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The Amesbury Vehicle

The Carriage Making Industry of Amesbury, Massachusetts

by
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Amesbury Carriage Museum
Amesbury, MA

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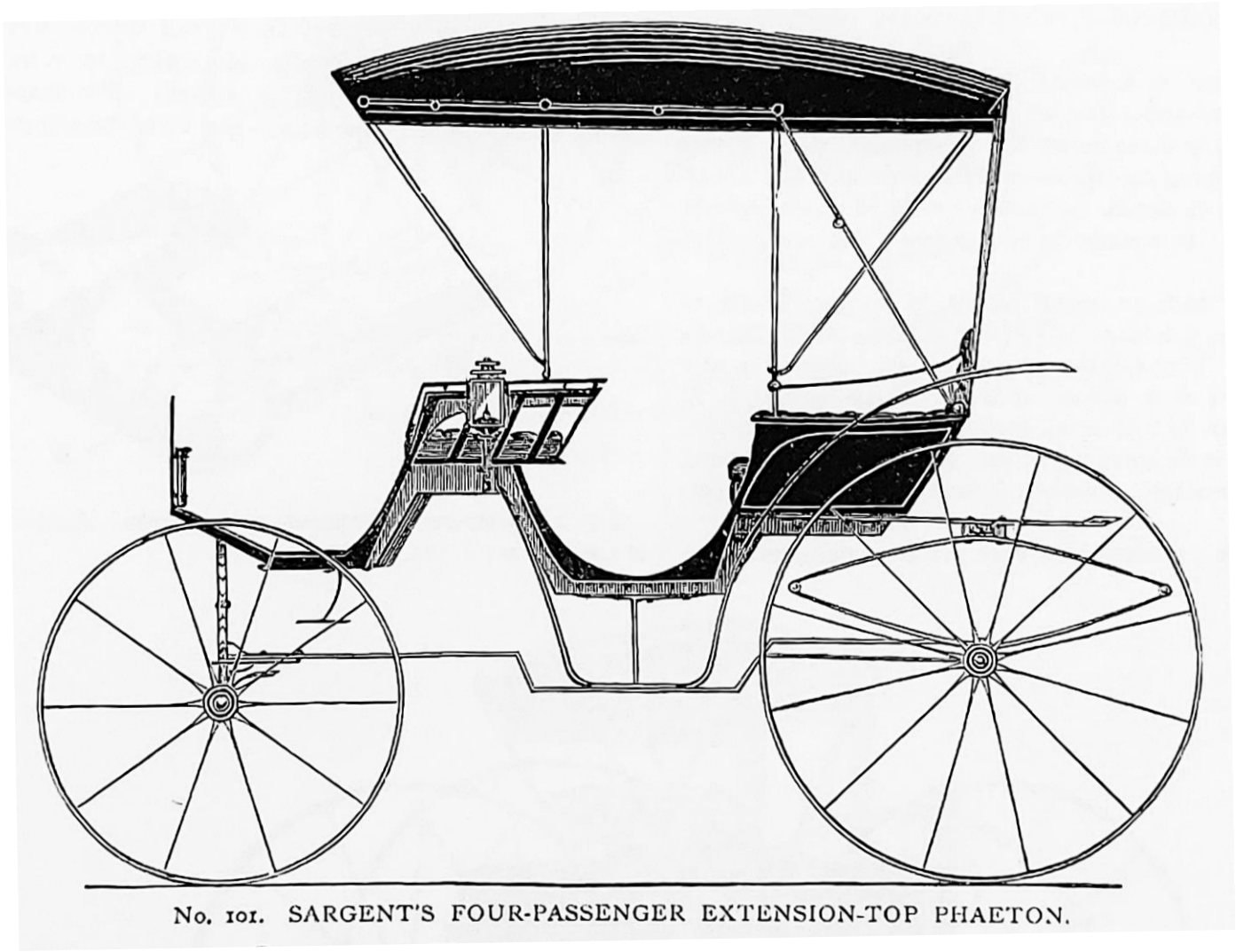
The Amesbury Vehicle*

1853 - 1928



**The title is that of a carriage business newspaper published for several years ca. 1891 by the Amesbury Dailey News*
Illustration from the 1876 Centennial Exhibition display of William P. Sargent & Co. of Merrimac, only local carriage maker at the Centennial. Merrimac had been part of Amesbury up until just a few months before the Centennial event.

Introduction

The following presents a macro-view of Amesbury's carriage-making business. Tiny 19th century Amesbury resided amidst a generally rural region, except that it was among the towns benefitting from the ocean and inland waterways for its commerce and industriousness. Shipbuilding and various forms of mills along the Powow River had promoted an atmosphere of productivity and mechanical arts. Manufacturing expanded, even as waterpower rights became monopolized by and devoted solely to textile milling along the river, which was financed by large outside capital. Local enterprises thus pursued a more modest business model, achieving a significant position in American carriage building and boutique high-grade auto body construction.

Amesbury is treated herein as separate from Merrimac even though Merrimac was part of Amesbury until 1876, and from outside this area the two were generally considered as a common carriage-making community. However, there is excellent data for comparing and contrasting business practices of the two towns as they shifted focus through the carriage-making era.

The emphasis here is on overall operation of the carriage business and how it fit into the nationwide industry that in 1890 comprised over 10,000 shops and factories making wagons and carriages. Discussion of business functions explores the working environment and the flavor of what Amesbury carriage makers both did and did not do over their life cycle, including their geographic distribution, size, methods, production, products, and pricing. The emerging picture is that of a cooperative group of mostly smaller and mid-sized shops that collectively constituted a major segment of the American carriage industry.

Summary of the Amesbury Carriage Industry

Brought to Amesbury from Merrimac by Jacob R. Huntington in 1853
- standardized a middle-to-high-grade vehicle around 4 production concepts:
    - a relatively simple & popular carriage style
    - part duplication by simple means (drawings, templates, gauges)
    - simple assembly line with specific employees & parts at each station[1]
    - wholesale distribution, to avoid tying up money in slower retail sales
- wholesaled at average price range of $100-$200 during the 1880s-90s

A simple low-capital small-business model carried out in mostly un-powered shops
- easily replicated around town
- able to hold a niche market in craft-built fine carriages
- prone to disruption from large industrialized makers encroaching on their markets
- unable to recover from the depression and competitive conditions of the 1890s
    - shops rapidly shifted to auto body manufacture after 1900

Americas five top carriage making cities:
- Cincinnati – largest carriage maker, & machinery maker
- Chicago – large industrial carriage & machinery maker
- St. Louis – large industrial carriage maker

} Centrally located transportation hubs, all having both rail and major river/lake access

- Amesbury – semi-industrial maker of craft-built fine carriages
- New Haven – high-grade enclosed craft-carriages for N.Y.C. trade

Amesbury merged hand-craft, soft industrial management skills, and light industrial technology to occupy a major position in high-grade carriage manufacture.

[1] an unreferenced period description with some details, *The Industries of Amesbury, Massachusetts*, Royal Feltner, Amesbury

Origins of Local Carriage Making

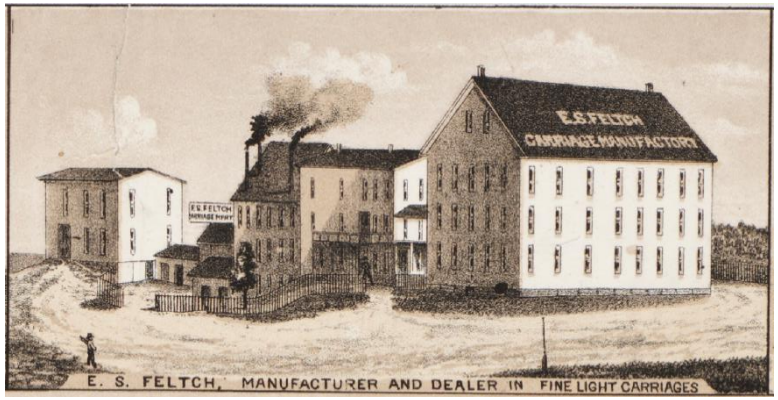
Chaise-making seemingly originated during the Revolutionary period in the Belleville area of Newburyport, then considered to be in Newbury being as the "Newburyport" title was restricted to the district directly around the wharves and Market Square[1]. Michael Emery (1764-1842) of West Newbury reportedly learned the craft in Newburyport[2] and then transferred it across the Merrimac River around 1800 when he married widow Sarah Worthen Sargent of Merrimacport (then called South Amesbury or River Village). Emery was assisted there by a local carpenter named Joshua Sargent, along with William Little, who made silver plated fittings, and Stephen Bailey, who did finish trimming[3]. By the 1820s the number of carriage shops was expanding in River Village and up into West Parish.

In 1836[4], "At Belleville, chaise manufacturing is prosecuted with vigor; there are probably not less than 30 hands employed." Regarding Amesbury at that time[5], "About 550 chaises are annually manufactured at West Parish (now Merrimac), giving employment to 150 hands and a capital of $30,000. These chaises are disposed of in almost every section of New England."

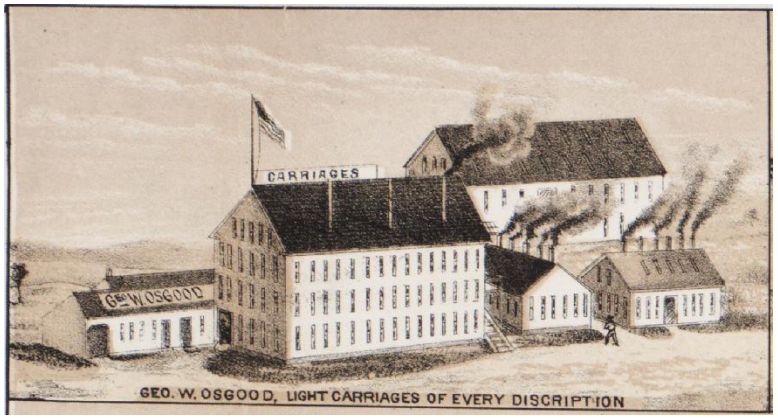
Fourteen years later, 1850 Merrimac largely continued that traditional craft. No carriage shops had power and many perhaps operated for only part of the year. The two industrially advanced businesses were larger water-powered factories on Cobblers Creek making wheels and iron axles, plus several smaller wheel makers. Sargent Gunnison & Co. (later Wm. P. Sargent & Co., see cover) had just then begun distributing fine carriages through southern New England, elevating the local reputation. One report stated[6], "The cost of a chaise in those days was about $120 and usually included a harness and took about 8 weeks to build."

[1] Map of Salisbury, surveyed and drawn by Philander Anderson, Sept. 1830
[2] *History of Essex County Vol. II,* D. Hamilton Hurd, J. W. Lewis & Co., Phila, 1888, pg. 1547
[3] *William P. Sargent & Co*., Paul F. Gauvreau, The Carriage Journal, March 2002, pg. 57
[4] *Essex Memorial for 1836*, James R. Newhall, Salem Mass., Henry Whipple, 1836, pg. 206
[5] ibid. pg. 48
[6] *Where the First Carriage was Made*, The Villager, August 6, 1885, pg. 8

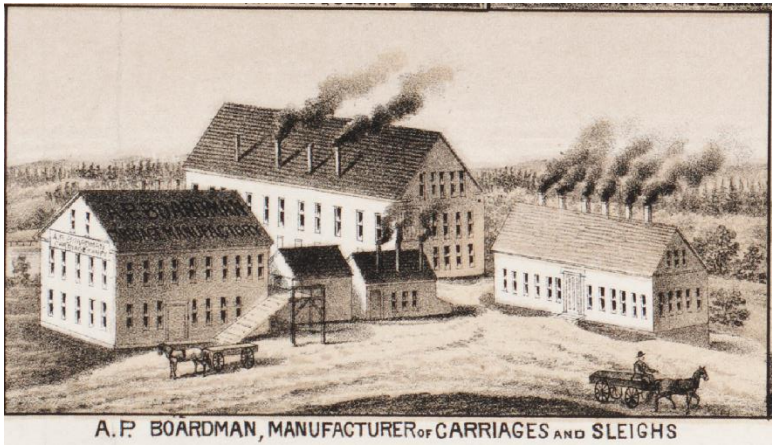
Amesbury Carriage Complexes



E. S. Felch – 500 car./year – 45 employees



Geo. Osgood – 475 car./year – 25 emp.



A. P. Boardman – 500 car./year – 21 emp.

Carriage makers were dispersed throughout town, most having no power. The many small chimneys seen here are from forge fires for working iron components.

