroad,” *Highways in our National Life: A Symposium Under the Editorial Sponsorship of the Urban Research, Princeton University*, eds. Jean Labatut and Joshua Wheaton (Princeton N.J.: Princeton University Press, 1950), 71.

made a preaching tour of Vermont in the spring of 1789 found himself in “mud belly deep to my horse and I thought I should have perished.”² In spite of such horrible road conditions, traffic increased considerably during the early years of the new nation.

Many inland areas had become more fully settled. Families that at first had struggled to hack out a bare subsistence in the wilderness and had little to trade with the outside world were now seeking a place in the market economy. By the early 1790s, one account notes that even towns that had been settled no earlier than the Revolution had overcome the difficulties in clearing farms and were supplying produce for market. Butter, cheese, beef, pork, and other goods able to justify the cost of transportation over poor roads were being traded at inland stores, often at considerable distances.³

This need for roads to market spurred the development of toll roads, or turnpikes. The turnpike craze began in the 1790s and had ended in all states, except Connecticut, by the war of 1812. The turnpike concept, however, was reintroduced in 1940, with the opening of the Pennsylvania Turnpike. Turnpikes usually had a toll gate every ten miles, as a way for its private capitalists to achieve a return on their investment. The sparsely placed toll booths were easily bypassed, and many turnpikes made very little profit. However, in New England, 240 corporations built more than 3700 miles of toll roads. All the New England states with the exception of Maine had an extensive turnpike network, with Connecticut far in the lead with over 1600 miles. These toll roads became the network of roads that goods and the fledgling stagecoach companies began to travel on. Turnpike companies also introduced and popularized more advanced methods of road building. Turnpikes were the proving ground for

² Roger N. Parks, *Roads and Travel in New England, 1790-1840* (Meriden, Connecticut: Old Sturbridge Inc., 1967), 5-6.

³ *Ibid.*, 11.

such standards as the straightening and widening of roads (some out to a standard of twenty-four feet), the installation of ditches to the sides, and a pronounced crown to the center of roadways to assist drainage. All later became standard features of quality roadways.⁴

By 1795 the number of people traveling between Boston and New Haven necessitated service by over twenty stagecoaches. In 1828 a survey of the transportation needs of thirty five towns near the route of a proposed railroad from Boston to Albany estimated an average of 740 tons was transported each year by land between towns along the route. At the same time over forty wagons a day traveled through the town of Bolton, Massachusetts en route to markets in Boston, a total of over 14,000 tons a year.⁵

Road building activity again intensified between 1820 and 1840 in New England as manufacturing began to appear in communities situated near sources of water power. As the expected profits from privately-funded toll roads had never materialized, the burden of road building fell on towns, with counties in some cases exerting power over towns, especially in Massachusetts and Maine. By 1840, New England's highway system was the best in the nation, although far below the standards of advanced European countries such as England and France. The best roads were in Eastern Massachusetts and near Hartford and Providence, but even these roads were ill-prepared to compete with the railroads that began to appear in the 1830s.⁶

⁴ Ibid., 14-21. Frederic J. Wood. *The Turnpikes of New England* (Boston: Marshall Jones Company, 1919). passim. For an overall view of transportation in New England, and the pros and cons of water and land transportation in each state, see Caroline E. MacGill, *History of Transportation in the United States before 1860* (Washington, D.C.: Carnegie Institution of Washington, 1917), 319-348.

⁵ Parks, 12, 25.

⁶ Ibid., 22-23.

By 1840 railroads came to dominate the long distance transportation of goods and passengers. Considerable road networks had been put in place over the inland regions of the country. Though no longer the primary long distance artery for commerce, these roads were necessary to funnel goods to the railroad networks. Nevertheless, in light of the dominant railroad, public roads were generally neglected. Historian Albert C. Rose even called the era from 1835 to 1885 the “Dark Ages of Public Roads.”⁷

Even in the depths of winter this network of inland highways was used. Roads that saw the most traffic, such as those that went to market cities like Boston or Albany, for example, often saw increases in traffic during the winter. In the slack winter months, free from the daily demands of planting and tending fields, many farmers would take sleds loaded with produce to market. Farmers from as far away as Northern Vermont and New Hampshire would bring their produce to Boston and Portsmouth after the turnpikes and roads were covered with a heavy snowfall. Once the snow was compacted by teams of horses pulling large rollers, road surfaces were enviously smooth compared to the rest of the year.

The actual large volume of traffic in winter belies the myth of a rural populace isolated by the snows of winter, living off stores of food and firewood, waiting for spring time to move freely about once again. Farmers and merchants in more rural areas used the ease of winter transport to move goods that normally were too bulky to ship overland in a wagon over the turnpikes and country roads. In one winter Saturday in 1803, more than 700 sleds entered the river town of Hudson, New York, using the toll road leading from Berkshire County, Massachusetts.⁸

⁷ Parks, 4-5, 27; Albert C. Rose, “The Highway from the Railroad to the Automobile” in *Highways In Our National Life*, ed. Jean Labatut and Joshua Wheaton (Princeton, N.J.: Princeton University Press, 1950), 77.

⁸ Parks, 11.

Cities and Snow in the Mid-Nineteenth Century

In the mid-nineteenth century, the horse-drawn metropolis was able to adapt to winter and conduct business as usual, albeit at a less strenuous and punctual pace. The early struggles to cope with snow in cities such as New York City and Boston would be copied in other cities and towns.

As the developing inland cities made their own peace with old man winter, rural areas still battled with harsh winter conditions. Frozen rivers and sled-tracked turnpikes often did provide the best transportation of the year, but the combination of long distances, scattered populations, and high snowfalls still made getting there difficult. “The Great Snowstorms” of January 1831 isolated Pittsburgh and Gettysburg with snowfalls of twenty-two inches and thirty inches, cutting them off from Eastern mail. The stages were halted at Lancaster, where the efforts of fifty horses and twice as many men could not open the highway blocked by ten and twelve foot deep drifts.⁹

New York City and Philadelphia both relied heavily on canals for transport, and the merchants in both cities nervously watched for the date each year in which ice would close the canals to traffic. A cold snap closed the Erie Canal on December 1, 1831. In contrast, the Boston and Worcester rail line in 1834 boasted its forty miles of track were in service all but six days that winter. In Baltimore, after receiving eighteen inches of snow, the recently operational Baltimore & Ohio steam railroad cleared its tracks with a team of horses pulling a “contrivance” to push the snow away from the tracks. This was the first use of a snowplow

⁹ David M. Ludlum, *Early American Winters: Volume II (1821-1870)* (Boston: American Meteorological Society, 1968), 99-100.

to clear railroad tracks and was a glimpse at a new era, the dominance of the intra-city railroad.¹⁰

Following the Civil War, cities began to benefit from a more widespread and scientific approach to weather forecasting. In the late 1860s, over 150 weather observers wired reports to the Smithsonian Institution. By 1871 control of this network had been transferred to the U.S. Signal Service, and reporting stations stretched from Portland, Maine to San Francisco. Coverage expanded inland, beyond the original port cities, covering agricultural and commercial concerns, and information was exchanged with a similar service in Canada. Weather bulletins began to be published in the *New York Times* and other leading daily newspapers. Weather signal flags began to appear in the commercial districts of several cities, a white flag with a large blue sunspot warned of approaching snow. These warnings began to give cities time to prepare for approaching storms. On January 26, 1871, a storm warning caused horse car companies in New York City to add extra teams to operate snow plows through the night. This enabled them to maintain regular service the next day despite nine inches of snow.¹¹

During this period municipalities discovered that evolving transportation technologies had pushed them into a dilemma. With the introduction of horse cars running on tracks, beginning in the 1850s, the annual switch to sleighs for the worst of winter's weather was no longer possible because the streetcar companies pushed the snow off the tracks and into the adjacent streets. The mounds of snow left by the horse-drawn plows of the companies became an obstacle to sleigh drivers, pedestrians, and store owners who were incensed by the

¹⁰ Ibid., 16-27. *American Journal of Science* (July 1834): 166.

¹¹ Donald R. Whitnah, *History of the United States Weather Bureau* (Urbana: University of Illinois Press, 1961), 1-30; *New York Times*, 27 January 1871

banks of snow that now cut off their store fronts from foot traffic. In Rochester, New York, when twelve inches of snow fell in February 1871, the city even hired men to shovel the snow back onto the tracks. The horse-car companies responded by plowing back the snow with their plows, and this see-sawing conflict occurred for several days, effectively stopping traffic in the commercial district. Other cities took a more effective approach by removing snow from the street by hiring large numbers of carts and day laborers with shovels. However, in northern cities such as Rochester and Buffalo, the opened tracks of the horse car companies elicited renewed protests from sleigh drivers, unable to traverse the large banks of snow left beside the tracks.¹²

The 1880s saw municipal responsibility for cleaning the snow from the streets increase. In New York especially, any delay from snow-covered roadways stopped mail, halted the daily deliveries of supplies such as coal and milk on which city dwellers depended, and generally slowed the pace of commerce. In 1881, a reorganization of the city's government established the Department of Street Cleaning as a separate department with a year-round group of workers. These city workers, combined with the shovelers and carters in the employ of the car companies, were charged with clearing city streets.

The city soon realized that its small group of street cleaners could not provide the manpower for even the snow clearing needs of New York's commercial district. By 1883, over 200 Italians, newly arrived to this country, were employed in the city's efforts to clear an omnibus lane on Broadway. Guided by cartmen who could speak both English and Italian, this immigrant workforce doubled the overall workforce and the amount of snow removed.

¹² McKelvey, *Snow in the Cities*, 41-42, 45; Clay McShane and Joel A. Tarr, "The Centrality of the Horse in the Nineteenth Century American City," *The Making of Urban America*, ed. Raymond Mohl (New York: SR Publishers, 1997), 111, 123.

These day laborers, willing to shovel streets after each storm, were the newest element of a snow fighting plan that would be used for several decades. Horse car and later streetcar routes would be cleared by horse drawn and later streetcar mounted plows. The city Department of Street Cleaning would then coordinate a day labor workforce that would remove by hand the snow of the commercial district. Horse-drawn carts would carry the snow to the East River for dumping. This pattern was duplicated in other cities, relying on inexpensive manpower, rather than machinery to remove snow..¹³

The Blizzard of 1888

In spite of the advances New York had made in the struggle against snow, the city was dealt a massive blow by Mother Nature that would prove just how poorly prepared it really was. The residents of New York were blindsided on the morning of March 12, 1888 by a huge snowstorm. The Weather Service had incorrectly predicted “cloudy, followed by light rain and clearing.” Many horse-cars and hacks were quickly marooned in the drifting snow, and the early-rising deliverers of milk, coal and other consumables soon found themselves stranded as the snow increased. The new elevated lines of steam trains, overloaded by those dutifully attempting to get to work, could not move forward on the snow-covered trestles. Passengers were rescued from the stalled trains by fire companies. Other trains were unloaded by men who demanded payment from the stranded in order to climb down their ladders. By nightfall, twenty inches of snow had fallen, and the few elevated trains still running fell silent. New York City was paralyzed. *The Evening Sun* editorialized the next day that, “It was as if New York had been a burning candle upon which nature had clapped a snuffer leaving nothing of the city’s activities but a struggling ember...Everywhere horse

¹³ McKelvey, 51-53; George E. Waring, *Street Cleaning and the Disposal of a City's Wastes...* (New York: Doubleday, 1898), 10, 94-96.

cars were lying on their sides, entrenched in deep snow, lying across the tracks, jammed together and in every conceivable position. The city's surface was like a wreck-strewn battlefield."¹⁴

After three days of snow and wind, compounded by freezing temperatures, New York faced snow depths between two-and-half to four feet, and drifts covering the first story of many buildings. New York's two million residents experienced a complete failure of the city's infrastructure. Four-fifth's of the city's telephones were not functioning. Almost all of its electric lights and most gas lamps were out. Residents who had traveled to work early in the day found themselves stranded at work or crammed into the few saloons and hotels that had managed to stay open. Two miles worth of passenger trains packed with commuters were trapped for two days in drifts over 20 feet high on the northern approach to the city. In all, over 400 people were counted as victims of the storm.