Neighborhood complexes mostly began during the late 1860's, lasted until the 1890's, and then were over-grown by their neighborhoods without leaving a trace.

Miller Brothers – 151 Market St.
E. S. Felch – 139 Market St.
A. P. Boardman – 91 Market St.
Geo. Osgood – 27 Powow St.
Francis & Smith – 15 Thompson St.
Samuel Rowell – 12 Pond St.
W. G. Ellis – 99 Friend St.
Charles Rowell – 100 Friend St.
F. D. Parry – 108 Friend St.
Folger & Lewis – 13 School St.
C. W. Long – 5 Ring St.
John Chesley – 5 Clark St.
Foster Gale – 6 Clark St
T. W. Lane – 4 Rich's Court
Geo, Hunt – 42 Elm St.
Seth Clark Jr. – 80 Elm St.
Dudley Gale – 11 Collins St.
E. S. Lane – 178 Elm St.
A.M. Huntington – 66 Rear Main St.
Locke & Jewell – 6 Mechanics Row
David Lane – 258 lower Main St.
Edwin Morrill – Salisbury Point

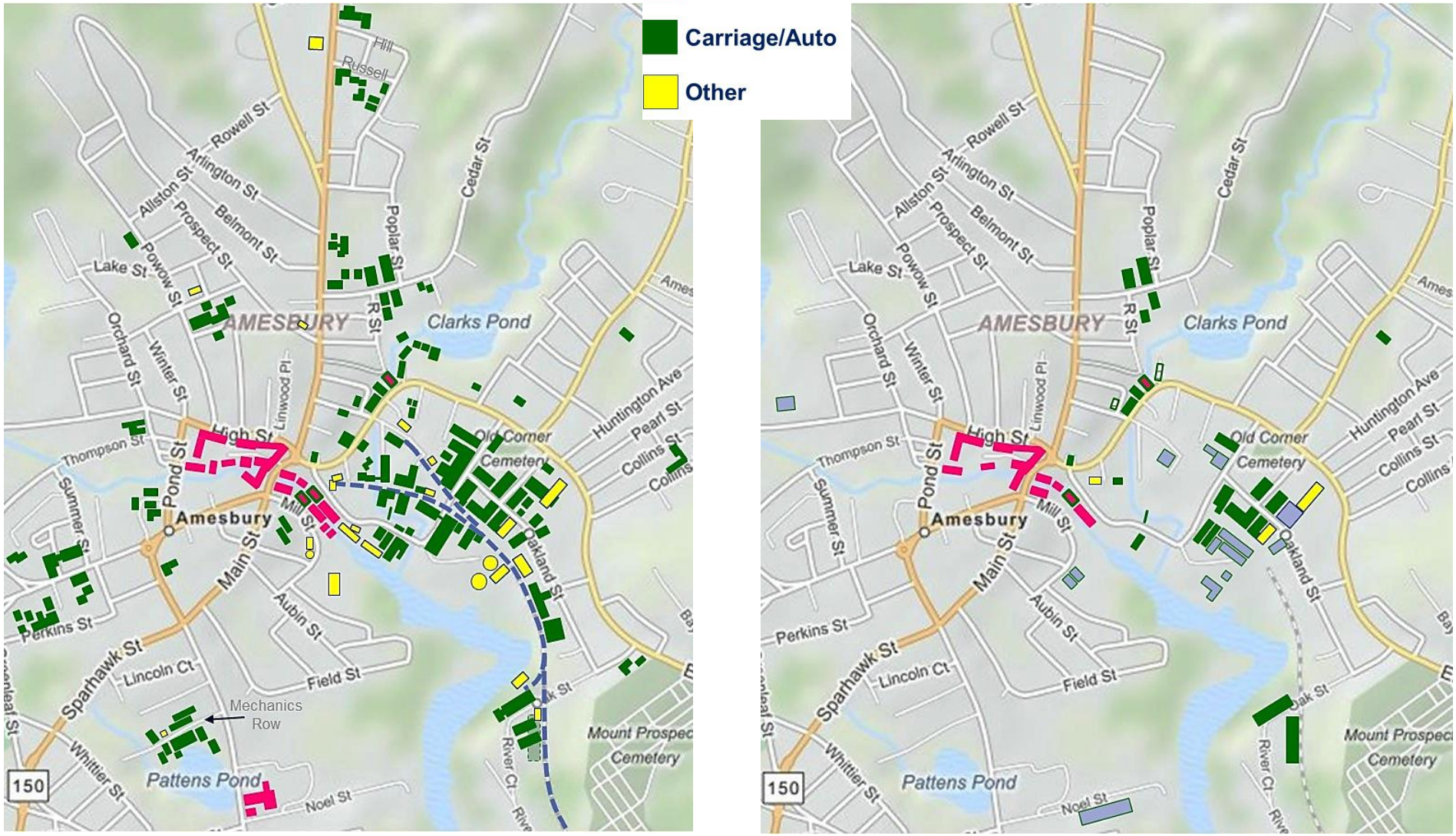
Carriage Hill began developing during the 1870s, burned in 1888, and re-developed immediately after.

Railroad Ave. began receiving factories during the late 1880s, steadily lost buildings during the early 20th century, and was gone by 1960 (along with the railroad) leaving virtually no traces from the carriage era.

Then & Now Geographical Carriage Factory Distribution

Historical summary of all buildings

Currently existing buildings

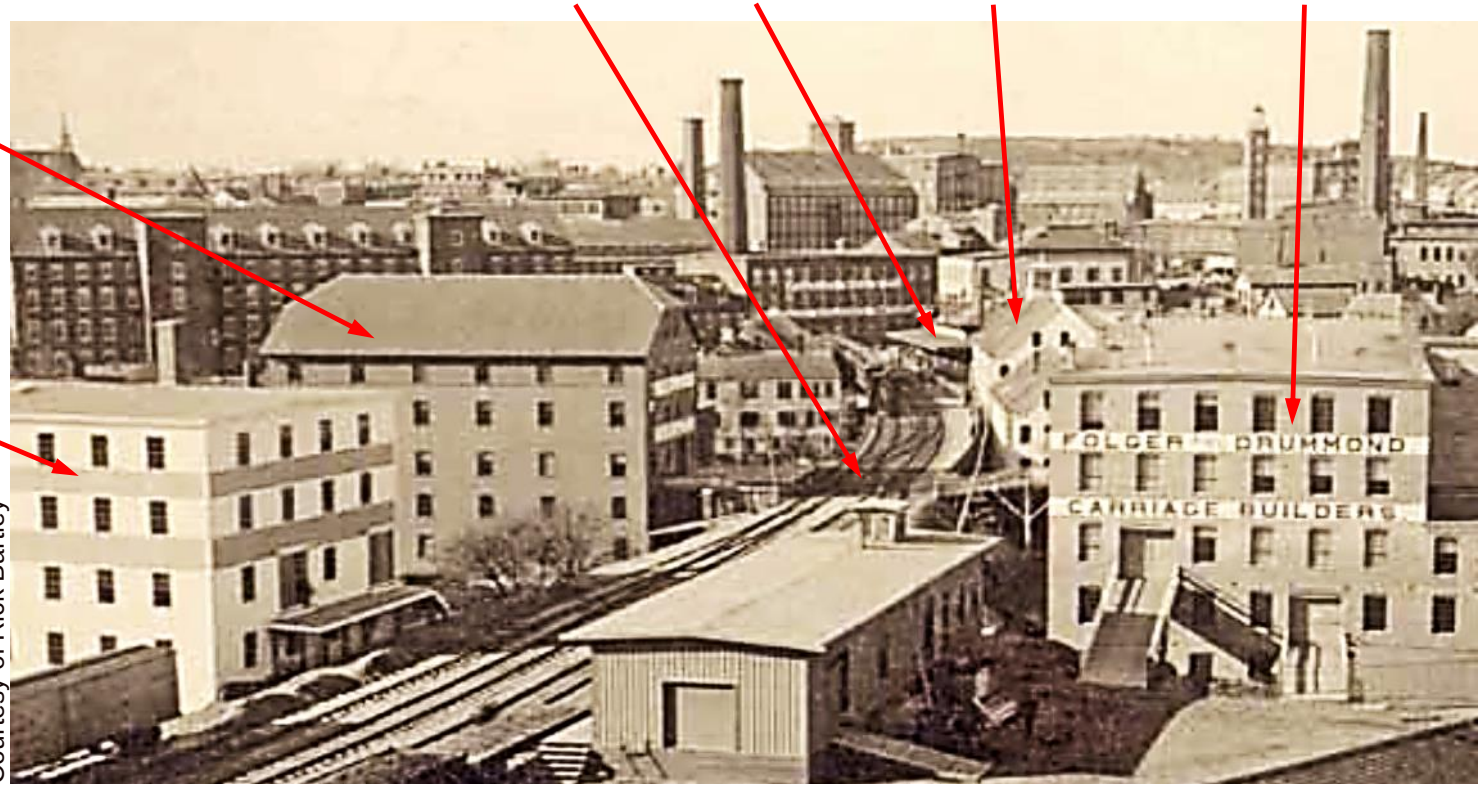


Carriage making was spread throughout town, using no waterpower. Much carriage work was at complexes in outlying neighborhoods, of which there are no remnants today. Downtown had a concentration of factories on Railroad Ave., Water St., and Carriage Hill, but few still exist.

Railroad Ave. Carriage Factories – ca. 1890

showing the density of 5-story factories in the area of today's senior center

Today's footbridge across back river is located between the N. H Folger and J. T. Clarkson buildings.

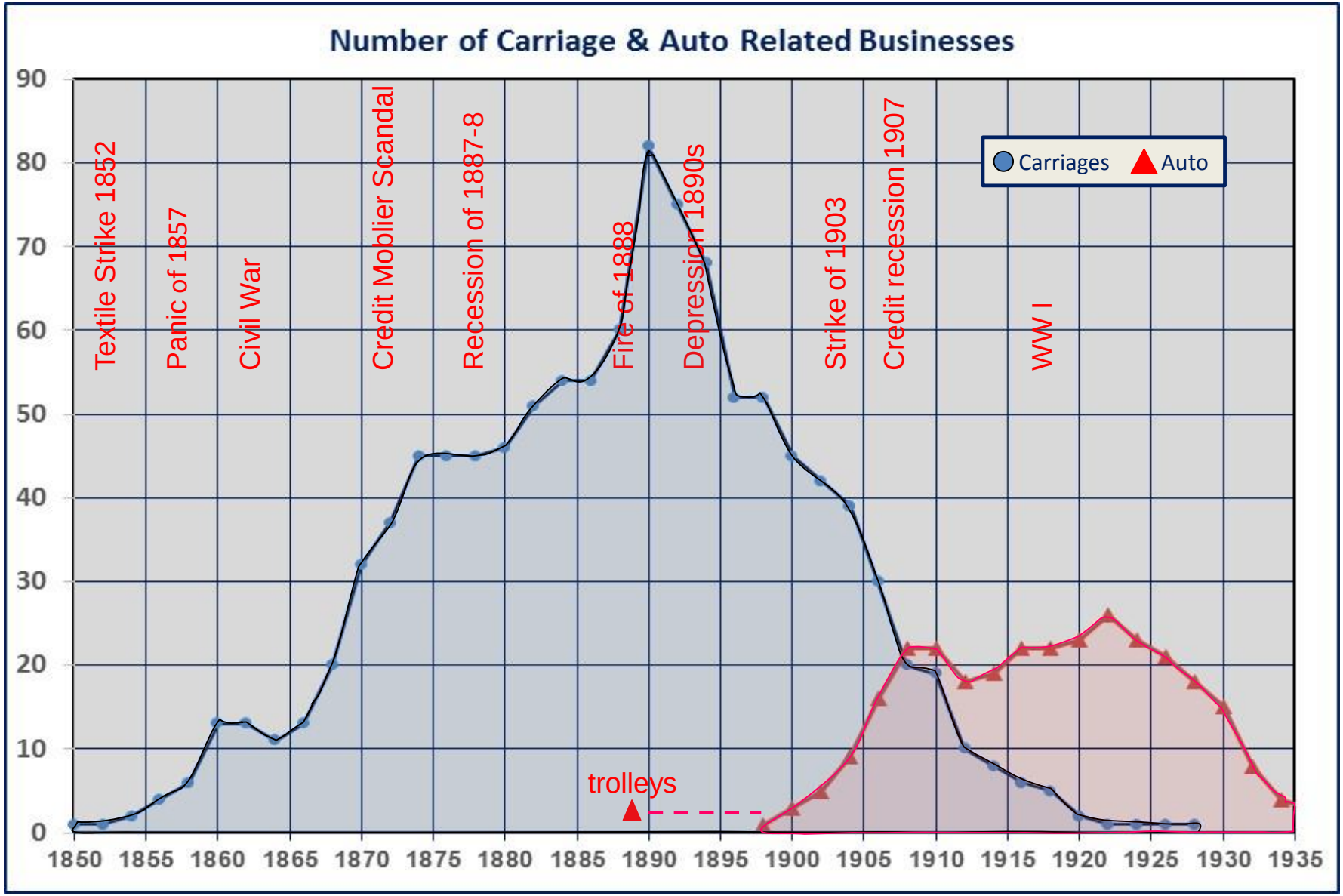


Courtesy of Rick Bartley

The railroad station is now Crave restaurant. The Barn restaurant building by the railroad was part of the Charles W. Long carriage complex. There is another building next to that and then the railroad trestle over Back River. The Clarkson factory was just across Back River from today's parking garage. Folger & Drummond was near today's senior center. The N. H. Folger factory (above left) was located where today's German AutoSport building is. David J. Folger, of Folger & Drummond, and N. H. Folger were brothers from Nantucket, certainly related to the coffee Folger.

Lifecycle of Amesbury Carriage & Auto Body Businesses

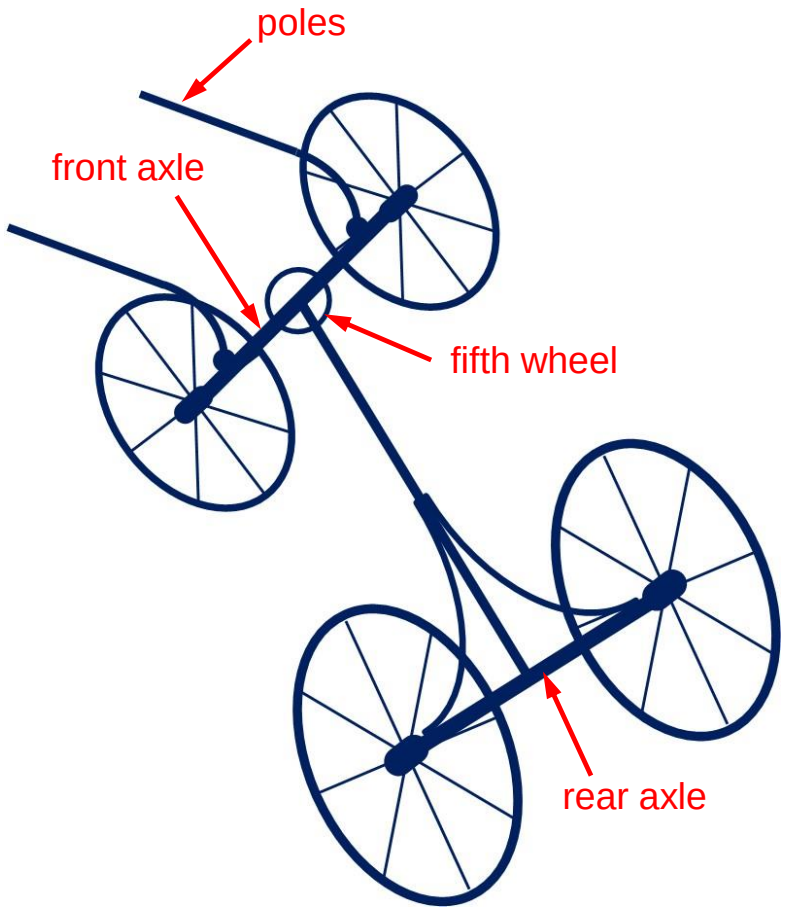
including related support businesses



Basic Carriage Function and Comfort

As with little red wagons and semi-tractor-trailers, four-wheel carriage structure derives from wagons of old. A front axle-and-pole assembly is attached directly to the horse, via the poles, and follows the horse around curves. In the middle of the front axle is pivoted a rear axle and assembly that follows as a trailer, having the carriage body attached on top via suspension springs. Twisting loads on the pivot pin are supported by a "fifth-wheel" (traditional carriage term) having two horizontal rings atop each other, the bottom one attached to the front axle assembly and the top one to the rear axle assembly. The ring-halves rotate against each other at a greased face, to support vertical loads and twisting of the rear axle relative to the front axle.

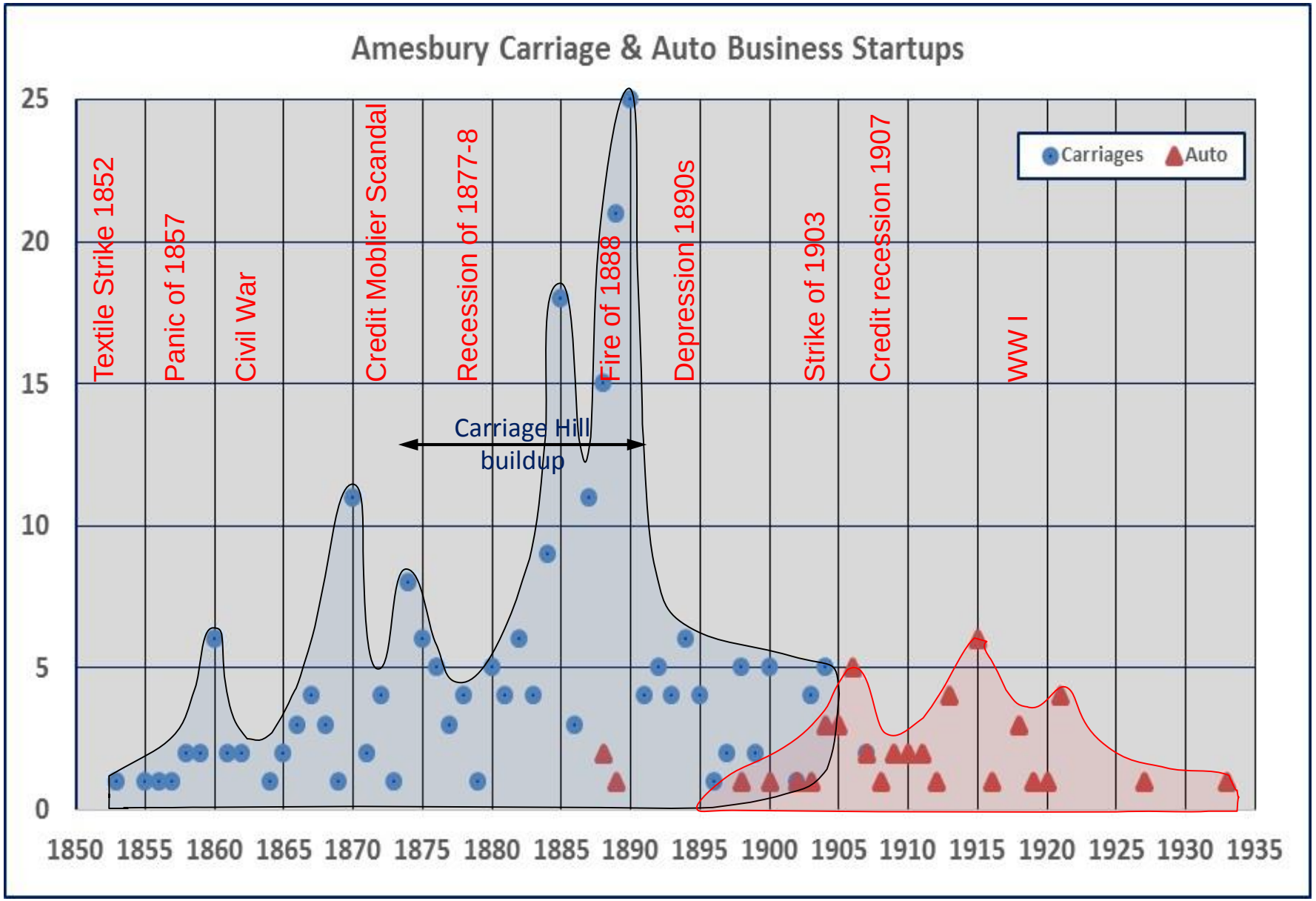
Carrying little cargo, these structures and the body are made very light, for a high strength-to-weight ratio, and comfort of the horse. Human comfort is attended to by suspension springs and upholstery. Beyond that, there developed over time additional features such as we would expect today.



Traditional wheels had iron rims that clattered along cobblestone streets. By 1890 there were solid rubber tires that both softened the ride and eliminated noise, which were soon followed by more effective air-filled rubber tires. Rubber tires attached to specially shaped iron rims, as rims were still structural parts holding together wood rims of spoke-and-hub wheels. The advent of formed steel rims and wire spokes for bicycles, ca. 1890, presented carriage wheels that were lighter and cheaper, while still strong. Simultaneously came roller and ball bearings, bringing increased smoothness and less noise. The J. D. Marston wheel company of Amesbury combined with the Chicago Screw Co., maker of bearings, to provide high-tech metal undercarriages, under the name of SAFE, Standard Anti-Friction Equipment Company.

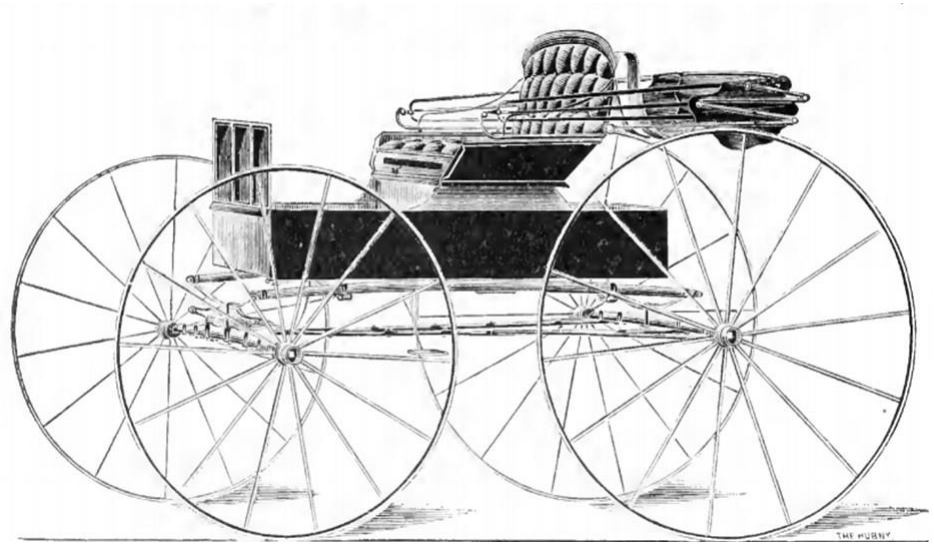
Carriage & Auto Body New Business Startups

Startups being more volatile & responsive to changing economic conditions



The Simple Rectangular Piano Box Buggy

The “piano box” was a common carriage style, having a low-cost body construction



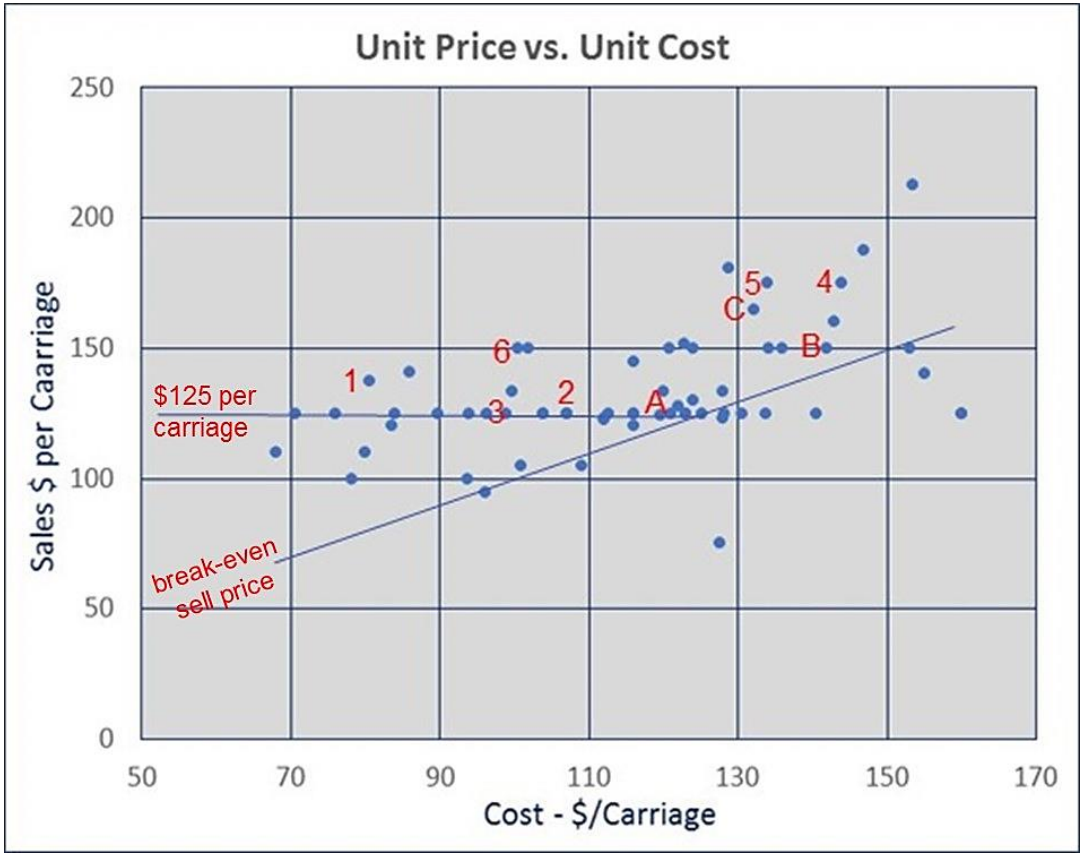
“Piano box” buggies were common and less expensive carriages, with rectangular bodies in proportions similar to the literal piano box (right). They avoided complex curved features that were expensive to make, and had a simple seat bracketed to the box. Folding tops were an optional add-on.