After the "Blizzard of 1888," New York officials enacted legislation demanding telegraph and telephone wires be buried underground, and the push for an underground subway gained momentum. More broadly, the confidence of New York was shaken, while no city had the crush of business centered around it as did New York, at this time, no other city had seemed as prepared to successfully combat a huge winter storm. Yet, the city's elevated railways, city-operated horse carts and plows, and other costly safeguards had been completely thwarted. As a result, memories of the Blizzard of 1888 were a constant theme that echoed in municipal snow management in New York City for years to come.¹⁵

The Urban Snow Problem

¹⁴ *Evening Sun*, 13 March 1888, 3.

¹⁵ Bernard Mergen, *Snow in America* (Washington, D.C.: Smithsonian Institution Press, 1997), 35-37; McKelvey, *Snow in Cities*, 58-62.

The 1890s were a pivotal decade for urban transportation. Electric trolleys came to replace horse-drawn cars, and the increased volume of business in cities made interruptions due to snow more costly. The Blizzard of 1888 caused New York to take the lead in dealing with snow. The plowing of snow from car tracks and the carting away of snow increased yearly, and more elevated railways were constructed to avoid drifting snow. New York's horse car lines were electrified in the 1890s, and the long awaited subway system was seen as the ultimate blizzard-proof transportation, although it would not become operational until 1904.¹⁶

With regard to snow plowing, the electrification of the streetcar systems left the companies in a precarious position. Having dispensed with the now obsolete and expensive –to-maintain horses, the companies had no means to operate the horse-drawn plows they had used in the past to clear the tracks. While some horses had been retained for this purpose, their numbers were hopelessly inadequate. In the past, heavy snowfalls needing to be cleared simply meant more teams of horses would be hitched to plows to clear the tracks. Reports were common of heavy snows prompting double and triple teams to be attached to the plows. On occasion it took up to six or eight teams of horses pulling plows to open lines. After the electrification of the streetcar lines, this snow removal technique was no longer available.

To remove snow from the tracks, trolleys were fitted with smaller versions of the “v” or wedge-shaped plows used on the large railroads, especially in the West, to break through heavy mountain drifts. On the mountain tracks these many ton mammoth plows were often pushed by three or up to as many as twelve locomotives. However, the small trolleys in use in the East were simply too small and narrow to push this style of plow. Trolley companies

¹⁶ McShane and Tarr, “The Centrality of the Horse in the Nineteenth Century American City,” 112.

had to scramble to introduce heavier cars that could support plows. These specialized vehicles often had plows mounted on both ends to expedite clearing rail lines. Lighter snows could be removed by trolleys equipped with circular rotating metal brushes called snow sweepers, akin to the street cleaning equipment used in warmer months.¹⁷

Cities throughout the snow belt responded with various means to conquer transport issues in winter. Boston routed the cars of its extensive trolley system either into the subway tunnel under its central district or onto elevated tracks. By 1905, the city had also equipped its trolley system with heavier cars able to push the v-style plows. Nearby Worcester followed suit, and both locales were able to keep open lines in the face of heavy snowstorms.¹⁸

Chicago relied on its system of elevated lines that it had constructed for the 1893 Worlds' Fair, and this system diverted traffic from its often ice-bound cable car system. Philadelphia relied heavily on its steam commuter trains, and Washington, situated on the edge of the snow belt, did the same. Washington was one of several fringe cities which used a few horse-drawn plows to clear sidewalks. Luckily, in the nation's capital the sun and rising temperatures usually melted most snow within a few days of the storm.

Other cities were not so lucky, and had to cope with being a heavily trafficked urban center in a high snow region. Buffalo, Rochester, Syracuse, and Oswego, New York all suffered from "lake effect" snow, cold wind blowing over the warm water of the Great Lakes picked up large amounts of moisture, which it then released as snow on the regions south and east of the Lakes. These cities had the unenviable distinction of being urban centers that

¹⁷ David Minsk, "A Short History of Man's Attempts to Move Through Snow," *Highway Research Board Special Report* (1974): 1-3.

¹⁸ *Scientific American*, Supplement (9 December 1905): 25033.

consistently received record-setting snowfalls. While many other cities in the snow belt still relied on the sun to remove much of their snow, these upstate New York cities began to organize against snow storms using methods similar to their larger metropolitan sister.¹⁹

Organized street cleaning departments also introduced the concept of “snow as refuse.” By the 1890s, snow was no longer a medium for transport, as in the earlier decades when bulk produce was transported by sleigh. Snow was now viewed as an obstacle to the everyday functioning of society and commerce. This prevailing and widely accepted belief led to a schism between urban and rural snow removal ideology. Unlike their urban counterparts, rural areas still viewed fallen snow as a medium for transport.²⁰

In smaller cities where traffic from the rural outlying areas would come into the city by sleigh these two realms clashed. Cities such as Rochester tried to accommodate both urban and rural modes of transport in winter and found a compromise by leaving certain streets uncleared. When plows crossed these streets, they had to leave snow behind to allow the passage of sleighs. However, even in cities such as Rochester surrounded by rural areas still using sleighs, in the downtown and commercial districts snow had come to be seen as refuse, and clear streets were the order of the day.²¹

Adapting to Snow in Rural Areas

The status of snow removal in rural areas had stayed remarkably static through the turn of the turn of the twentieth century. After railroads established their dominance in the

¹⁹ McKelvey, *Snow in the Cities*, 74-75.

²⁰ H.L. Stidham, “The Removal of Snow” in George E. Waring, *Street Cleaning and the Disposal of a City's Wastes...* (New York: Doubleday, 1898), 108-109; Martin Melosi, *Garbage in the Cities: Refuse, Reform, and the Environment, 1880-1980* (Chicago: Dorsey Press, 1981), 68-69; Blake McKelvey, “Snowstorms and Snow Fighting – The Rochester Experience,” *Rochester History* 27 (January 1965), 1-24.

²¹ “The Removal of Snow From Public Highways,” *The American City* (October 1916): 390-393; “Snow Removal in American Cities,” *The American City* (February 1921): 168-170; “Snow Removal Equipment in Use, Abstracts of Reports from Cities in the Snow Belt,” *The American City* (December 1923): 604-606.

long-distance transportation of goods and people in the 1840s, rural responses to snow remained largely the same for the next seventy years. Sleighs remained the mode of transport up to the rail terminal, and for all short distance travel. Some small towns had trolley lines either as spurs into larger cities or as regional networks to nearby towns, but trolley lines did not compete with trains for the long distance transport of goods and people. Trolleys remained regional, and any snow removal needs were done with car-mounted plows or hand labor.²²

The “Good Roads” and “Roads to Market” campaigns that were advocated for by various groups in the 1870s and 1880s did not include snow removal. The “Good Roads Movement” was at first championed by various bicycle groups such as the League of American Wheelmen. Bicycling was a fair weather sport, and advocacy focused on improved roads and the installation of hard surfaced pavements, not snow removal. The agrarian sponsored “Roads to Market” campaign failed to address snow removal as well, as any farmer transporting goods to market would be traveling on runners, and roads were usually cleared communally.²³

The communal maintenance of roads was done through a system that had been in place since the Colonial Era. In lieu of taxes, or a portion of taxes, each man in the community had to work on the roads for a certain number of days each year. In the spring, road work would occur in the slack time between plantings, and minor improvements to the local roads would occur between equal amounts of socializing, tall tale telling, and drinking. In the winter, drifts and other obstructions to the rolling of a flat road would be shoveled out.

²² William D. Middleton, *The Time of the Trolley* (Milwaukee, Wisconsin: Kalmbach Publishing Company, 1967), 376, 379-380.

²³ Rose, “The Highway from the Railroad to the Automobile,” 84-86.

with similar amounts of socializing and drinking to ward off the cold and the monotony of work.²⁴

The rolling of roads although done communally could vary by town, and by the geography of the roads. A snow roller was a large wooden cylinder usually made of oak for its strength and resistance to rot. In some cases they were lined with granite to add weight. Usually equipped with a simple foot bar or seat for the driver, some of the more extravagant rollers were outfitted with rudimentary cabs to protect the driver from the cold of a long day of breaking roads. The roller was usually constructed with town funds, although the cost was minimal, since the wood and other construction materials were often donated.

The roller left a flat, compacted roadway that lent itself very well to sleigh traffic. The surface of the road would become icy as people traveled over it, but horses were specially equipped with sharp horseshoes for pulling sleighs. An additional benefit was that after compacting, since there was no outer ridge as a plowed or scraped surface would contain, drifting snow in most cases would blow across rolled roads, leaving them clear for traffic. After particularly snowy winters it was not uncommon to have three feet or more of compacted snow and ice built up over rural roads, compounding the problems of muddy roads once the spring thaw set in. A stubborn section of ice would have to be chipped out to speed up melting. Streets in town were often rolled, leading to several feet of ice building up on the main streets of some small towns. In desperation, some towns near mining or lumbering industries would seek out an experienced "dynamite man" who with the use of explosives could break apart the ice besieging Main Street. Although hard on the windows of

²⁴ Parks, *Roads and Travel in New England*, 8-10. Rose, "The Highway from the Railroad to the Automobile," 85.

the local downtown business district, it was not uncommon to have ice on some town roads until April, and such conditions would warrant the use of such extreme measures.²⁵

The Dawn of the Automobile Age

Upon this landscape of electric trolleys, steam trains, and even horse-drawn sleighs, appeared near the turn of the century, a new mode of transport. Under the guise of “horseless carriage,” the automobile began to appear on the American scene in the mid-1890s. It was first seen as a fragile, complex, almost experimental finicky beast, under the control of a wealthy urbanite who sought a faster toy than his high-wheeler bicycle or racing sulky.

A multitude of technological problems made operation of early automobiles in cold weather and snow a cumbersome task. Early garages advertised storage “for all model automobiles.” General histories of the automobile thus relegate it to the carriage house during the winter months, wheels removed, up on blocks and drained of fluids until spring. These works never clarify when this practice stopped.²⁶

In 1895, the attention of the public was focused on a staged race in Chicago, sponsored by the *Chicago Times Herald* newspaper. This event was extremely well publicized, and various American inventors claimed they would have automobiles ready by the entry deadline. Only six entries actually materialized at the race, even after the deadline was pushed back in an attempt to enlist more. This extension, however, pushed the date of the race to the end of November, and when the six entries began the race, over eight inches of snow had recently fallen on Chicago. Although cleared, the icy and rutted streets were

²⁵ “The Northern Snow Roller,” *Sargent Snow Plows Catalog* (Bangor, Maine: Union Iron Works Inc., 1927), Un-numbered insert; Charles A. French, “Snow Rollers Instead of Plows,” *The American City* (October, 1918): 289-290.

²⁶ John B. Rae, *The American Automobile: A Brief History* (Chicago: University of Chicago Press, 1965), 17-32, 52, 92-95; James J. Flink, *America Adopts the Automobile, 1895-1910* (Cambridge, Massachusetts: MIT Press, 1975), 36-46, 95-99, 216-223; Frank Coffey, *America on Wheels: The First 100 Years* (Los Angeles: General Publishing Group, Inc., 1996), 22-48.

treacherous: one entrant was broadsided by a streetcar, and one judge was injured when thrown from a vehicle in a particularly rutted section. Only two cars finished the fifty-five mile course, and the winner was a gasoline-powered automobile driven by auto pioneer Frank Duryea. By going forward with the race Americans foreshadowed a time when automobiles would be used in all seasons.²⁷

Snow removal for automobiles does not seem to have been seen as important until about 1920 when there were already eight million on American roads. In the monthly journal *The American City*, a publication targeting city and town managers, municipal works directors, and others in the infrastructure management of cities, towns, and counties the issue of the automobile in snow removal does not appear until nearly 1920. The needs of the commercial delivery vehicle and motor-truck appeared first as motivations for comprehensive snow removal.²⁸

By the early 1900s, snow was becoming just one more type of refuse that city sanitation departments had to plan to remove in a timely manner. The principle of municipal level organization, a tenet of Progressive Era reform and government, was now applied to the problem of snow removal. Following the lead of New York City's Street Cleaning Department and its second commissioner, Col. George E. Waring Jr., appointed in 1895, cities relied on horse-drawn dump carts (the same as used the rest of the year for trash removal) and armies of shovel-wielding temporary workers. H. L. Stidham, Snow Inspector for Waring's Street Cleaning Department, stressed organizing downtown streets into zones.

²⁷ Rae, 9.

²⁸ Survey of *The American City*, 1900-1935, passim; *Facts and Figures of the Automobile Industry* (New York: National Automobile Chamber of Commerce, 1927), 4.

City employees would supervise the large forces of temporary laborers who would be called into action if snowfalls became too heavy for them to remove²⁹

The level of manpower being brought against nature can be seen in various cities. Kansas City, located on the periphery of the snow belt, received twenty-five inches of snow in a record-breaking two-day storm March 23-24, 1912. Trolley cars equipped with rotary sweepers were normally sufficient to combat the small snow falls the city usually received. Hopelessly ill-equipped for the severity of this storm, the trolley company had to hire fifteen hundred shovelers to clear the lines, and still only succeeded in keeping a few sections open. The city attempted to open the business district of town with seven hundred men and two hundred fifty teams of horses. As often occurred on the outer periphery of the snow belt, by the third day after the storm ended, rising temperatures allowed the opening of fire hydrants to flush the remaining snow from the streets. A similar display of manpower occurred in Denver during January 1913 when four feet of snow fell on the city over two days. For the next ten days over six hundred men and three hundred carts worked to clear the streets.³⁰

The pressing need for more comprehensive snow removal led to the first conference on snow removal in Philadelphia in 1914. Public works officials from around the snow belt met to share ideas and practical experience. Advanced planning and organization was stressed by the attendees: working out in advance the contractual agreements with transit companies for removing snow from their tracks, locating dumping locations for snow either in waterways or on vacant lots, and investigating the capacity of the city's sewer system for absorbing large amounts of snow. The conference attendees also called for more emphasis on

²⁹ Mergen, *Snow in America*, 58-69; H.L. Stidham "The Removal of Snow," ed. George E. Waring *Street Cleaning and the Disposal of a City's Wastes...* (New York: Doubleday, 1898), 100-101, 117-128.

³⁰ McKelvey, *Snow in the Cities*, 79-80.

the mechanization of snow removal. Early experiments with blades mounted on the front of motor-trucks had showed them to be considerably faster than the standard horse-drawn plows. The attendees also suggested the use of trucks for transporting snow to the nearest sewer line.³¹

Present at the inaugural snow removal conference, New York City's Street Cleaning Department Representative, John T. Fetheron, did not agree with all of the recommendations of the panel. He favored the flexibility of horse carts, filled with snow by men with shovels. His department's strategy was to send men out at the beginning of the storm and to increase the numbers of men deployed to avoid getting behind in removing the snow. This method avoided being left with large piles requiring mechanized equipment to remove. He felt that with such a labor pool at his disposal, a sufficient army of shovelers could be called into temporary day labor to clear streets in a timely manner. Thus, in his view, the more radical plowing and melting equipment being brainstormed at the Philadelphia Snow Removal Conference would not be needed. New York's reluctance to mechanize and instead rely on massive hand shoveling (some years over 40,000 workers were registered to work) would see them through six years of mild winters, until disaster struck.

In February 1920, New York City was hit by a blizzard that brought seventy two hours of continuous precipitation with accumulations over seventeen inches. Mixed in with the snow were layers of sleet that froze the snow into a solid mass. Laborers could not break through the ice to shovel the snow, and the sleet that fell in the initial stages of the storm coated the pavement underneath so that the few motor-trucks mounted with plows spun their wheels. The early hours of the storm were so severe that the Department of Street Cleaning.

³¹ "A Conference on Snow Removal," *The American City* (May 1914): 493, 495; "Recommendations as to Snow Removal," *The American City* (December 1914): 500-501.

the snow contractors, and the street railway companies could not start work on schedule. Emergency laborers were scarce, and a large number of those who were hired went on strike. Some street cars were stalled in the streets of Manhattan for several weeks. Emergency measures were required to distribute food. Businesses suffered \$60 million in losses. Eventually, all city departments and business firms with men and trucks to spare were volunteered to the cleanup effort. Costs for this cleanup rose to \$5.5 million.

In response to this disaster, New York City abandoned its policy of using only hand labor and horse-drawn dump carts. In one fell swoop the city mechanized its snow removal force with the acquisition of 100 two-ton tractors, 50 five-ton tractors, 200 five-ton trucks, 100 two-ton trucks, over 300 push plows, 150 drag plows, one snow loader, and various miscellaneous pieces of equipment. The city authorized the expenditure of \$2,757,000 to purchase this equipment and \$1,370,000 for buildings around the city to house it. Adding all this equipment to the organizational structure that the New York Street Cleaning Department had pioneered in previous decades, permitted a snowfall exceeding one foot to be cleared in just twelve hours the next February. This quick response saved the city businesses an estimated \$10,000,000 in lost revenue, and proved the value of the new equipment. The street area cleared and cubic yards of snow carted away tripled from the amount removed before mechanization took place.³²

Throughout the snow belt smaller cities soon followed New York City's lead, and during the years 1920-1921, mechanization to some degree was found in all cities of the region. As the new equipment appeared on the scene, cities increased the scope of their snow

³² "Holt Sells Fifty Tractors to New York City," *The American City* (December 1920): 667; "Wrestling with New York's Big Storm," *The American City* (April 1921): 447; Reginald Hawkins, "Snow Removal in New York City," *The American City* (September 1926): 327-329; "Preventing Snow Tie-Ups," *The American City* (November 1920): 567.

removal. In the first two decades of the twentieth century, cities only cleared their downtown or commercial districts. Residential and other areas had to rely on transportation by streetcar. On snowy days streetcar lines had to cope with double their number of customers, who were forced to unmercifully crowd into cars to avoid trudging to work through uncleared streets.³³

A consistent theme present in *The American City* from the early teens forward is the need to clear streets for the delivery of goods by motor-truck. The automobile as a reason for expanded snow removal is almost completely absent, while the commercial uses of the motor-truck, especially in the delivery field, demanded clear roads. *The American City* also noted the motor-truck's appearance as an incentive for the clearing of highways between cities.

During World War I, the trucking industry was born. The railroads of the country were pushed to capacity and could not meet the transportation demands of the country. In spite of a road network not designed for heavy truck use, the first "overland to the coast" convoys of military trucks traveled from inland factories to ports for shipping to France. One such convoy of trucks from the Packard factory in Detroit traveling during the winter of 1917 was forced to shovel highways clear in order to continue to the waiting freighters in Philadelphia. These convoys highlighted the wartime need for passable winter roads, and the possibility of inter-city trucking for the post-war period.³⁴

Several articles in *The American City* noted that participation in the war had vastly different effects on how society dealt with snow removal. Several municipalities organized snow removal programs that were suspended for the winters that America was in the war.

³³ W.A. Van Duzer. "Does It Pay to Clean City Streets in Winter?" *The American City* (February 1921): 149; "Snow Removal in American Cities," *The American City* (February 1921): 168-170.

³⁴ Robert F. Karolevitz. *This Was Trucking: A Pictorial History of the First Quarter Century of Commercial Motor Vehicles* (Seattle: Superior Publishing Co, 1966), 79.

The war effort diverted personnel and other resources that were previously used in non-mechanized snow removal tasks. This may have been one factor in the slow adoption of the proposals put forth in the first snow removal conference held in Philadelphia in 1914. Following the war, not only were trucks, tractors, and other heavy equipment available as surplus from the government, but returning soldiers who had left for Europe familiar with horse-drawn equipment, arrived home after seeing airplanes, motorized ambulances, tanks, and motor-trucks in action in the first mechanized war. These returning servicemen were anxious to adopt new mechanized equipment with which they had become familiar while in the military and helped to push forward the adoption of mechanized snow removal.³⁵

The Era of Snow-fighting Begins

The heavy snow storm of February 1920 had acted as a wake up call to the snow belt of the United States, but these snows fell on a country that had changed markedly from its experiences in World War I. The motor-truck's steadfast record of service on the front lines had proved its capabilities versus the horse, over two million of which lay dead on the battlefields of Europe. A country that could fly men through the air could hardly be stymied by something as simple as a snowfall.

Reinforcing the information emanating from Europe about the practicality of the motor-truck was the needs of a country stripped of its horses. After the war F. L. Atwater, Highway Commissioner of Denver, Colorado, found he was unable to procure good teams of horses to draw street-sweeping equipment and snow plows. His department purchased a pair of two-ton motor-trucks out of necessity. Upon placing them in service, ten horse-teams were transferred to other duties. Further proving their reliability, the trucks were in service sixteen

³⁵ John F. O'Toole. "The Removal of Snow from Public Highways." *The American City* (October 1916): 390-393.

hours a day. In Chicago one truck was found to be the equivalent of five horse-drawn wagons. The mechanized city was developing as quickly as municipal budgets allowed.³⁶

Officials from New York City were quick to point out in *The American City* that its recent investment in mechanized snow removal equipment of over \$2 million had saved the city \$10 million in commerce. In the next few seasons all cities adopted some level of mechanical snow removal equipment as quickly as finances allowed. In 1922 Boston still had only three snow-plows mounted on trucks, a few horse scrapers, and a tractor, but in July 1923, 50 snow plows were purchased, and Mayor James M. Curley stated “the wisdom of the step taken by New York has been emphasized during the last two years.” Boston’s snow removal problems became obvious in 1920 when the worst snow storm since 1893 devastated the city with over three feet of snow. Gridlock was finally cleared by renting steam shovels from various construction companies. Boston believed its equipment would swing the balance in battle against snow in the Bay State.³⁷

In contrast to what was taking place in these major cities, a survey of snow removal plans in the December 1920 *The American City* revealed that many state and local agencies were completely at odds as how to cope with snow removal. Recently formed County and State Highway Departments were not prepared to deal with clearing miles of solitary roads that wound through the landscape. Unlike cities that had a dense system of streets to clear, highway departments had an extended network of roads of varying qualities of construction and surfacing among their hundreds of miles of snow-covered roads to clear every storm.

³⁶ F.J. Atwater. “The Motor Truck – Mechanical Jack-of-All-Trades,” *The American City* (July 1919): 23-26.

³⁷ “Boston Better Prepared to Fight Snow This Year.” *The American City* (February 1924): 180; “Chicago’s Snow Activities.” *The American City* (December 1922): 494.

The American City assembled the data for this survey from the response letters of various county and state officials, revealing varied and often bleak results. Many state and county highway departments were still in their infancy and often ineffective. Equipment heavily advertised in *The American City* had yet to be purchased by these organizations, even though federal funding was available. The State of Connecticut used monies from a maintenance fund derived from the driver's license fee. Snow removal had begun over the last three and four years, and in the previous year over 1,000 miles of Connecticut highways had been maintained. In contrast, Illinois reported no snow removal at all. Massachusetts had been unable to maintain any roads due to lack of equipment and was looking to purchase equipment in preparation for the upcoming winter. Minnesota had seen its highways blocked four times in the winter of 1920; one blockade lasted two weeks. Many towns were cut off, and "considerable hardship" was reported. Michigan's state highway department maintained a few roads, and also maintained a significant portion "for sleighs." Wisconsin intended to keep roads open through winter. Pennsylvania cleared its highway system to relieve rail congestion, and its follow-up traffic censuses indicated increased heavy truck traffic.