This piano shape is rarely seen now – a sideways rectangular box, with strings arranged sideways. Chickering & Son, of Boston, was the foremost 19th century American piano maker when this rectangular box piano style was common. A similar Chickering accompanied P. T. Barnum’s famous Jenny Lind tour of 1850, where newly emigrated Henry E. Steinway first saw it in New York and had to be pried away from the piano for the concert to begin. Many early Steinway pianos were modeled after this design. (1851 Chickering piano #11,329)

Merrimac 1850 - Sales Price vs. Manufacturing Cost

a growing business that stimulated Amesbury carriage manufacture (see appendix)

1850 census manufacturers' data was sufficiently complete as to disclose the total cost of manufacture. This data is for the 62 carriage shops then in Merrimac, many being small family operations making no more than 4-5 carriages per year. The six numbered points are shops that all reported 40 carriages, and the three lettered points are shops that made 50-85 carriages.



These nine larger shops were relatively young, with larger capitalizations and paying higher than traditional wages in town. They were cashing in on high demand for 2-wheeled chaises then being made.

The graph shows sales price vs. manufacturing cost. Below about $120 cost, sales price is relatively constant at $125, plus or minus $25. As cost drops below $120, sales price does not drop with it. Makers simply charge prevailing prices because demand exceeds total supply. Sales prices rise as rising cost approaches the break-even line, because the nature of that higher cost has added value that buyers will pay more for. The ambitious new numbered and lettered makers charge high prices because they can. They invested to make larger quantities of high-priced carriages to satisfy high dependable demand, pent-up demand being the market condition that enticed Jacob R. Huntington to make carriages in Amesbury three years later using more efficient manufacturing methods.

Carriages and Their Market

Chaises were the main product prior to 1850, chairs on two wheels for personal transportation. Whereas working wagons were heavily constructed for large payloads, carriages were built lightly for quickness and ease of their horses, which had to pull them uphill and restrain them going downhill. For personal comfort, carriages had upholstered seats and spring suspension, or at least spring mounted seats. There were also large wheels, three to four feet in diameter, which rolled more easily over rutted and rocky roads. Such vehicles were light enough to be picked up or moved, and even four-wheeled carriages could be moved sideways, one end at a time.

More households in increasingly wealthy industrialized America of 1850 could afford personal transportation, and much as today, were tending toward an “SUV” having capacity for family and some cargo. While chaises were still convenient, especially amid urban crowding, affordable four-wheeled carriages were increasingly in demand. Such were often open vehicles without tops satisfying a range of domestic uses. Still, “carriage trade” had cache for a reason. Especially for urban households, carriage expense was joined by the cost of a horse, barn, tack, and feed.

A perhaps unanticipated market was farmers, who already owned that infrastructure, and were experienced at driving their work wagons. Following the Civil War, especially in the mid-west, farmers were prospering from fertile lands that were feeding growing urban populations. Retiring farmers were filling farm towns with well-appointed Victorian houses and the agricultural population was becoming a market for affordable personal vehicles.

Jacob R. Huntington must have had some awareness that sufficient such demand existed for an appropriately low-cost four-wheeled carriage, and that he could achieve that low cost through rationalized manufacture and economy of scale. Such concepts had become common in New England’s industrial environment.

Edwin Morrill Carriage Factory – ca. 1890

Laurel Place at Salisbury Point

Courtesy of APL

General Carriage Making

A requirement for serial manufacture of any item and its parts is a clear definition of the physical details, such as using drawings, templates, or master models. Carriage making had traditionally used full-sized drawings that included all specific components, either on large blackboards or manila paper. Templates were also used, likely of thin wood that could be traced around, and it was noted that William G. Ellis discontinued trolley making in 1893 after a fire at his Oak St. factory destroyed his machinery and patterns[1]. Models could have been a complete set of components kept for reference, although these were probably not so convenient in directly guiding duplicate manufacture.

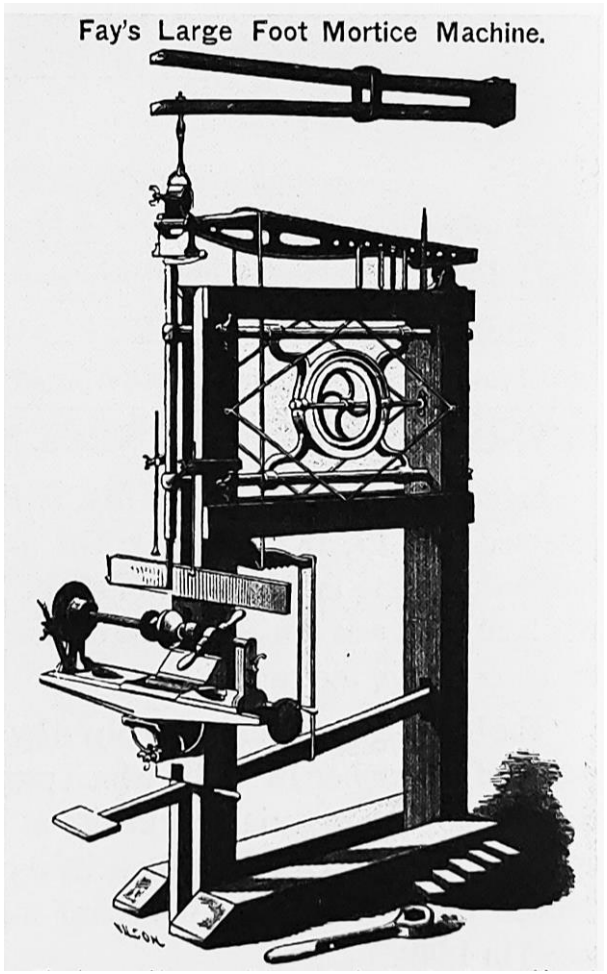
Carriage making was woodworking, akin to cabinetry, furniture, or sash and door making, where mortice and tenon joints connected parts into structures that remained tight, strong, and rigid. Noted in 1854 was that traditional hand tools were rarely seen anymore in major carpentry shops, machines becoming nearly universal and shops often being specialized[2]. Carriage making used general carpentry tools, but a specialty was making wheels for thousands of small wagon and carriage makers, while another was making machines for such shops, often being floor-mounted wood-framed tools and fixtures. Such “machines” were not necessarily powered, for many devices functioned solely by their operator, as will be seen herein. Hand-cranked post drills (affixed to building posts) were common, another primary motive force being foot treadles. Foot treadle lathes had been evolving since first appearing in DaVinci’s sketchbooks. Powerful foot treadle printing presses with heavy flywheels were common with 19th century job printers. Wood-frame foot-pedal morticing machines were used in sash and door shops and general carpentry. Many appliances located and clamped the part being worked while the operator manipulated hand and foot levers, jacking screws, hand cranks, and geared-up (or down) hand cranks.

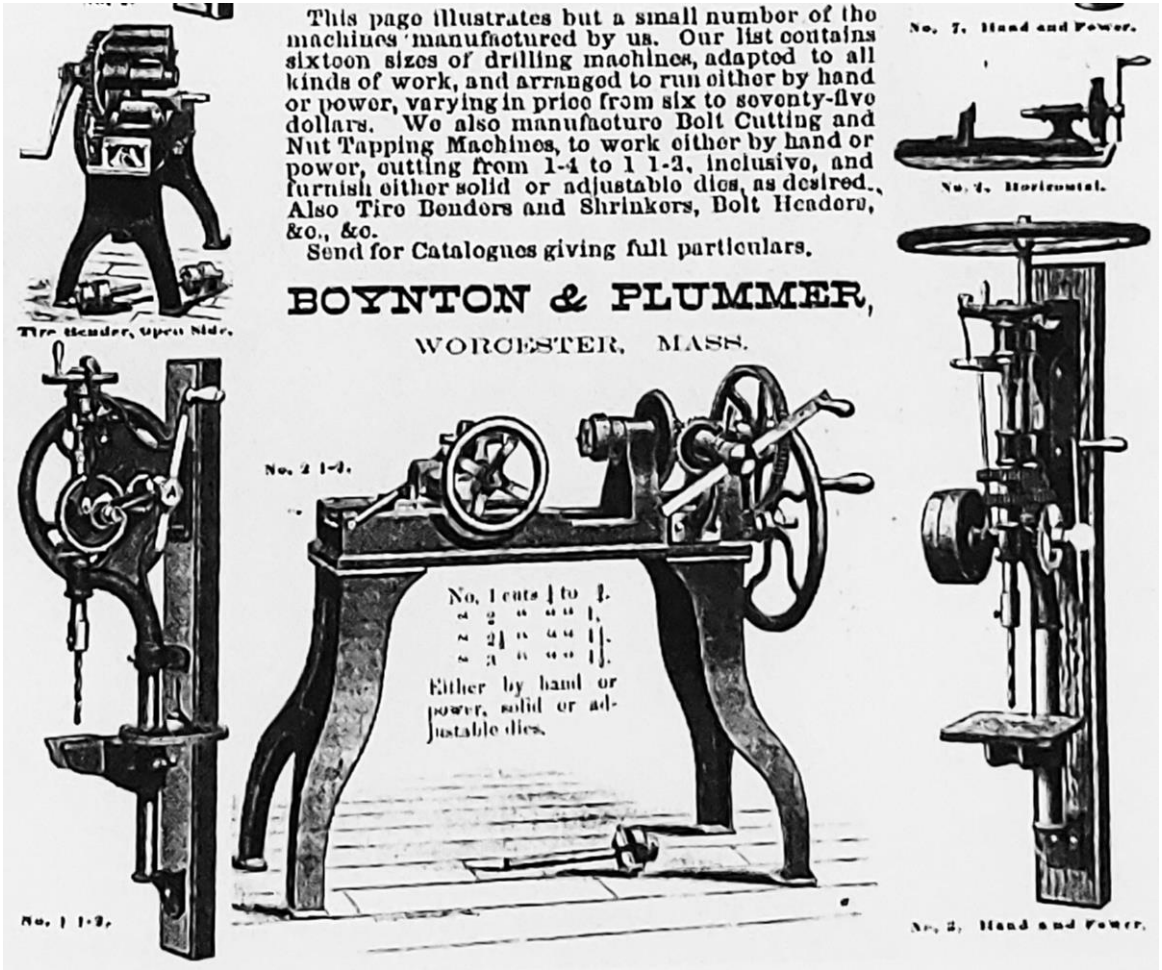
[1] *W. G. ELLIS DEAD*, Tuesday, November 3**,** 1896, Amesbury Dailey News

[2] *Carriage and Wagon Makers’ Machinery and Tools,* Kenneth L. Cope, 2004, Astragal Press, Mendham, New Jersey, pg. 4

Hand & Foot Powered Carpentry Machinery

At left[1], a foot-pedal morticing machine that used foot power to drive a chisel point down into the workpiece. This one could be for general carpentry but came with an attachment for holding and indexing wheel hubs. Right[2], several hand powered machines for general woodworking, plus an iron tire bender (upper left) in which an iron strip was hand-cranked through a set of rollers that were gradually adjusted to bend the hoop to its desired diameter.





[1] *Carriage and Wagon Makers' Machinery and Tools,* Kenneth L. Cope, 2004, Astragal Press, Mendham, New Jersey, pg. 89

[2] ibid., pg. 29

New Ideas in Carriage Making

Having started as a youngster in the Amesbury textile mills, Jacob R. Huntington (1829-1908) worked during 1852-3 as a carriage painter in Merrimac, where there would have been awareness that several New Haven makers were applying sub-division of labor to produce over a carriage per day[1]. He decided in 1853 to make a carriage back in Amesbury, choosing a popular vehicle style and garnering cost efficiencies from labor management while avoiding expensive machinery. This proved sufficiently successful that it spread to several other makers over the next few years. Timing was perhaps intentional, grasping workers idled by the textile mill strike of 1852. Timing was also a bit unfortunate, as the group soon encountered a recession extending from 1855 into the panic of 1857. Huntington and an associate named E. S. Felch then relocated to the carriage making city of Cincinnati to introduce their system there. Upon returning to Amesbury in 1859, Huntington set up business on Lincoln Court, while Felch bought a recent carriage shop out Market St. from one of their fellow early makers named Felix D. Parry. Parry then established his long-sanding shop on Friend St. opposite Whitehall Road. A young Amesbury carriage industry next ran into the disruption of the Civil War, but had established a stable business that continued growing. The Appendix shows how this innovation was later reflected as new Amesbury-like business methods in old Merrimac, compared to their earlier practices seen on page 12.

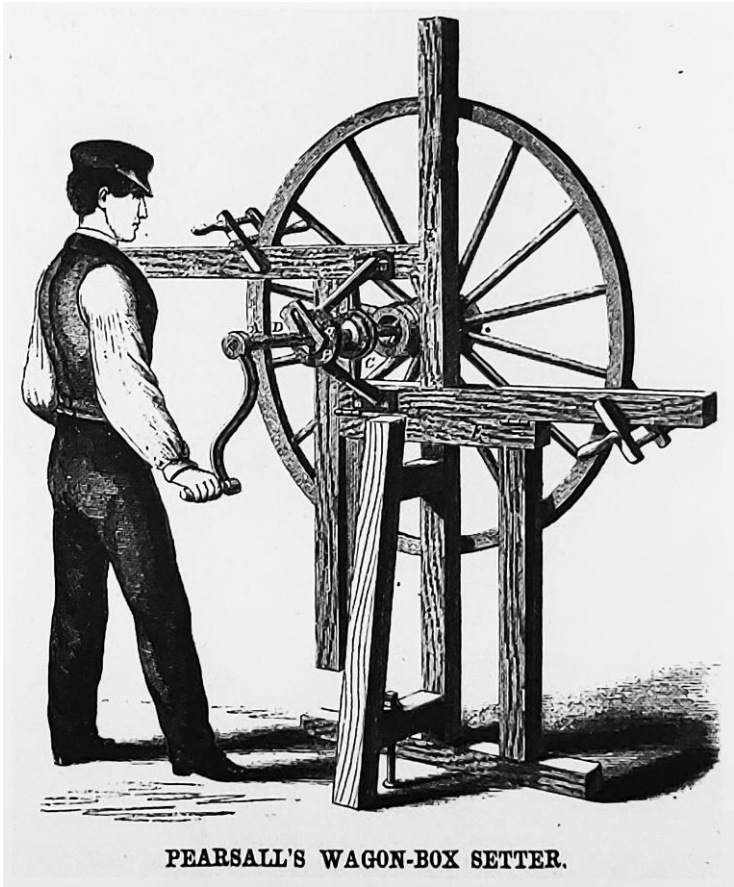
Remaining between ten and fifteen carriage business entities, there was a slight reduction in their population during the Civil War. With war's end, the next decade saw a steep rise in carriage making, including an increase in supporting businesses and a shift to more industrial methods, most notably for wheel making. Supporting businesses over the years were four purveyors of carriage hardware, findings, and trimming fabrics and leathers. With 10,000 carriage and wagon makers in the U.S. in 1890 there were numerous regional factories making finished iron components, nuts & bolts, brackets, raw metal stock, and the like, distributed through such local hardware outlets. Still, carriage shops kept iron forges busy fitting numerous iron components to their individual vehicles.

[1] *New Haven*, Michael Sletcher, Arcadia Publishing, 2004, pg. 43

Carriage Making Around Town

Below left, assembling wheels to carriages at the George Osgood carriage complex at 27 Powow Street. The two houses in the background still exist at 9 and 7 Chester Street. There were many such complexes through Amesbury neighborhoods.

At right[1] is a simple fixture for hand-boring a wheel hub concentric with its rim, so that an iron journal box can be set into the hub.

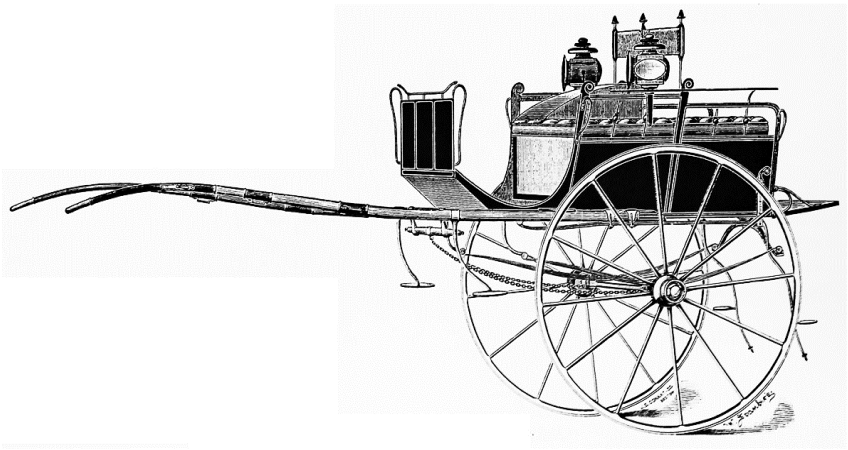


Courtesy of APL

[1] *Carriage and Wagon Makers' Machinery and Tools,* Kenneth L. Cope, 2004, Astragal Press, Mendham, New Jersey, pg. 148

A Range of Amesbury Carriages[1]

Carriages are personal comfort vehicles having upholstery & spring suspension.

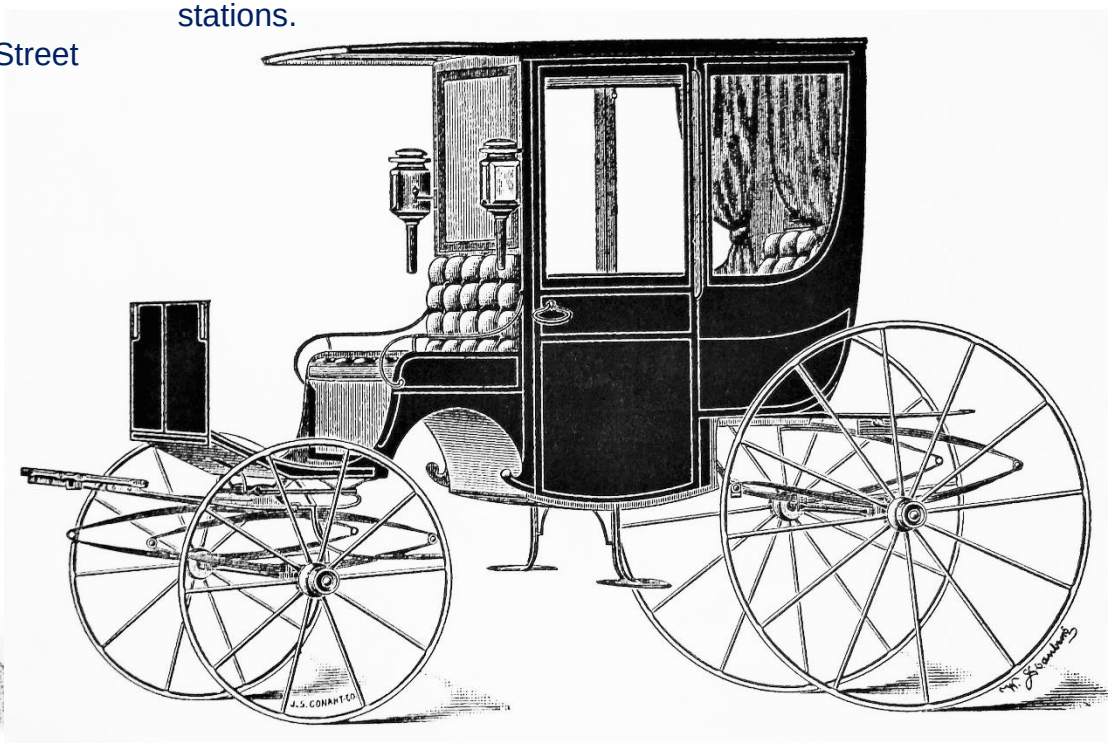


Left, elaborate 2-wheeled chaise, or “one hoss shay,” also simply called a cart, by Neal & Bolser, 258 Main Street across from the Macy house.

[1] *Amesbury, Mass. Carriage Center of the World*, reproduction, 2006, Algrove Publishing Limited, Ontario, Canada

Below, Rockaway enclosed carriage by Lambert Hollander, 1 Oakland Street. Commercial versions were used as light delivery wagons, with some types known as “station wagons” for taxiing travelers, luggage, and cargo to train stations.

Folding top phaeton by Eben M. Currier, 11 Oakland Street



Felix D. Parry Complex at Friend Street

Opposite Whitehall Road

photo, Amesbury Carriage Museum collection

Felix Parry had come early on to Amesbury from Merrimac, seemingly with J. R. Huntington, where he had been a carriage maker. He was generally a prolific maker, as well as grooming a number of other makers who sometimes started their early businesses in this complex with Parry. He eventually had a steam engine and drop forge here. At left can be seen two sets of wheels and gears “in the white” in the process of building up a carriage.

Factory Power Usage and Machinery

The "horsepower" of making things

Power determines how much physical work can be done per day, and mid-19th century textile engineers had defined a "Standard Mill Power" that amounted to 85 horsepower[1]

- many 19th century factories operated on less horsepower than is available today in a common mid-size automobile
- modern capability to produce widespread consumer products rests on the ability to generate and use large amounts of power

Amesbury carriage factories were all away from the river with no waterpower

- most had no power at all, were heated by stoves and lighted by kerosene
- Amesbury carriage factories were largely human powered, ca. 2 HP
- large mid-western carriage factories were steam powered, 50-200 HP
  - some made nearly as many carriages/year as all of Amesbury

Machinery consumes power to perform specific useful tasks

- simply provide a continuously moving tool for a human operator (saw, drill)
- hold and manipulate the piece being worked, control shape of piece
- perform a series of operations in sequence
- perform tasks much faster than is humanly possible (less wasted time)
- perform tasks far more precisely and repeatably than is humanly possible
  - critical to interchangeability that eliminates human fitting of parts

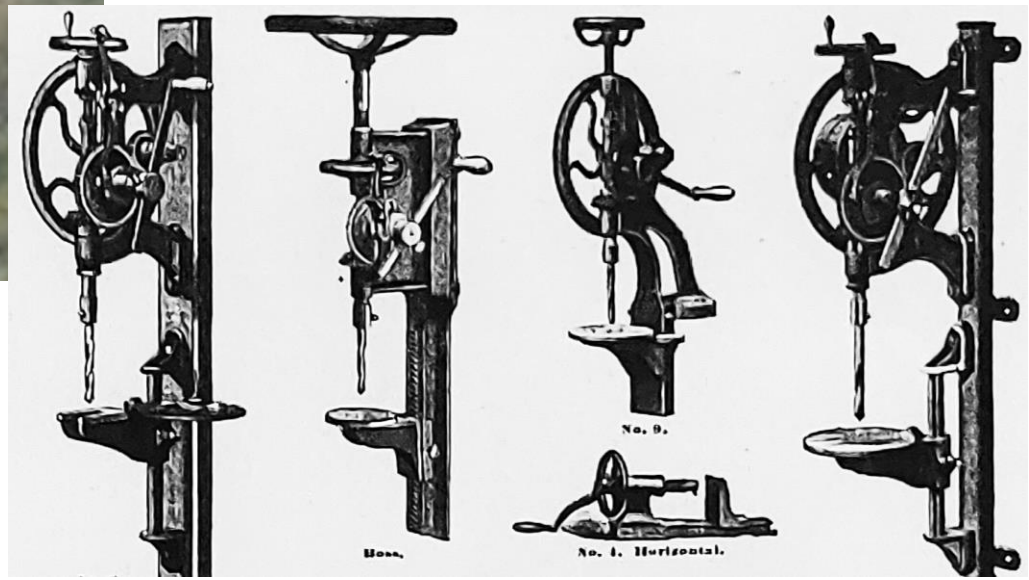
Lack of horsepower meant that Amesbury could not mass-produce low-cost consumer carriages. Instead, Amesbury occupied a higher-grade niche for craft-built vehicles

[1] *Water Power of the United States Part I*, Department of the Interior, Government Printing Office, 1885, pg. 26

Machines & Tools for the 19th Century Small Factory

Many 19th century small factories were unpowered and thus reliant on human-powered machinery such as shown here. At left is a foot-treadle table saw in which the large diameter wheel underneath provides both a substantial flywheel that powers the saw through heavier loads, and a large “gear” ratio for a high RPM saw blade.