The most telling statements came from northern New England. New Hampshire officials wrote that the "demands for automobile traffic have not been sufficient to warrant any expenditure." Chief Engineer for the Maine Highway Commission Paul F. Sargent went even further and stated that it would be a long time before any attempt was made to keep the roads of Maine open for motor traffic during the winter. He said the only work done during the winter months was the minor breaking of drifts for horse-drawn traffic. It is worth noting

that in the United States automobile registrations totaled over nine million in 1921, with 42,039 and 77,527 in New Hampshire and Maine respectively.³⁸

Consistently, snow removal was prioritized differently in urban and rural areas. In the period from 1920 to 1928, the urban response to snow removal was the expansion and the refinement of a mechanized attack on the obstacle of snow. War-like terminology was adopted by officials, as post storm “snow removal” was replaced by a continuous strategy of “snow fighting.” Advertising for snow removal machinery and statements by city officials combined to punctuate the movement with slogans such as “The Science of Snow Removal,” and “Progressive Cities don’t Hibernate.” Cleveland’s first organized snow fighting program in 1923 according to a *Cleveland Plain Dealer’s* editorial was “Battling the Beautiful.” Town officials filled *The American City* with statements proclaiming that once a town experienced open roads it would never look back regardless of costs. One enthusiastic official stated, “The up-to-date community once enjoying winter freedom of the open road, never again is content to return to the old order of paralyzed traffic.”³⁹

In contrast, rural areas were still grappling with the issue of snow removal even though the increasing numbers of automobiles indicated that the transition to a motorized society had occurred here as well. In this period from 1920 to 1927, rural areas began to adopt variations of urban snow removal practices. Snow removal equipment became mechanized, was adopted in greater numbers, and an organized policy of how to react to snowstorms was slowly developed by county and state highway organizations.

³⁸ “Snow Removal Plans of States Within the Snow Belt.” *The American City* (December 1920): 583-588; *Facts and Figures of the Automobile Industry*, 19.

³⁹ “The Cost of Snow Blockades.” *The American City* (March 1928): 112; *Snow Removal 1928 Catalog* (San Leandro, California: Caterpillar Tractor Co., 1927), 4; Advertisements in *The American City* (January 1922): 26, 58, 70. J.W. Morris, “Cleveland’s Snow-Fighting Organization,” *The American City* (January 1924): 43-44.

In Eastern Massachusetts, for example, the heavy snow in the winter of 1922-23 was noted as interfering in the use of highways “due entirely to the fact that motor trucks and automobiles have almost entirely eliminated horse-drawn vehicles on through driving and trucking routes.” However, a strong objection to the complete removal of snow from roads in the more rural areas was because “horses are still used in the country districts.” In Weymouth, Massachusetts, located just fifteen miles south of Boston, Superintendent of Streets, Irving E. Johnson commented on multiple types of winter transportation. In Weymouth, “enough snow was left for the use of farmer’s sleighs, yet not enough to hinder the heavy commercial trucks and passenger cars passing through the town.”⁴⁰

Weapons of the Snow War

Throughout the 1920s as cities began to concentrate on effective snow removal two allies in fighting this battle were mechanization and organization. Municipal organization was the primary tenet of George E. Waring and his “White Wings” professional street cleaning personnel of the 1890s. The street cleaning and precise organizing of street clearing that had occurred with the contract shovelers of previous decades transferred to a municipal force wielding tractor plows and trucks. It was here, in the mechanization of snow removal, that the greatest changes occurred.

Truck-mounted Snow Plows

It is not known who mounted the first plow onto the front of a motor-truck. Several companies claim the first purpose-built plow-blade, but from the early 1900s on, *The American City* was illustrated with various rudimentary wooden devices attached to the front of trucks. The Mack Truck Museum and Archives in Bethlehem, Pennsylvania contains a

⁴⁰ “The Snow Removal Problem in American Cities Part I.” 349; “The Snow Removal Problem in American Cities Part II.” 482.

1911 photograph of a very early truck in New York City, with wooden planks mounted to the front of the vehicle as a rudimentary plow, complete with a lever to the passenger compartment to allow the blade to be raised. Although the first plow builder is unknown, by 1918 national companies such as the Baker Manufacturing Company, Sargent Snowplow Company, and the Good Roads Machinery Company, all began to market metal plow blades in various configurations that could be mounted to the front axle of a truck. Many local companies also produced truck plows; however, most held to several industry wide designs, either being a straight single blade or a double bladed “v” configuration.⁴¹

The typical straight blade snow plow varied in length, depending in most cases on the size of the truck it was to be mounted on. The blade would mount directly to the front axle of the truck. This allowed the plow to fit a wide variety of trucks, convenient for municipalities that would purchase plows, but install them on contracted trucks. A manual angle adjustment would allow the blade to angle to either side. A wheel in the passenger compartment of the truck would raise or lower the blade by way of a chain attached to the frame supporting the blade. This required a second person to be in the vehicle. The raising of the blade was more important on early blades as they had not yet been equipped with a spring loaded lower edge. V-bladed plows were mounted in much the same manner, although usually they lacked as much elevation adjustment as a single blade.⁴²

Trucks

More important than the effectiveness of the snow plow was the truck on which it was mounted. Truck technology improved considerably through the period of this study.

⁴¹ Survey of *The American City*, 1900-1935, passim; Unpublished black and white photograph, Mack Truck Museum and Archives (Bethlehem, Pennsylvania), cabinet 7 file 36; Advertisements in *The American City* (January 1918): 22, 46, 48.

⁴² *Sargent Truck Plows Brochure* (Bangor, Maine: Union Iron Works, 1927): 1-4.

Both Philadelphia and New York City used 5-ton motor trucks supplied by the White Company in 1920. Philadelphia equipped its trucks with a single blade plow 10 feet long and 16 inches high. As was standard at that time, the truck rode on solid rubber tires with no tread. Traction was provided by chains that mounted on the back tires for grip on slippery pavements, but often traction was obtained simply by placing huge amounts of weight over the rear wheels. Recommendations called for the loading of each truck with two or three tons of pig iron, gravel or other heavy material. In Philadelphia, short wheelbase trucks, would be outfitted with a four-ton cubical block of scrap-iron or concrete mounted directly over the rear axle of the tractor. This gave the highly maneuverable vehicle exceptional traction. In most cases the driver and passenger sat in an open compartment without side windows or windshield. Several municipal experts also recommended outfitting the drive wheels of these heavily ballasted trucks with double the number of snow chains to capitalize on the weight for even greater traction.⁴³

Many areas used trucks normally used as delivery or road building vehicles, but pressed them into service in the winter as expedient snow removal vehicles. Alternatively, tractors were powerful, slow-moving construction vehicles equipped with continuous tracks in place of wheels. Tractors had extreme traction and mobility in snow, but were more expensive than trucks, thus limiting their adoption by some organizations. After WWI, the Kahn-Wadsworth Bill made possible the distribution of over 25,000 surplus army trucks and other equipment to state highway departments for road-building purposes. These surplus

⁴³ "The Snow Removal Problem in American Cities Part I," 351; Archer M. Soby and John H. Nuttall, "Flusher Evolution- The Changing Factors in Street Cleaning," *The American City* (July 1926): 29-32.

trucks, in the hands of the returned servicemen, who had been introduced to them in European service, boosted the mechanization of cash-strapped state highway departments.⁴⁴

West Virginia was one state that received these surplus trucks and pressed them into service for snow removal. Individual trucks, lacking the power of a tractor, or the traction of four wheel drive trucks, sometimes were chained together and used in tandem. West Virginia cited one example of this solution in which the plow was mounted to a 3-ton Aviation truck, which was assisted by a 4-ton Peerless truck in the rear. A pole was chained between the trucks to connect them. This two truck arrangement also solved the problem of the truck carrying the plow becoming engulfed in a snowdrift as it tried to break through, and spinning its rear wheels before it got out. The second truck was enough behind the plow not to be wallowed in the drift and could pull the front truck free.⁴⁵

The truck became versatile due to developments in several other key areas. Improvements in tire technology during the 1920s allowed even the heaviest laden trucks to run on pneumatic tires. This gave the vehicles a traction advantage over those with solid rubber tires, and also allowed vehicles to operate at higher speeds. Engines became more powerful, and transmissions became more versatile with a wider range of gears. New steel alloys resulted in much stronger and more resilient frames. It became common to equip trucks with enclosed cabs, even though the wheel to raise and lower the plow blade protruded into the cab, a necessary element until hydraulic mechanisms appeared in the mid 1930s.

The Midwest was an example of one region that preferred truck mounted snow plows. Cleveland used a fleet of truck-mounted snowplows exclusively, using trucks already purchased for municipal departments. Not only were plows mounted on existing trucks

⁴⁴ Karolevitz, *This Was Trucking*, 81.

⁴⁵ "Snow Removal in West Virginia with Pusher-Type Plows," *The American City* (September 1925): 245-246.

cheaper than purchasing tractors with plow units, but truck plow companies were able to deliver their simpler products in shorter order, guaranteeing delivery before the storms of winter hit. According to J.W. Morris, city engineer, Cleveland's first organized snow fighting program in 1923 had been a success due primarily to their use of truck mounted snow plows. James McLean, County Engineer for Sioux City, Iowa described in a 1928 summary article for *The American City* his report to the American Road Builders Association Convention, of the preference for trucks as the prime mover for snow removal equipment in his county and its surrounding region of the Midwest for the last decade.⁴⁶

Four-Wheel Drive Trucks

A major technological innovation that allowed trucks to take over part of the role of tractors was the introduction of trucks equipped with four-wheel drive. Although today a fixture on millions of sport utility vehicles, initially, most trucks equipped for snow removal were driven only by the rear wheels. A few specialized companies introduced trucks equipped with a center transfer case that sent power equally to all four wheels. Early companies such as Jeffery Quad and FWD produced four wheel drive trucks even before World War I, but it was not until the late 1920s that these trucks were produced in any significant numbers. By that point the market for four wheel drive vehicles was provided by just a handful of specialized companies, the major manufacturers being Oshkosh, FWD, and the Walter Motor Truck Company.

Combining the speed of a truck with traction capabilities similar to that of tractors, four-wheel drive motor-trucks were in many cases the choice of highway departments needing to clear many miles of highway. Each company, however, found a particular niche

⁴⁶J.W. Morris, "Cleveland's Snow-Fighting Organization," *The American City* (January 1924): 43-44; James C. McLean, "Highway Protection and Snow Removal," *The American City* (May 1928): 85-86.

market. Oshkosh and FWD were popular with state and county highway departments that needed to clear roads quickly and faced large amounts of snow that would normally have been reserved for slow moving tractor-driven plows. Michigan, Wisconsin, and highway departments in the western mountains used large four-wheel drive trucks equipped with snow blowers to carve out roads from heavy snowfalls. The spectacular tunnel-like roads left by these machines attracted newspaper and photo coverage.⁴⁷

Walter motor-trucks could be equipped with a center scraper blade, mounted under the body of the truck. This center blade had considerable down pressure, and could scrape pavement clear of ice or packed snow. This combination allowed the plow mounted on the front of the truck to clear heavy snow and the center blade to scrape any remaining snow, even at operating speeds up to 20 miles an hour. Walter motor-trucks were initially used in New York and other cities to break up packed and rutted snow in high traffic areas. With an operating speed far higher than tractors, and able to scrape roadways clean, Walters began to replace tractors in several cities. In rural areas of New York and New England, Walters were popular as well, although tracked vehicles remained in use in many locations.⁴⁸

Tractors

The initial traction difficulties of trucks and the inability of early truck mounted snowplows to push through drifted or packed snow led to the widespread adoption early on of the tractor mounted snowplow. Equipped with continuous treads like a military tank, these powerful tractors had an obvious traction advantage over wheeled vehicles. This led to a surge in the

⁴⁷ Howard W. Troyer, *The Four Wheel Drive Story: A Chapter in Cooperative Enterprise* (New York: McGraw Hill, 1954), 105; John Gunnell, "The Development of the Snowplow," *CHP* (January 1990): 40-43.

⁴⁸ David Wright and Clarence Jungwirth, *Oshkosh Trucks, 75 Years of Specialty Truck Production* (Osceola, Wisconsin: Motorbooks International Publishers & Wholesalers, 1992), 9-17, 48-68; "A Heavy-Duty Snow-Plow Tractor-Truck," *The American City* (September, 1925): 347; "Snow Removal in a High-Grade Residential District, Motor Scrapers Used on Park Avenue, New York," *The American City* (September 1929): 142.

use of tractors equipped with snow plows in major cities, especially after New York City purchased one-hundred fifty tractors after icy conditions in 1920 rendered useless its truck mounted plows.

Good traction on icy streets was one reason that tractors were popular in cities. This traction combined with the power of the five ton and larger Cletrac and Holt brand tractors opened streets buried by a large snowfall and bucked any drifting that may have occurred. Also, tractors had the power to windrow large amounts of snow to either side of a thoroughfare to open it to traffic, and to later push that snow to waiting shovelers at a nearby manhole of the sewer in a process called "sewering." The tractor also had the capability to open streets that had not been cleared in the initial stages of the storm. Once the downtown or business district was completely cleared, tractors operated in deep snow and in snow hard packed by traffic in other areas of the city.

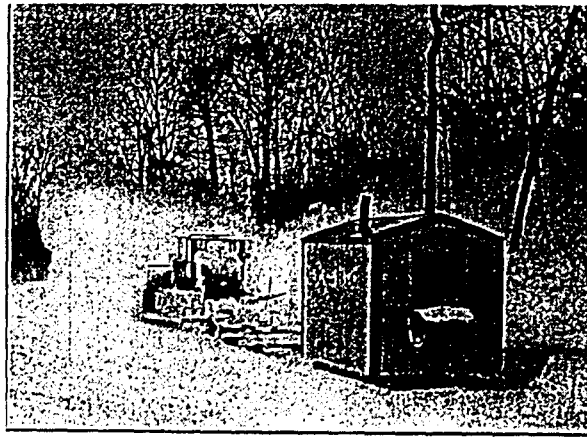
In spite of these capabilities, tractors did have serious disadvantages. With a top speed between three and eight miles per hour, tractors were slow machines. Even the slowest trucks could clear roads often twice as fast as a tractor. While the traction capability of tractors was undisputed, the special "winter tracks" that gave them this capability were expensive and needed to be replaced frequently. The longer lugs or "cleats" of these winter tracks could need to be replaced after just a season's use on the hard pavement of city streets. Winter tracks also damaged all street surfaces to some degree, especially the softer macadam pavements. Tractors were also expensive to operate, with gasoline consumption higher than that for motor trucks. In the cities tractors also sat idle in garages for much of the year. County highway departments and rural towns, which were building and maintaining roads all summer, could easily keep tractors in constant use. Tractors, however, would remain in use

in urban environments until truck technology evolved improving the capabilities of truck-mounted snowplows. In the late 1930s and 1940s new, more powerful snowplow equipped trucks reached a level of parity with tractors in their ability to move large quantities of packed snow and began to replace tractors as cities modernized or bought replacements for out of date or worn out equipment.⁴⁹

In rural areas tractors were the preferred mode of snow removal with just a few specific exceptions. Lacking the large organizations and the ability to fight a snow storm from the moment it began, rural towns ended up clearing roads well after the storm had ended. Roads had to be cleared that had not been plowed at all during the storm. Pushing large v-plows, the ten, fifteen, and even twenty-ton tractors used on rural roads were often larger than their urban counterparts. Trucks were incapable of breaking out these roads, often days or even weeks after a snowstorm. The traction capability of tractors was also preferable if roads had not completely frozen before becoming snow covered or if they began to prematurely thaw in the spring. The shoulders of country roads also were not always well marked or engineered, and a tracked vehicle could better extricate itself from a crumbling shoulder.⁵⁰

⁴⁹ "Fighting Snow with a Tractor," *The American City* (September 1925): 337-338; Highway Research Board, 6th Annual Highway Research Board Report, "Snow Removal and Snow Removal Equipment" (Washington, D.C.: Government Printing Office, 1926), 328-347; E.A. Terhune, Jr., "Cost of Snow Removal by Tractors," *The American City* (May 1926): 488-490.

⁵⁰ "Fighting Snow With A Tractor," 337-339.



REAR VIEW OF IRON COUNTY PLOW IN ACTION

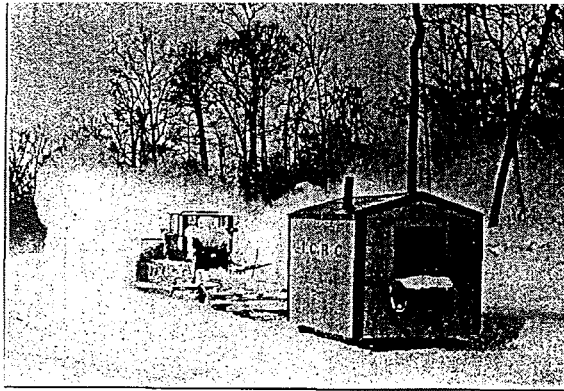
Illustration 1

In several western states, tractors were used before municipalities could acquire plow blades. One or more tractors would pull a V-plow behind them to clear rural roads. In Michigan, Delta and Iron County Road Commissioners used a ten-ton Holt tractor to pull a wooden V-plow with an adjustable wing on either side that could clear a roadway twenty feet in width. Behind the plow was attached a small building on runners, equipped with a wood stove to warm the men who accompanied the tractor to shovel out large drifts.⁵¹

Fordson Tractors

Snow removal was not the exclusive domain of mammoth Holt tractors of five, eight and ten-ton capacity. Many small towns attempted to provide some measure of snow removal with the two-ton Fordson, in many cases the first tractor purchased for municipal use. The Fordson was Henry Ford's attempt to make a tractor equivalent to his Model T: a cheap, simple to operate machine that would allow the American farmer to mechanize cheaply. Unfortunately, the Fordson was underpowered and overheated when taxed. Sometimes it was pressed into use for applications where a heavier duty machine would have been more suitable. However, the low price of a Fordson tractor, along with government subsidies, and

⁵¹ "Snow Removal by Counties," *The American City* (November 1922): 391-394; "Snow Removal in Michigan Counties," *The American City* (January 1925): 14-16.



REAR VIEW OF IRON COUNTY PLOW IN ACTION

Illustration 1

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its accessibility in Ford automobile showrooms and garages allowed many cash-strapped towns to buy one. Equipped with a popular conversion kit called a Trackson, which converted the wheeled Fordson into a tractor with full crawler treads, this diminutive tractor was pressed into service across the country. Trackson-Fordsons showed many towns and municipal departments what a tracked vehicle could do to clear snow from city streets and even some rural roads. Initial attempts at snow removal with a Trackson-Fordson often ended up with mixed results, but were positive enough to lead to the purchase of a heavier tractor the following season.⁵²

Some areas eschewed the slow moving tractors. In the 1920s, Michigan had several counties in which organized highway departments preferred the speed of trucks. These counties had the organization and the resources to implement truck-based snow removal plans by traveling over routes several times during the course of a storm. Using this approach heavier equipment was not needed to “dig out” after the storm.

Rotary Snow-Blowers

When snow drifts were too large or too heavily compacted to plow through, highway and county maintenance departments adopted a snow removal technology developed by the railroads. Rotary snow-blowers had been in use on western railroads since the 1880s to open lines packed in so heavily with snow that it was impossible to plow it aside. Smaller versions were adapted to trucks and tractors using horizontal augers that would feed snow into a centrally located impeller that ejected it out of a top mounted chute.

⁵² Reynold M. Wik, *Henry Ford and Grass-roots America* (Ann Arbor: University of Michigan Press, 1972), 93-97; “Snow Removal with Light Tractors,” *The American City* (January 1928): 197; “Ford Products for Every Business,” *The American City* (October 1924): 22.

Expensive to purchase and maintain as well as being extremely slow moving, rotary snow blowers soon found themselves being held in reserve to clear difficult drifts or to widen roads after snow banks hardened and became icy. Rotary snow blowers were also popular for the clearing of roads in the Western mountains where extremes of snow depth and drifting occurred. Many mountain roads were closed all winter and had to be cleared of an entire season's snowfall to open of the roads in the spring. In these cases, snow blowers would remove the snow in layers, leaving a roadway with near-vertical sides, and snow on each side three to four times the height of the snow removal equipment. In order to generate the tremendous power needed to run the biggest of these snow blowers, the four-wheel drive truck had a large industrial generator mounted in place of its body to run the rotors and impellers of the machine. These generators were so powerful that to reduce weight from the front of the vehicle, the engine was removed and the truck was driven by the generator as well. These mammoth machines soon were replaced by tractors in most applications because they were also used for summer road building.⁵³

Snow Loaders

In the urban landscape, the major technological innovation was not a snowplow or motive power to propel one, but instead a mechanical substitute for hundreds of shovelers. Several companies began to produce machines to load trucks mechanically. The first such machine was produced by the Barber-Greene Company of Aurora, Illinois. Operating on the same principles as the conveyer belt hay loader used on farms, the Barber-Greene loader was mounted on tractor style crawler treads and propelled by a Buda four-cylinder truck-type gasoline engine. A two-armed apron scraped snow off the pavement, and deposited it on a

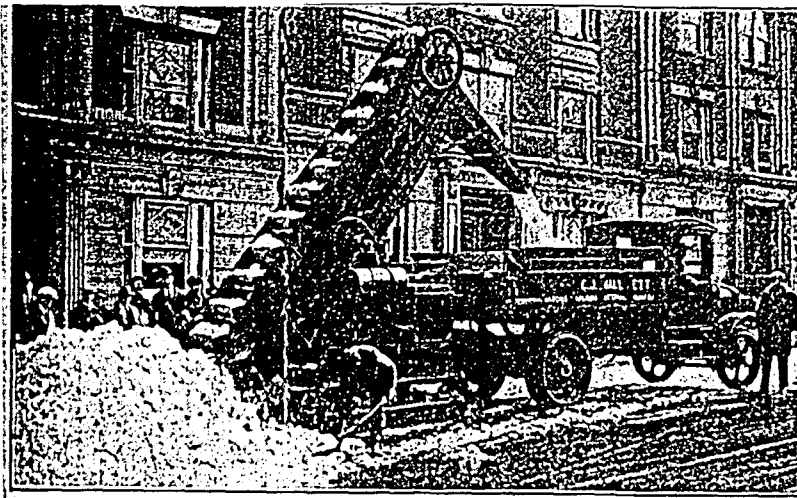
⁵³ Gunnell, "The Development of the Snowplow," 40-43; Highway Research Board, 328-34.

cleated belt which carried it up to a discharge chute that would deposit the snow into waiting trucks.

Chicago was the site of the first use of the Barber-Greene snow loader in December 1920. Running for thirty hours straight, the loader needed only one minor repair that was fixed in a matter of minutes. It was operated by three separate eight-hour shifts of city workers. After working the downtown length of the Boulevard, the snow loader worked across the Loop district. One comment after the first trial of the machine was that the machine worked just as hard between midnight and dawn as any other time, referring to the inefficiency of workers hired to shovel through the night.