Foot treadle lathes were also common, although perhaps not in such high demand for carriage making.

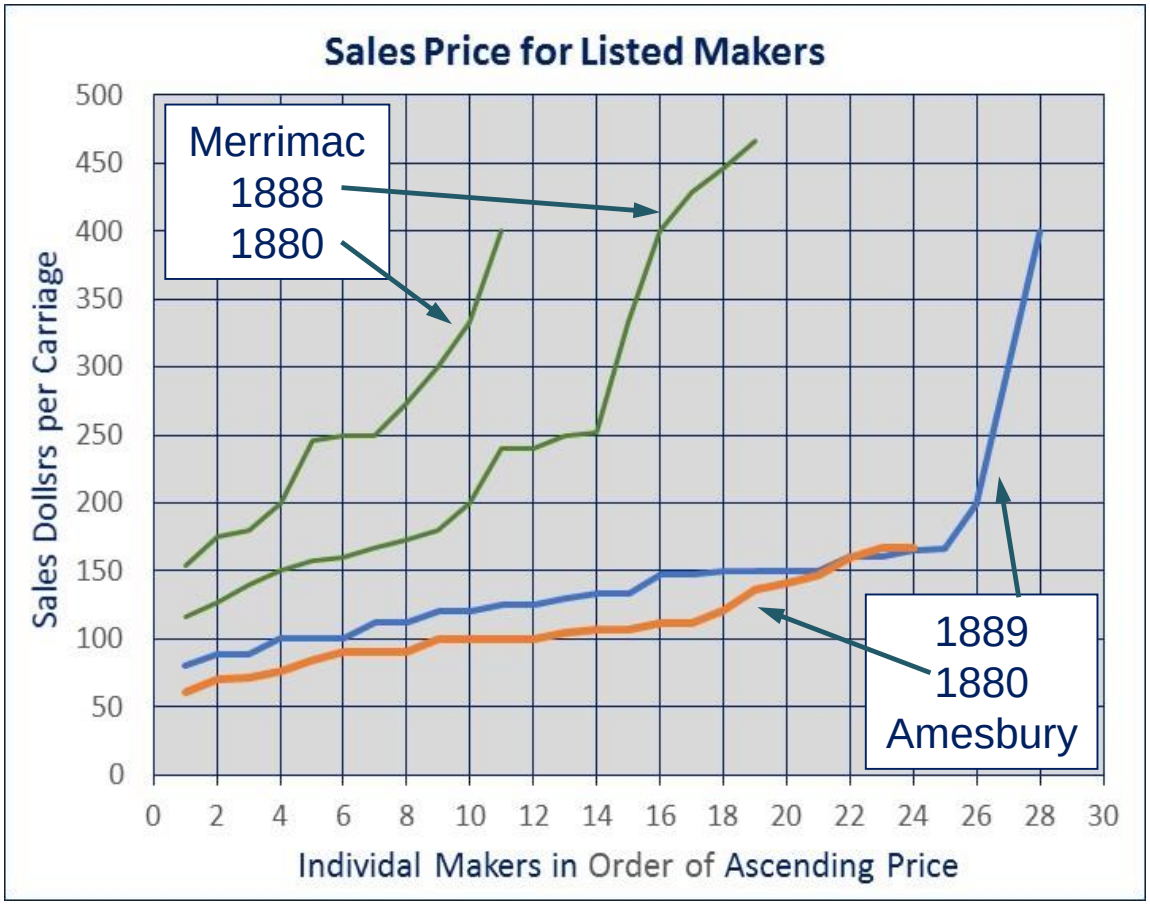


At right are various styles of hand-powered post drills having hand feeds.

1880s Prices of Amesbury and Merrimac Carriages

average price that year for individual shops, generally wholesale but maybe some retail
Amesbury competition has moved Merrimac vastly upscale from $125 chaises in 1850

Merrimac vehicles were then mostly above $150 and above the majority of Amesbury carriages. Merrimac concentrated on higher grades of goods rather than compete directly in Amesbury's market. By 1888 Merrimac had extended its price range in both directions compared to 1880, with both more makers priced under $250 and makers now priced over $400. Merrimac still had little priced under $150, where most Amesbury vehicles were sold. (As average prices, this data does not reflect small quantities of high-priced vehicles that a given maker might have produced.)



By the halcyon years of the late 1880s, Amesbury had entire shops specializing in larger and more sophisticated carriages at higher prices, and in vehicles with patented conveniences and versatile features, both technical and aesthetic. Part of that ability resided in the large group of supporting manufacturers that could focus on new items such as carriage bodies of more elaborate styles, metal wheels and gears, rubber tires, and roller bearing axles.

1876 Prices of Amesbury vs. New York City Carriages[1]

Average prices on the previous page are reflected below in base prices shown in the left column. In the right column are high-end prices that can be reached for added quality or features. These Amesbury carriages were noted as of a better class of work than many makers could produce for the price.

At right are prices for top-end carriages made in Philadelphia and New York City. Little is under $1000, some are larger vehicles with extended folding tops, with the most expensive being fully enclosed carriages having doors and glass windows.

PRICES OF AMESBURY CARRIAGES.

No-top Buggies	from	$65	to	$125
Top Buggies	"	100	"	250
Brownell Wagons	"	100	"	150
Beach Wagons	"	100	"	150
Jump-seat Buggies	"	100	"	150
Concord Buggies	"	65	"	125
Ivers Buggies	"	100	"	150
Light Phaetons	"	100	"	200
Four-passenger Rockaways	"	150	"	300
Carryalls (a variety of curtain-side Rockaways)	"	150	"	300
Six-passenger Rockaways	"	250	"	550
Cutters	"	40	"	125
Four-passenger Sleighs	"	75	"	125

It should be noted that the above schedule of prices does not apply to the better class of work built in Merrimac, Mass., formerly known as West-Amesbury.

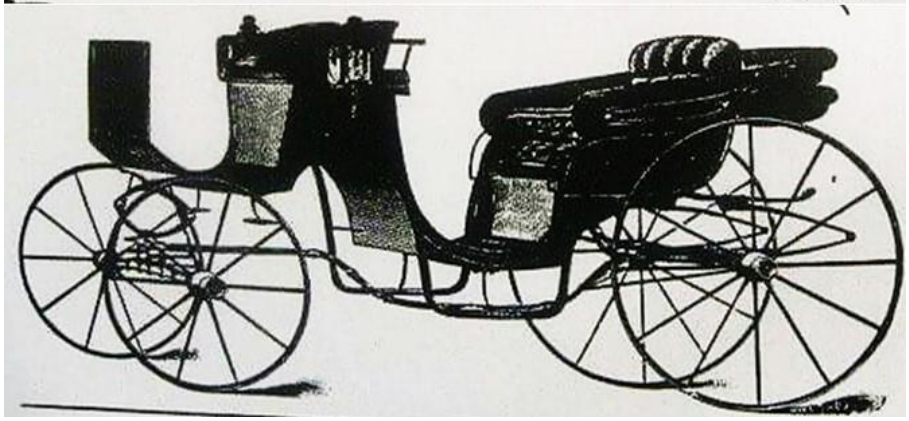
PRICES OF BEST NEW-YORK AND PHILADELPHIA CARRIAGES.

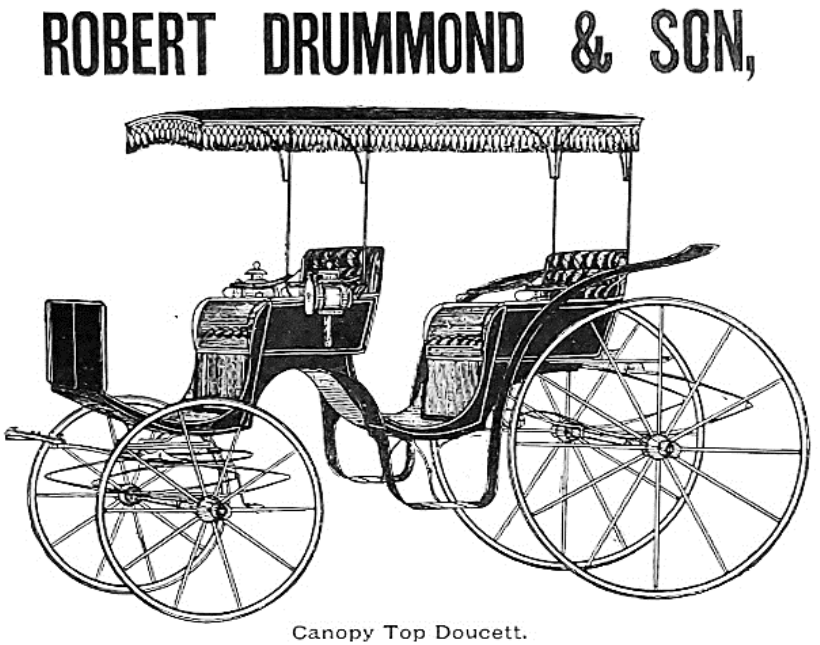
Road-wagons; without top, including shafts	$335
Road-wagons; with top, including shafts	475
Wagon-poles, plain tips, extra	40
Wagon-poles, plated tips, extra	45
Queen-phaetons; with top	490
Gig-phaetons, and wagons for physicians	525
Dog-carts; two wheels, Collinge axles	850
T-carts; elliptic springs, Collinge axles	900
Phaetons; elliptic springs, without top, Collinge axles	850
Phaetons; elliptic springs, half top, plain, Collinge axles	1050
Coupelets; elliptic springs, Collinge axles	1250
Victorias; elliptic springs, Collinge axles	1400
Victorias; elliptic springs, with rumble, Collinge axles	1550
Victorias; grand; double suspension, Collinge axles	1900
Victorias; grand; double suspension, with rumble, Collinge axles	2050
Cabriolet caleches; elliptic springs, Collinge axles	1400
Cabriolets; elliptic springs, size A, plain, Collinge axles	1050
Cabriolets; elliptic springs, size B, Collinge axles	1150
Broughams; elliptic springs, stable shutters, Collinge axles	1450
Coupés; elliptic springs, circular front, Collinge axles	1550
Barouches; elliptic springs, Collinge axles	1550
Barouches; six springs, Collinge axles	1750
Barouches; six springs, hung on loops, Collinge axles	1850
Barouches; double suspension, Collinge axles	2300
Coaches; elliptic springs, glass front, Collinge axles	1800
Coaches; six springs, glass front, Collinge axles	2100
Coaches; elliptic springs, curtain quarters, Collinge axles	1750
Landaulets; elliptic springs, size A, Collinge axles	1600
Landaulets; elliptic springs, size B, Collinge axles	1700
Landaulets; elliptic springs, size C, Collinge axles	2000
Landaulets; six springs, size C, Collinge axles	2200
Landaus; elliptic springs, Collinge axles	1900
Landaus; six springs, hung on loops, Collinge axles	2300
Landaus; elliptic springs, glass front, Collinge axles	2000
Landaus; double suspension, Collinge axles	2900
Landaus; double suspension, glass front, Collinge axles	3000

[1] *Draftbook of Centennial Carriages*, Hub Publishing Co., New York, 1876, pg. 31 (reprinted University of Michigan Library)

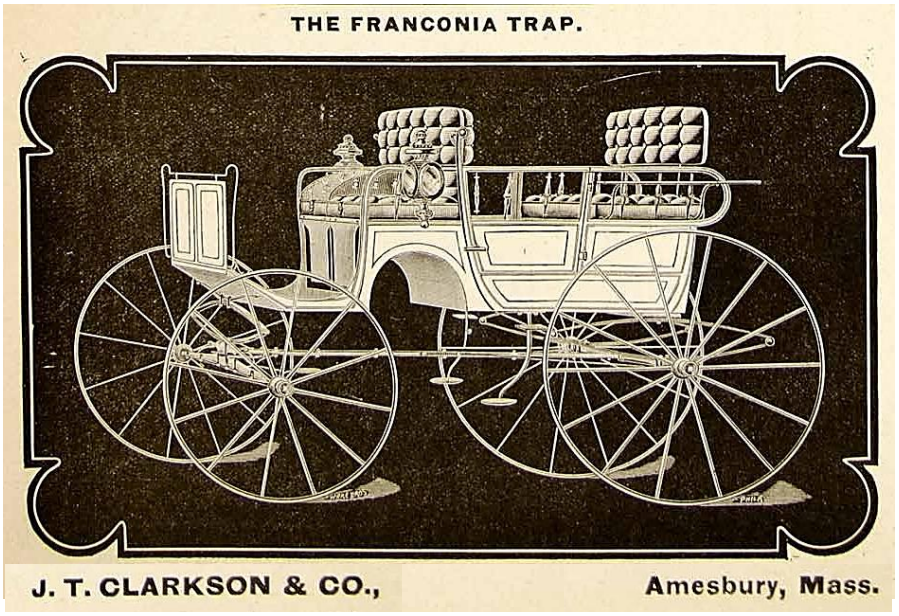
Larger Amesbury Carriages

Beyond personally sized carriages were larger vehicles having potentially commercial use. Right, 2-seat fixed-top surrey similar to the beach wagon at City Hall. Bottom right, 2-seat trap, and below a park coach similar to those used today at Central Park. All are cut-under, having an open arch under the driver's seat so that front wheels can turn tighter.