The Barber-Greene snow loader was an immediate success and was purchased by many cities. By 1922, advertisements by the company proclaimed its use in New York, Chicago, Philadelphia, Boston, and Pittsburgh, along with numerous smaller cities. The normal procedure to use a loader was similar to the previous methods of loading trucks by hand. The snow was windrowed into large piles either in the center of the street or alongside the gutter. Then instead of having bands of men fill each truck by hand, the loader was positioned at one end of the windrow filling trucks as it moved down the street. Previously, filling trucks by hand was both slow and extra hard on the men. They had to throw snow higher than their shoulders up into the back of a truck. If sideboards were fitted to the bed of the truck to allow it to hold more snow (usually 10 or 12 cubic yards in a 5 ton truck), filling by hand became very difficult. As a result, many operators would dispense with sideboards, making their trips to the city snow dump, only half loaded, carrying as little as 5 to 6 cubic yards of snow.⁵⁴

⁵⁴ "The Snow Removal Problem in American Cities Part I," 350.

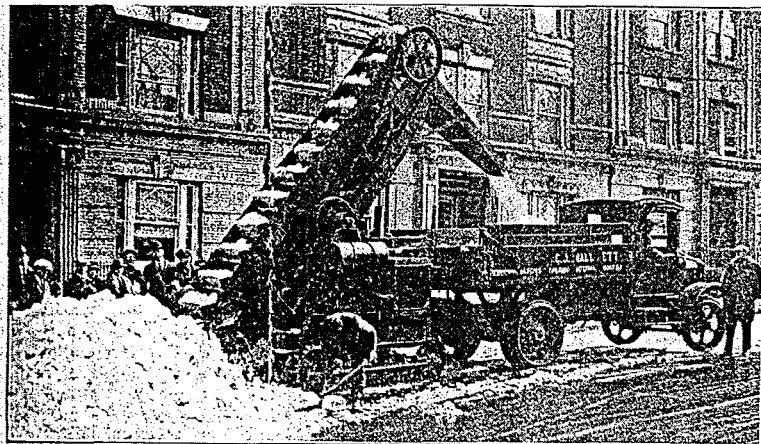


LOADING SNOW WITH MECHANICAL LOADER INTO A 5-TON WHITE TRUCK EQUIPPED WITH A SHADBOLT BODY, AFTER NEW YORK'S ONE BIG SNOW-STORM OF THE WINTER

Illustration 2

Published accounts stated a Barber-Greene snow loader could load an 8-yard dump truck in two and a half minutes. To load the same truck by hand took twenty minutes. Other statistics stated that between twenty-five and sixty men were replaced by the snow loader. Additionally, almost immediately municipalities admitted to the loading of dump trucks to capacities higher than ever achieved with manual labor. The city of Albany used a newly acquired snow loader to fill forty-five trucks an hour for the duration of the cleanup effort after a 1923 snowstorm. Officials in Chicago stated in 1922 that one snow loader and four trucks performed the work formerly requiring twelve trucks and sixty laborers. Curiously, promotional information for the Barber-Greene snow loader published in 1922 stated the adjustable intake scoops of the loader could be adjusted above the surface of the road, to leave snow for the use of sleighs.⁵⁵

⁵⁵ William J. Galligan, "Chicago's Snow Activities," *The American City* (December 1922): 493-495; "Fighting Snow Cheaply and Fast," *The American City* (December 1922): 79; "Loading Snow with a Standard Truck Loader," *The American City* (April 1924): 457; "A New Development in Snow Removal," *The American City* (February 1921): 217.



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The most common manufacturer of snow loaders, Barber-Greene was soon joined by competitors. Other companies, such as the Joy Manufacturing Company of Franklin, Pennsylvania, produced a snow loader propelled by a truck chassis that was equipped with an angled discharge chute. Unlike the first model of the Barber-Greene that required each dump truck to back under the end of the conveyer belt, the angled chute of the Joy loader allowed dump trucks to line up in a row beside the loader, a virtually seamless procession of trucks from loader to the snow dump, and then back again to the end of the line. In advertisements, the Joy Loader was stated to be able to remove a cubic yard of snow from the street for one-tenth the cost of removal by shovel and cart.⁵⁶

Small cities and towns had to rationalize the expenditure for equipment that could sit idle for several years if little snow fell. Some advertisements for snow loaders proposed their off-season use to load gravel or other material for road maintenance. However, several case studies in *The American City* set forth how quickly a snow loader could pay for itself. Boston dispensed with a gang of 90 men after purchasing a single snow loader. On a conservative basis of using the snow loader for eighteen ten-hour days, the city reported savings of over \$10,000 per year. Savings were so great that the snow loader paid for itself in the first fourteen days of operation. Repair costs remained low as well, as only minor replacement parts were required in what seems like a penchant for around-the-clock operation; in 1926, the loader was used twenty times for a total of thirty days. Such convincing examples were needed to persuade municipalities to purchase snow removal equipment costing over \$6,000 each, before optional equipment was added.⁵⁷

⁵⁶ "The Joy Snow Loader," *The American City* (October 1930): 54.

⁵⁷ Joseph J. Comfrey, "Snow Removal Costs Cut 56 Per Cent," *The American City* (March 1926): 250-251.

The snow loader was extremely important in the evolution of mechanized snow removal in urban areas. A city equipped with just a few snow loaders no longer needed to employ huge numbers of shovelers. The efficiency and speed of these machines lowered the cost of snow removal, but also utilized the speed and capacity of motor-trucks to move snow off of the streets. Until hydraulically operated front-end loaders appeared in the 1930s, snow loaders were the only equipment able to displace manual snow shovelers. Even as front-end loader equipped tractors became standard equipment on construction and road sites, snow loaders did not completely disappear. Jim Houle, former public works engineer for the Town of Barnstable, Massachusetts, recounted clearing Main Street with a vintage snow loader well into the 1960s.⁵⁸

Half-Truck, Half-Tractor: The Linn Tractor

The need for brute power combined with the need for traction on snow and ice led to the development of specialized equipment. One example was the Linn tractor, an odd combination of truck and tractor featuring rear drive via tracks like a bulldozer, and steering like a truck thru wheels on the front.

The Linn had initially been marketed for hauling lumber in winter, often attached to a series of sledges loaded with logs. It resembled a locomotive hauling tons of lumber through the forest. In 1920, Frank W. Carpenter, owner of the Black River Bus Lines that operated in northern New York, hired Carl H. Frink of Clayton, New York to install a snow plow on a Linn tractor. Frink is credited as one of the first manufacturers of snowplows; the company still manufactures snowplows today. Linn tractors quickly became popular in northern New

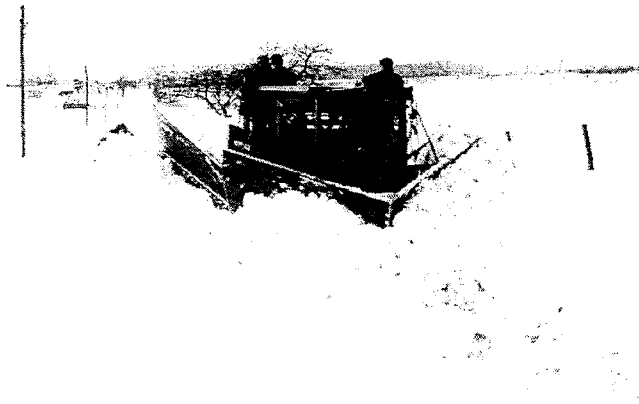
⁵⁸ "A New Shovel for Dirt Moving." *The American City* (December, 1930): 191; "Two New Snow Fighters." *The American City* (October, 1930): 199; Interview with Jim Houle, March 15, 2005.

York for the brute force they brought to road clearing in a region that receives more snow than any other area of the snow belt.

Trucks and small tractors were not able to operate in this area due to the large amounts of snow, and the long distance between towns. Linn tractors were equipped with v-plows and a new innovation, a wing on either side of the tractor adjustable for angle and for elevation that allowed snow to be pushed back and not cause the tractor to wallow. Several men were needed to adjust the wings via a series of cables and pulleys. Hydraulic controls were not introduced to replace the men until 1928. The Linn Corporation also operated several of their machines plowing the main roads for the sum of \$1.50 per hour, a payment made by towns, bus lines, and auto clubs. This occurred after the Otsego (New York) County Board of Supervisors passed a resolution that plowing snow was a waste of county funds and caused premature deterioration of roads.

The operation of Linn tractors was typical of rural snow removal before systematic plans were enacted by county and state highway departments. Operating days after the snow storm, Linn tractors were forced to buck drifts and deep snow that had received no previous attention. In northern New York that often meant Linns were operating in snow depths of seven or eight feet. With snow higher than the windshield, visibility was a common problem. The crew on the back attempted to communicate to the driver through a variety of signals, involving lights, horns, and knocks on the cab. However, with the noise of the 935 cubic inch engine and the exhaust pipe running through the cab to provide heat, this method of communicating was not always reliable. Roads were not yet marked for snow removal with snow poles, so navigation was by landmarks such as trees, fences, telephone or power lines, and by watching for fresh sod or mail boxes being thrown by the plow.

Setting off to clear roads with a Linn tractor was much like embarking on a voyage by boat, a solitary craft in a sea of snow. Operating in snow as high as the vehicle, the Linn often appeared to be burrowing through the snow rather than clearing a road. Even with a 60-gallon fuel tank, several barrels of gasoline were carried as auxiliary tanks. If the engine was stopped and allowed to cool, restarting it might require pre-heating the intake manifold with a blow torch. Crank-start engines had to be spun by a rope wrapped around the crank handle, which two men standing on the radiator of the tractor would pull in unison.



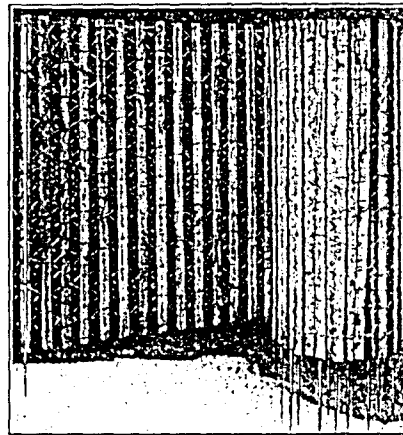
Linn Tractor Operating In A Sea of Snow
Illustration 3

The excitement of being on a Linn crew clearing roads was offset by the exposure to the elements for the men operating the wings on the back of the tractor. It was common practice to equip the tractors with a small cabin outfitted with a wood stove on the back of the tractor to protect wing operators from the weather. It was also common to break through frozen or particularly stubborn drifts by ramming into them, backing up and ramming them again. This violent maneuver more than once resulted in the stove in the cabin being tipped and the cabin catching fire. Several cabins were burned, and in a number of instances, a

desperate crew, with over a hundred gallons of gasoline on board, would hook a cable to the nearest power or phone pole, and pull the entire burning cabin off the back of the tractor!⁵⁹

Linn tractors were just one example of the stopgap technological adaptations used to clear roads before improvements in motor-trucks allowed them to fulfill a considerable portion of the snow removal needs of the country by the 1930s. Tractors and rotary snow blowers were still held in reserve for areas of high drifting and for expanding the primary cuts made by trucks during the height of the storm; however, as snow fighting became more organized and systematic the truck was found to be suitable for more and more applications.

Snow Fences



Courtesy Wickwire-Spencer Steel Corp.
SNOW-FENCE MADE OF WOVEN WIRE, WOODEN
SLATS AND STEEL POSTS

Illustration 4

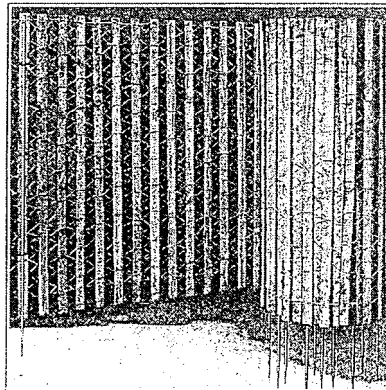
As county highway departments became more organized they began to focus more on drift prevention. The Southern Pacific Railroad had pioneered the use of snow fences in the western mountains, modifying techniques that had been first used on railroad lines in Norway and Russia. Highway departments discovered that by erecting barriers that stopped snow from drifting onto roadways, snow accumulation could be reduced by over fifty percent.