Canopy Top Doucett.



Amesbury Carriage Industry Matures into the 1870s

After the Civil War, Amesbury carriagemaking enjoyed steep growth into the late 1870s. The 1867 Locke & Jewell factory was Amesbury's first wheel maker[1], wheels previously coming from Merrimac. An 1871 news article[2] also described axles and springs as all being purchased from sources in Maine and Connecticut. Amesbury shops had been making primarily carriage bodies, to be assembled to wheels and gears (undercarriages) from elsewhere. A new 1873 factory next to Locke & Jewell was the Pettingell Machine Co., making general carriage woodworking machinery and especially wheel-making machines.

Just two local firms attended the 1972 inaugural New York meeting of the Carriage Builders National Association and only the young Pettingell Machine Co. displayed Amesbury wares at the Philadelphia Centennial Exhibition of 1876. Pettingell was described there as making over 20 different machines[3], which would have begun flowing into area factories. Amesbury carriages were a known entity in the American trade at that point, and their complete absence was noted[4]:

"Amesbury is situated….in the midst of a farming district and presents a remarkable instance of what Yankee industry can accomplish…. The total number of carriages builders…is about forty-five, who, when business is prosperous, employ over 1000 men and turn out upward of 10,000 vehicles….It is a great pity that the ordinary class of Amesbury work was not represented at the Centennial, as its good finish, considered in connection with its price, would without doubt astonish many carriage-builders who make greater pretensions - and no better carriages... machinery is largely employed, different builders make specialties of different classes of vehicles, style and fine finish are made subservient to the one quality of serviceableness, and thus the prices of carriages built in this town are reduced to a minimum; and a large wholesale trade has been developed with carriage-builders and dealers throughout the country who find themselves unable to produce work of the same grade so inexpensively…. Merrimac includes most of the older firms….and the work produced in this section is generally of a better and more expensive class than in the others…"

[1] *History of Carriage Manufacturing and Auto Body Building*, typescript, 1955, John J. Allan, pg. 141
[2] The Villager, July 20, 1871, pg. 2
[3] *Draftbook of Centennial Carriages*, Hub Publishing Co., New York, 1876, pg. 111 (reprinted University of Michigan Library)
[4] ibid, pgs. 28 & 31

Simplicity of Assembly Line & Labor Management

Labor management expanded sub-division of labor and specialized assembly line stations with enough people and tools to rapidly make and assemble the many carriage parts. Each person made and/or assembled fewer parts, but quickly and with little down-time. Carriage bodies were simply carried from station to station. The factory was larger than a traditional shop to accommodate the larger staff and their many simultaneous operations, numerous carriages in-process, and support staff performing roughing-out operations and peripheral tasks. The concept was a low-tech, low-budget model for small businesses, one of the workers typically being the shop owner, while the shop had no office staff and no office.

Courtesy of Images of America Amesbury

Assembly line at Shiels Carriage Co. – a relative late-comer ca. 1896

Shiels Carriage Company – ca. 1898

Courtesy of Images of America Amesbury

Seen above and on the previous page, this building still exists at 11 Oakland Street, directly opposite the D. J. Folger building, also pictured herein. Shiels had relocated here from a smaller shop on Clark Street, directly behind the current Prime gas station. The top line of lettering has been painted over, having been for the previous E. M. Currier Carriage Company. This building was purchased in 1918 by Frank Hoyt for his burgeoning peanut products business, which he expanded with a connected adjacent building and operated into the 1960s.

The Other Major Carriage Product - Sleighs

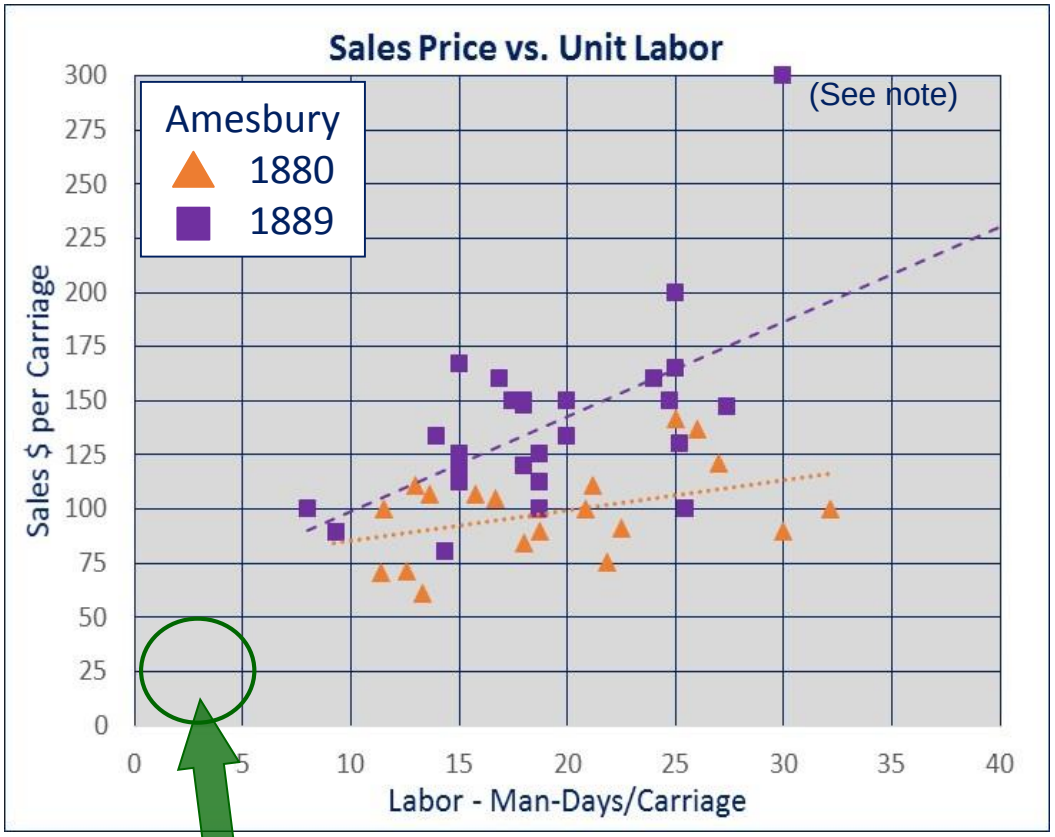
Many Amesbury makers, if not most, also made some quantity of sleighs, appropriate winter vehicles in New England. S. R. Bailey of Amesbury had begun as a Maine sleigh-maker and concentrated on sleighs more than most makers in town. Winter roads were prepared by rolling a firmly packed surface rather than plowing, the latter being a brute force exercise. Such power was not generally available to clear roads in the horse-drawn era, with the exception that railroads used steam locomotives to plow tracks.

photo from https://www.pinterest.com/pin/14073817557368645/

photo from online blog: https://kendragale.wordpress.com/tag/horse-drawn-snow-plow/

Labor Content, Carriage Price, Amesbury's Market Level

Amesbury carriage data for 1880 and 1889



For 1880, price generally rose with increased labor input, meaning that added labor had also added value. But the trend was mild, suggesting a relatively non-competitive group enjoying high market demand.

By 1889 there was market competition from Midwest producers using industrial equipment that had begun appearing during the 1870s. Amesbury then followed Merrimac up-market.

1889 Amesbury generally sold at higher prices for a given labor content, and price rose more steeply with labor. The latter suggests that the higher-grade carriages also used more and better materials. Alternately, at a given price many 1889 makers had lower labor input per carriage.

Where Amesbury could not reach.
Retail prices around $35 resulted from horsepower & machinery, noted in the trade as "3-for-a-hundred" carriages. Amesbury could not reach this market. Its data literally does not get close and its projected trendline remains above such prices. Technology infusion was required to lower the entire trendline.

Both aspects, price and labor, are showing 1889 efficiency growth (economy of scale), as carriages at a given price have less labor content, and a given amount of labor produces larger and higher-grade, higher-priced carriages.

NOTE - Most prices herein are likely wholesale, but this anomalous point is for the relatively low-volume (500 carriages/year) producer N. H. Folger, who was noted as making[1] "a specialty of ordered work". That may imply that Folger took direct retail carriage orders as well as generally doing high-grade work.

[1] quote from 1891 Amesbury Souvenir, Amesbury Daily News, January 29, 1891, pg. 8

The Range of Carriage Related Businesses

When J. R. Huntington was first doing carriage work in Merrimac (1852), that town had water-powered factories making wheels, axles, and springs. Many local chaise makers built primarily bodies and then assembled complete carriages. Amesbury had similar subdivisions of carriage component production, plus suppliers of hardware brought in from outside, which also facilitated a diversity of carriage types and styles to satisfy customers.

John Allen[1] states that Amesbury did not have its own wheel maker until 1867, all wheels previously coming from Merrimac. As decades passed there were local companies that specialized in “wheels and gears”, being the complete undercarriage assembly. S. R. Bailey specialized in bent carriage poles, which attached to the horse from the front axle. Several shops made only carriage bodies. Several others made complete carriages “in the white”, to be completed, painted, and trimmed by other makers (several such partial carriages can be seen in the photo of the F. D. Parry shop, probably for their own use).

Two larger shops, plus one smaller one, were purveyors of carriage hardware to the trade, having large arrays of iron components, nuts, bolts, fasteners, leather and fabric (foreign and domestic) for trimming carriage interiors, paints and varnishes, etc.. There was also an Amesbury maker of paints and varnishes, plus large lumber yards near the railroad, having milling capability. Two different leather finishers specialized in carriage goods, for dash boards and fenders were leather-covered metal frames. Several casting shops and machine shops made metal components. Several more made brass name plates, also doing silver and nickel plating. Three companies made carriage lanterns, in addition to general metal brackets and fasteners. A small shop made curved and beveled glass for lanterns and windows. Another shop made hand files.