⁵⁹ "A Heavy-Duty Tractor Plow," *The American City* (November 1925): 579-580; Robert C. Ackerson "Linn, The New England Truck," vol.2, *The Best of Old Cars Weekly* (Iola, Wisconsin: Krause Publications, 1978), 111-114.

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Extensively used in Pennsylvania, Wisconsin, and Michigan, the first railroad type fences consisted of six-inch-wide boards spaced six inches apart on a ten foot frame. These were superseded by an a lath and wire fence with one and a half inch wide cedar lathes spaced two and a half inches apart. This style later became standard and was sold by a company also engaged in the production of snow plows and other snow removal equipment, the Good Roads Machinery Company of Kennett Square, Pennsylvania. Permanent snow fences could also be used in the form of trees and shrubs planted specifically to block drifting. In either case, highway engineers had to survey the roads of their district in the off-season to determine where the best locations were for their district's supply of snow fence. Planning for all season roads was becoming a year-round responsibility.⁶⁰

Salting the Suburbs: Searching for Grip

The final weapon in the arsenal of the snow removal was traction aids and melting agents, such as sand, salt, and calcium chloride. Before and during the early decades of autos, sand and cinders were hand spread in traffic intersections and hilly regions to provide traction. Salt, which actually would melt snow and ice, seemed a good idea, but many cities banned its use. Salt damaged people's shoes and clothes as well as the hooves of horses as they slogged through the briny mix. Some transit companies were allowed to spread salt at sharp turns and switches to prevent re-icing, but extensive salt use did not begin until the late 1920s when horses were no longer present in the urban landscape.⁶¹

The popularity of salt also illustrates a trend in snow removal. By the late 1920s and early 1930s the biggest obstacle to the use of the automobile in urban environments had

⁶⁰ Mergen. *Snow in America*, 43; "An Effective Snow Fence to Prevent Drifts," *The American City* (October 1926) : 201; "The Possibility of Natural Snow Fences," *The American City* (April 1928): 114.

⁶¹ McKelvey, 49

shifted from snow drifts, to slippery streets caused by auto traffic compacting the snow. Also, salt became a cheaper fix than continual applications of sand to achieve acceptable traction. In Springfield, Massachusetts, one coating of salt was spread to achieve passable roads when in the past three or four coatings of sand and cinders were needed. First appearing in the mid-1920s, mechanical truck-mounted spreaders also allowed a reduction of manpower in this process, making salt an even cheaper alternative than before. It would be into the 1940s before the truck-mounted spreader was refined and found throughout the snow belt. The popularity of salt also points to a stage at which bare pavement was expected, for both pedestrians and automobiles.⁶²

As cities expanded and suburbs developed around them, municipal departments were faced with thousands of miles of new streets to clean, and millions of suburban automobiles whose drivers demanded clear, slip-free roads. The application of salt became extremely popular in the mid-1930s and beyond, as the “snow war” soon evolved into “chemical combat” against, both snow and, unfortunately, the surrounding environment.⁶³

As mentioned earlier, from 1920 to 1927, rural areas began to adopt variations of the snow removal policies being used in urban areas. Mechanized snow removal equipment appeared, and an organized policy of reacting to snowstorms was slowly developed by county and state highway organizations. However, just as the urban reports of snow removal do not portray a complete picture, with large sections of residential and lesser priority

⁶² William H. Woodward. “Melting Ice with Salt Saves Men and Tires.” *The American City* (January 1943): 79; “A Salt-Distributing Machine for Snow Removal.” *The American City* (January 1926): 123; “A Chip Spreader for Road Work.” *The American City* (March 1927): 585.

⁶³ E.A. Miller. “Preventing Accidents on Icy Pavements.” *The American City* (October 1929): 94; Highway Research Board. 10th Annual Highway Research Board Report. “Removal of Ice from Pavements.” (Washington, D.C.: Government Printing Office, 1931), 42-43.

business areas ignored or only cleared of snow after the downtown districts, rural areas did not immediately come to terms with snow removal either.

The American City reported success with highway organizations, but did not explain the difficulties facing smaller cities and rural areas in this period. True snow removal from all roads did not occur until the late 1920s at the earliest, the early 1930s in many areas, and in some more rural areas it was delayed until the 1940s, or even after World War II.

It is apparent from the registration and purchase data of the 1920s that people living in rural areas were not hesitating to purchase automobiles even if the roads remained uncleared throughout the winter. More automobiles were sold in rural than urban areas, and this statistic held true in the rural areas of the snow belt. In many northern cities, snow removal did not occur until the mid-to-late 1920s when automobile ownership boomed. Albany, New York, did not clear its roads until the mid 1920s, but that did not deter automobile ownership in the city. *The American City* consistently quoted the Highway Research Board and other Federal organizations that laud the increasing ratio of miles cleared each winter to total mileage. In the period from the winter of 1924-1925 to the end of the decade, several years show an increase in roads cleared from the previous year of over fifty percent.

If one looks to the historiography of the automobile in America for answers as to how the automobile remained viable transportation without all-weather roads, you will come away empty-handed. The role of winter weather and the absence of all-weather roads in the history of the automobile has largely been ignored. The image of the automobile mired in the muddy quagmire that rural roads were reduced to every spring has become symbolic of the early days of motoring, but the winter snows that blocked that same road have been ignored.

The two seminal works in automotive history, John Rae's *The American Automobile*, and James J. Flink's *America Adopts the Automobile*, do not address the issue of all weather roads in the adoption of the automobile. Rae's work centers on industrial and business history, while Flink's focuses on the early aspects automobile adoption.

Flink's work, however, does deal with the statistical parameters of early automobile adoption. Flink's thesis is that by 1910, the year in which Henry Ford established his Highland Park plant to manufacture the Model T, the American public was socially and culturally acclimated to the automobile. People were just waiting for a cheap, readily available automobile to appear on the market.⁶⁴ In attempting to prove this statement (which automobile historians have debated since its publication in 1970), Flink analyzed the available registration and sales information to answer many of the basic questions about automobile adoption. He examined distribution of automobile ownership, by economic status and between rural and urban regions. Relating to snow removal he states the geographic distribution of automobile ownership did not reflect any climatic biases. There were more automobiles in the snow belt states than in other parts of the country that did not experience harsh winter weather and snowfall. Flink attributed this fact to the poor economic conditions in many Southern states. Nonetheless, he proved that even in sections of the snow belt that were as economically depressed as the South, automobile adoption occurred at average to above-average rates.⁶⁵

Flink also documented another trend in the early history of automobile ownership. Automobile ownership numbers were not greatest in the city, where infrastructure was available to make hard-surfaced roads to remove snow, but in what he calls "country towns"

⁶⁴ Flink, *America Adopts the Automobile 1895-1910*, 1-3.

⁶⁵ *Ibid.*, 55-60, 74-86.

smaller population centers where municipal management was in its infancy and conditions were not always optimal for automobile operation.⁶⁶

Flink's enthusiasm for early automobiles garnered from his examination of popular literature is tempered by the cold hard numbers of automobile ownership. The American public may have acclimated to the idea of automobile adoption, but the cheap, readily available automobile had yet to appear. In 1910, in the entire United States there were only 458,500 registered automobiles and 10,000 trucks. By comparison, just five years later, over 2,300,000 automobiles and 136,000 trucks were in use. By 1920, when over eight million automobiles were on the road, the trends Flink had documented in his study of the pre-1910 period, had grown into a powerful agents of change in just a few years.

Flink did not address the difficulty in operating these millions of vehicles in the winter time. In 1926, of the three million miles of rural roads in the United States, only 521,000 were hard-surfaced. Sixteen years after the country was primed for automobile adoption, according to Flink's study, when car and truck registrations totaled over twenty million, the majority of the nation's roads turned to mud every spring. Clearly infrastructure, whether it is hard-surfaced roads, organized highway departments, or comprehensive snow removal, was not able to keep up with automobile volume.⁶⁷

The historiography of the automobile and *The American City* both give incomplete coverage of the issue of snow removal in rural areas. A source of information for the snow belt as a whole is The Federal Highway Research Board annual reports beginning in November 1922. Six consecutive issues of the Highway Research Board Report from its

⁶⁶ Ibid., 83-85.

⁶⁷ Ibid., 8, 55-60; *Facts and Figures of the Automobile Industry*, 4, 25.

annual conference carry discussions on snow removal from roads as a part of the required winter maintenance. The organization attempted to cover the issue for all thirty six snow belt states.

In 1922 and 1923 the Bureau of Public Roads only committed to studying a developing problem of snow removal; it surveyed the snow belt highway and county organizations in an attempt to find equipment that it could recommend for the clearing of highways. The reports attempted to describe the different plows and estimate their performance. The Bureau also conceded the difficulty of treating the entire snow belt as a whole. The report states:

The average cost of snow removal is a very indefinite figure. It varies so widely between one State and another and even between counties in the same State that little information can be given on the subject. The cost of snow removal varies with the density of the snow, depth and length of drifts, and width of traveled way provided.⁶⁸

In 1924, general tabulated data was presented with analysis and equipment recommendations from W.A. Van Duzer of the Pennsylvania State Highway Department. The usefulness of this table of data for comparable purposes was discounted by the Highway Board because it did not include methods, climate, and working conditions or even equipment descriptions. The cost of snow removal ranged from \$2.00 per mile for South Dakota, to \$400.00 per mile for Nevada.

While the Bureau of Public Roads and the Highway Research Board reports lacked specifics, they do provide figures for highway mileage and miles of roads cleared each winter: numbers crucial for examining the improvements of the snow removal program of the United States. During the winter of 1924-1925, 62,165 miles of highway were kept clear of

⁶⁸ Highway Research Board, 8th Annual Highway Research Board Report, "Report on the Committee on Maintenance," (Washington D.C.: Government Printing Office, 1928), 235.

snow with \$1,826,800 expended for the work. For the winter of 1925-1926 road mileage open increased to 93,000 miles with \$3,757,660 expended, a tangible increase of approximately 50 percent. In comparison, just four years before in the winter of 1922-1923, only 27,000 miles of snow-free roads were achieved. The American Automobile Association presented figures of 117,000 miles open in 1928, a number that represented nearly fifty percent of the main arteries of vehicular travel in the thirty six snow states. The Federal Highway Board, beginning in 1926, critiqued the level to which roads were cleared to highlight the improvement of mechanized snow removal. Roads that were merely "broken out" after a snowstorm with one swath of a plow in 1924 were passable both during and after a storm by 1925-1926. Reports from 1922 and 1924 depicted town and rural roads opened to the width of a plow, passable for single lane traffic only. Motorists encountering oncoming traffic had to attempt to squeeze by and risk getting stuck in the unplowed edge of the roadway, or back up for considerable distance until a turn-out was reached that would allow two-way traffic to pass. By 1925-1926, however, an expected level of comprehensive "snow clearing" was described, putting an end to one lane roads. This was accomplished through work continuing long after snow had stopped falling and the first plows had been recalled. This more complete snow removal may also explain why costs per mile of road cleared continued to increase in the 1920s, even as the organization and efficiency of municipal departments improved.⁶⁹

⁶⁹ "Minnesota Snow Drifts Easily Cleared by Tractors." *The American City* (April 1928): 7.



Traffic Meeting On A "Broken Out" One Lane Rural Road
Illustration 5

In terms of snow removal, the organization of state highway departments, and the funding of them with federal aid after the Federal Roads Act of 1916, took the responsibility for snow removal on major roads and highways out of the hands of the town through which the road ran. The responsibility for snow removal was placed within a large organization that as it matured, had the ability to organize a comprehensive snow removal program. This allowed equipment, personnel and routes of road clearing to be planned out before the winter season. Effective snow removal involved a level of planning that large municipal or state departments could handle more effectively than towns. This degree of organization also allowed faster equipment such as truck-mounted snow plows to be used, with heavier but slower equipment held in reserve for heavier snowfalls. In addition federal aid allowed these organizations to purchase expensive snow removal equipment.

Just as in cities where the organization and planning of a professional street cleaning department allowed the maximum effectiveness of mechanized snow removal equipment the same was the case in rural areas. An organized highway department could plan a regional

program of snow removal that maximized the attributes of snow removal equipment, such as high-speed truck-mounted snowplows. Unlike the efforts of towns previously, in which one large tractor or Linn would, over the course of several days, plow out the town after the storm ended, highway department snow removal began in the midst of the storm and continued until the roads were fit for automobile traffic. Thus, they kept “roads open” throughout a snowstorm rather than “clearing roads” just once.

The Highway Research Board publication provided a view of the level at which the automobile had permeated society by the winter of 1927-1928, but of more interest is the “work in progress” tone of the publication. Continually in this work, the goal of clearing more roads each year is promised and seemingly demanded by the public. By looking at this publication and the data that was used to create it, one can create a benchmark to examine the effectiveness of snow removal by 1928, and its importance to a society that had wholeheartedly adopted the automobile, but was struggling with complete year-round functionality.⁷⁰

Even nearly thirty years after the first mass-produced automobiles (the Curved Dash Oldsmobile in 1902-1904), winter travel throughout the snow belt, was still difficult. As the Federal Highway Research Board stated, there were a total of 16,139,859 motor vehicles (including trucks and commercial vehicles), or sixty six percent of all automobiles registered on Earth. These automobiles traveled over a system of approximately 376,575 miles of paved rural roads (1925), both on and off state systems. However, only 62,165 roads were reported cleared in the winter of 1924-1925. This increased to roughly 93,000 for the winters of 1925-1926 and 1926-1927, and edged higher to 117,000 miles in 1927-1928. Even though

⁷⁰ Highway Research Board, 8th Annual Highway Research Board Report, “Report on the Committee on Maintenance,” (Washington D.C.: Government Printing Office, 1928), 251-280.

the road mileage cleared increased by approximately fifty percent in these years, it left a significant percentage of roadways unclear.

Interestingly, in these reports, snow removal is not described as an “accomplishment.” Snow removal is described as “not a passing fad,” mileage is “doubling yearly,” and “someday all residents of the snow belt will be given the luxury of snow free roads.” Evidently the problem of snow removal was not solved. As an example of how uneven the response to clear roads could be on a regional basis, the rural resistance to clear roads due to rural-urban antagonism (fear of increased taxes, and reliance on horse-drawn vehicles) was documented in the Albany, New York area in 1922. This fear was quickly dispelled as automobiles pervaded the region. However, in *The American City*, as late as 1924, reports were posted from rural areas hostile to snow removal. In Marion County, Iowa Robert T. Johnson, county engineer, reported “the rural population objects to snow removal because of misinformation sent out by local politicians.” Ironically this article started off with the statement:

For nearly ten years we have been talking of the need of snow removal on main highways to facilitate traffic 365 days a year. This need has been imperative with the increasing number of bus lines and of manufacturers who depend on highways for the distribution of products.

For Marion County, Iowa, and other towns issuing reports in this article, the need was less than imperative.

Clear winter roads were not just an issue of personal mobility. By the 1920s so many professions were motorized that snow removal was essential. For both rural and urban areas, clear roads allowed fire departments to respond to emergencies. This became even more critical as motorized fire equipment came into use. Physicians as a group adopted early

automobiles en masse as it afforded them increased mobility for house calls. In the 1920s doctors needed dependable, clear roads to allow for visits and to transport their patients to the centralized hospitals that were being established.

Also in 1925, the United States Post Office Department supplied the information that 31,600 rural free delivery vehicles used 869,390 miles of road yearly to deliver mail in the thirty six snow states to 21,296,400 patrons. In a day when rural free delivery also handled parcel post that could include packages as important as springtime chicks to the farmer, and as large as tractor parts to his neighbor, the phrase "the mail must get through" held greater importance to a rural population that depended on rural free delivery as a lifeline to the rest of the world.

The adoption of centralized school districts allowed the youth of the snow belt access to a level of education unavailable in the one room schools scattered through rural districts. However, school centralization depended on the ability of the legions of school buses to deliver pupils in a timely manner year-round.

As buses began to play a greater role in transportation networks, snow removal shifted from the responsibility of railroad and inter-urban trolley networks that held the clearing of their rails as a private responsibility, to the clearing of roads by town, county, and state governments financed considerably by the federal government. Bus companies were often the first proponents and financial boosters of initial snow removal efforts (along with local civic organizations and motor vehicle dealers) but in some cases they would take the responsibility for clear roads into their own hands. Greyhound Bus Lines in Chicago operated its own large highway snow plows, and would clear the roads that comprised their bus routes. They were documented assisting Chicago municipal authorities on the Outer Loop, in order

to reach their outlying stops. In this case, it was important enough to ensure uninterrupted service to justify the cost of allocating men and specialized equipment to clearing snow from public roads.⁷¹

It is impossible to over emphasize the importance commercial trucking placed on clear roads. As the motor-truck replaced the horse-drawn cart or “truck” in urban areas, and began to compete with the railroad for long-distance freight shipping after World War I, clear roads became critical. Arguably, commercial road traffic was more of an impetus to clear roads than personal automobile traffic, due to the inability of commercial traffic to accept delays.

Conclusion

In combining municipal viewpoints as portrayed in *The American City*, with reports from the Highway Research Board and other organizations, the dilemma between automobile ownership and popularity with the lack of all-season roads can be further explored.

Clearly, automobiles were being adopted well before the roads were cleared of snow. Even if a pro-municipal viewpoint is factored into the coverage of this topic in *The American City*, as it is a publication directed toward municipal management, it is clear that in some locations automobiles were in widespread use a decade or more before open winter roads were achieved. Highway data reviews also demonstrated the lack of all-season roads, and extended beyond the peculiarities of a city or region to show in the mid-to late 1920s the total number of roads cleared increasing at a rapid rate. A decade earlier, at the end of World War

⁷¹ 8th Annual Highway Research Board Report, “Report on the Committee on Maintenance,” 232-235; Highway Research Board, 6th Annual Meeting of the Highway Research Board Report, “Proceedings of 6th Annual Meeting,” (Washington D.C.: Government Printing Office, 1926), 328-331; “American Counties Prevent the Blockade of Roads by Snow,” *The American City* (December 1924) : 577-580.

I, an automobile population of over 5.5 million was in use well before comprehensive snow removal.

By the 1920s the infrastructure to organize an effective snow removal program was in place. In cities, the municipal government had organized street cleaning into a structured and zoned program able to conduct city-wide operations. The introduction of mechanized snow removal equipment into this organization gave the street cleaning departments of large cities such as Boston, New York, and Chicago the tools to quickly remove large accumulations of snow ever more effectively. Each element allowed urban snow removal to be effective. The structuring of cities into zones and districts with specific labor assignments that had begun in the 1890s, in the first years of the professionalizing of street cleaning, ensured efficient distribution of resources. There were originally hand shovelers and later snow loaders, tractors, and plows. Mechanized snow equipment allowed this organization to function at a speed and efficiency impossible with even thousands of shovelers.

In the rural environment snow removal was organized and effectively implemented by state and county highway departments. Herein lies the difficulty with surveying as large an area as the thirty six snow belt states. Highway departments matured into effective organizations at widely varying rates throughout the snow belt. Since the formation of these organizations was necessary to receive funding under the 1916 Federal Aid Road Act, states began to organize under these parameters. Several states in the snow belt, however, did not have organized, funded (through federal and state plans) highway departments until the mid-1920s.

It remains unclear how much input private entities had on snow removal. Trucking companies, bus companies, business chambers of commerce, auto dealers, and associations

participated in actual snow removal to further their business goals. For example, Cole's Express Company, a freight firm, for several years plowed the first highway to remain open through the winter to the northern-most parts of Maine, in order to attempt to compete with freight shipped by train. Before Cole's freight trucks began servicing northern Maine, the railroad was the only transporter of freight for over 180 miles. In a similar but more metropolitan setting, Greyhound Bus Lines would plow their own routes through the outer loop of Chicago to provide bus service to the city. It cannot be measured how important private snow removal was to the establishment of regular programs by government agencies. In many regions, private individuals took on the role of convincing a skeptical public that plowing open roads and making runner-equipped vehicles obsolete was good for everyone thus making an easier transition for government organization and formalization of county and state highway departments.⁷²

On a more basic level the agency of the object must be touched on. While the focus of this study is the adoption of snow removal, the relationship of the automobile also must be highlighted. Simply, was snow an obstacle to winter use of the automobile? An automobile was stored away in winter, but was that due more to creature comforts and mechanical difficulties with cold temperatures, than a lack of prowess on snow-covered roads? In the most elemental of terms, how much snow can an automobile go through without snow removal? Several municipal road inspectors in *The American City* state automobiles maintained a certain level of competency on unplowed roads: ten to twelve inches of snow could be traversed by the standard automobile of the early 1920s. Multiple accounts exist of eight to twelve inches being no obstacle to early automobile pioneers in horseless carriages.

⁷² Galen Cole, *Allie Cole: A Maine Pioneer* (Portland, Maine: Casco Printing Company, 1980), 49 – 62; Karolevitz, *This Was Trucking*, 88.

With high ground clearances and equipped with proper snow chains automobiles were able to operate in snow provided the driver and passengers could deal with the mechanical complications and the lack of weather protection in automobiles. In fact, it would seem from accounts of early motoring, traction was not so much an issue in snow as it was on the ice which resulted from winter traffic. As automobiles first ventured out on uncleared roads, the small numbers of brave enthusiasts drove in the same ruts until they became icy and treacherous. The same basic problem, on an exponentially larger level, occurred in the suburbs of cities as increased vehicle traffic necessitated the adoption of salt and calcium chloride de-icing programs in the 1930s and 1940s.

The automobile was widely adopted by the time snow removal became effective in the 1920s leading to the more complex question of how society dealt with the adoption of a transportation method before the infrastructure was able to provide the means to utilize the system year round. It is now obvious the role of snow removal and the availability of all weather roads have played a larger role in the effectiveness of the automobile as both rural and urban transportation than previously understood.

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Appendix

Thirty Six States Comprising the Snow Belt:

Arizona
California
Colorado
Connecticut
Delaware
Idaho
Illinois
Indiana
Iowa
Kansas
Maine
Maryland
Massachusetts
Michigan
Minnesota
Missouri
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Dakota
Ohio
Oregon
Pennsylvania
Rhode Island
South Dakota
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming

Vita

Steven Russell Hatch was born September 21, 1974, in Rockland, Maine. He is the son of Lewis Wyman and Cheryl Ann Hatch. A 1993 graduate of Georges Valley High School, Thomaston, he received a Bachelor of Arts degree with a major in history from the University of Maine at Farmington in 1997.

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Beginning in February 2002 he has been employed at Heritage Museums & Gardens in the position of Assistant Curator of History, curating the collections of the American History Museum and the J.K. Lilly III Antique Automobile Museum. In August 2003 he was selected to be one of three automotive art judges at the Meadow Brook Concours d'Elegance in Rochester, Michigan. In April 2006 he completed the requirements for a Masters of Arts degree in history from Lehigh University. He is also co-author of the *The Automobile Collection of Heritage Museums & Gardens* to be published in the spring of 2006. He is a member of the Cape & Islands Historical Association and the Society of Automotive Historians.

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TITLE**