[1] *History of Carriage Manufacturing and Auto Body Building*, typescript, 1955, John J. Allan, pg. 135

David J. Folger Carriage Co. - 1880

Courtesy of Salem State University Archives

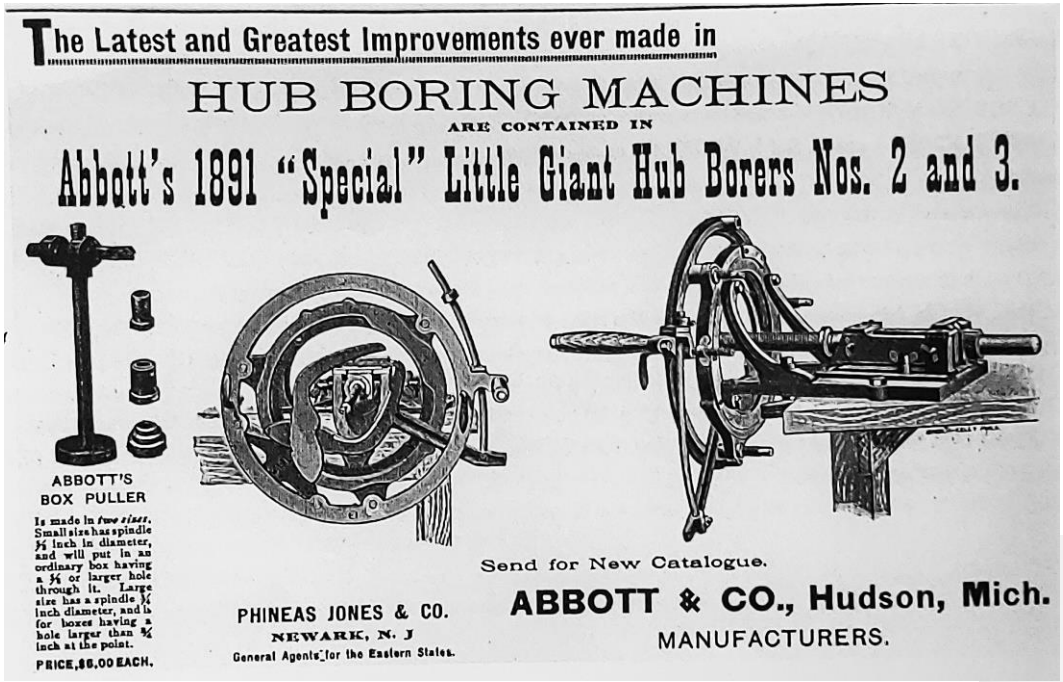
Manufacturer of carriages and sleighs, at corner of Oakland and Morrell Streets. Originally built in 1876 by William Smart, later of Biddle & Smart, the building on left still exists as 12 Oakland Street, which was called Carriage Avenue until 1906. Folger's name can still be read on the Morrell St. side of the building. The front buildings on right were replaced in 1888 by the left building, next page.

Granville Dow Carriage Co. (right) ca. 1890

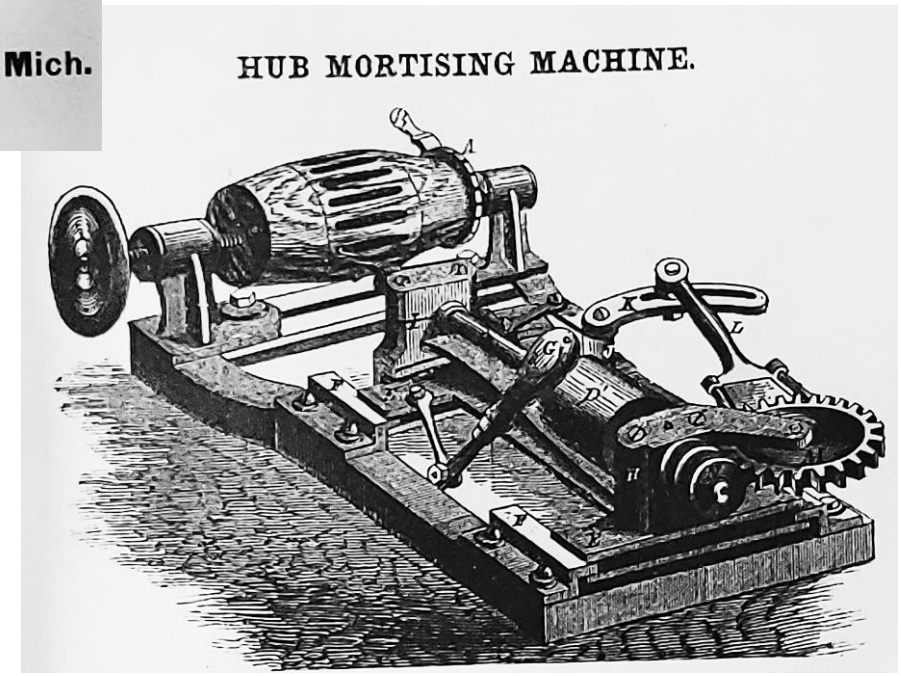
Courtesy of Images of America Amesbury

The D. J. Folger building (previous page) is just left of this view. The left building above is that of Robert Drummond & Son Carriage Co., who also occupy the Folger building. At right is the Granville Dow Carriage Co., formed ca. 1889 and short lived, likely because of the crash of 1893. Ramps on both buildings are for rolling carriages into and out of the upper floors where finish painting is conducted, free of dust from the lower floors. Many complexes had elevated walkways between upper stories of their buildings, as seen above center at back.

Wheel Hub Machinery



At left[1] a machine in which a wood wheel hub was clamped inside a circular rotating frame turned by a hand-crank. An auger was pulled into the hub by a lead-screw to bore an initial center hole in the hub for setting up the wheel assembly. The hub would later be final bored to be concentric with the wheel rim.



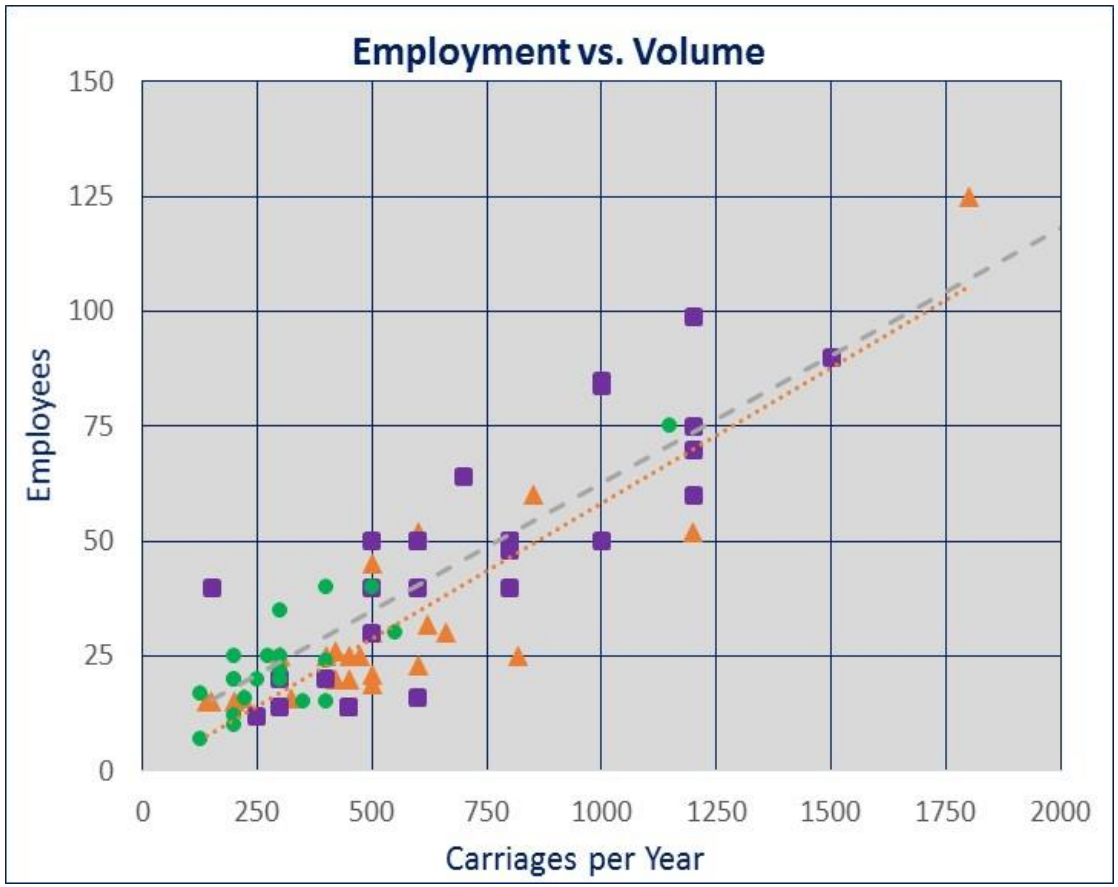
At right[2] a seemingly hand-powered machine in which a hub was rotated with an indexing wheel to set the spacing for spoke mortices (typically 12 or 14 spokes). A substantial twist drill type tool bit was driven in and pulled sideways across the hub to create initial slots for the mortice joints, which may then have had to be finished by hand-chisel.

[1] *Carriage and Wagon Makers' Machinery and Tools,* Kenneth L. Cope, 2004, Astragal Press, Mendham, New Jersey, pg. 8
[2] ibid., pg. 11

Larger Employment for Scaling up Carriage Production

Amesbury carriage data for 1875, 1880, and 1889

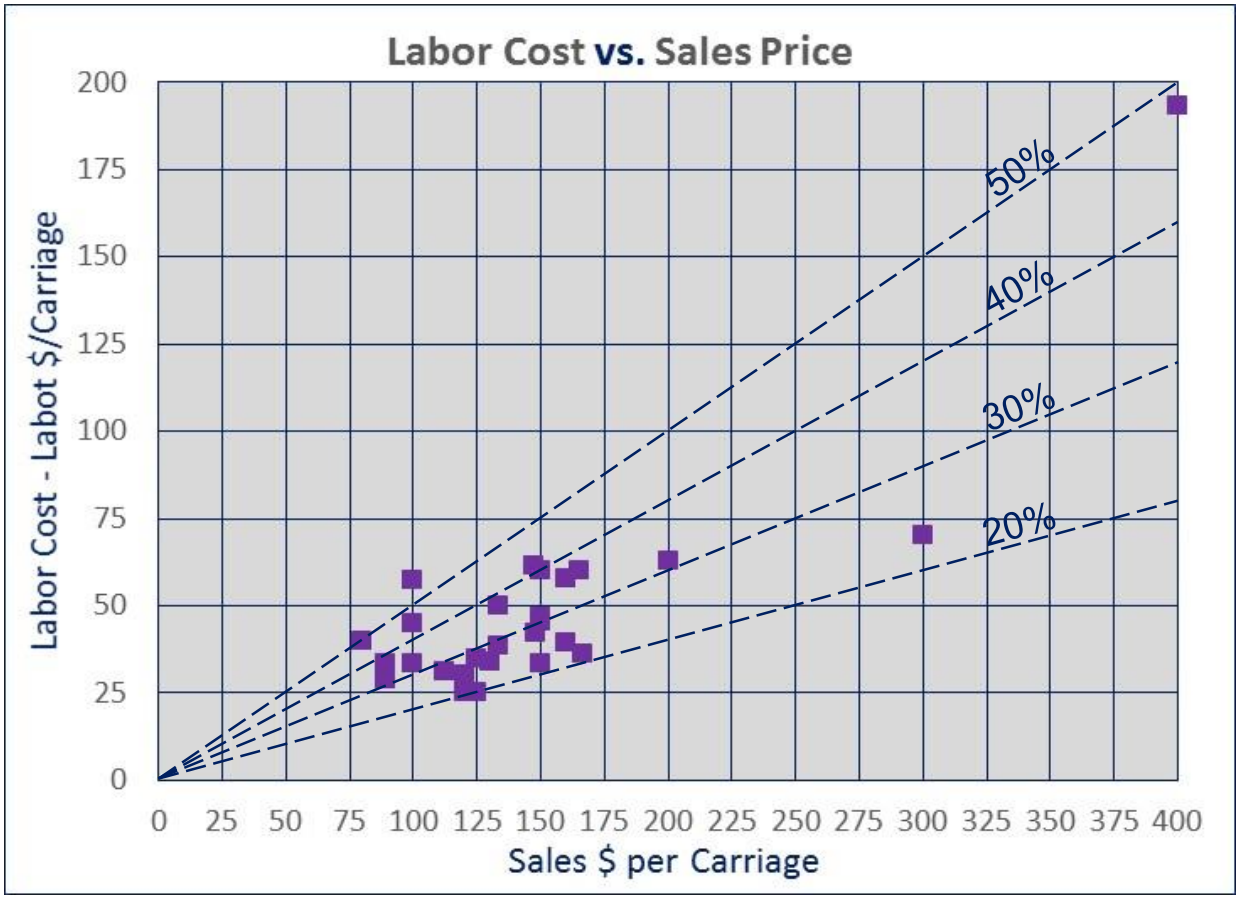
1875's high volume of 500 carriages per year had become low volume by 1889. Production and employment both grew during the 1880s but with a linear relationship suggesting little economy of scale (EOS). EOS implies that volume can double without doubling employment, and 1888 Merrimac data in the Appendix shows an example of this. Data below illustrates that Amesbury volume increased while maintaining a relatively constant ratio of about 17 carriages annually per employee. Lack of EOS would hold true if all else had remained unchanged. However, other data herein shows that Amesbury carriages in any given price range were produced with less labor in 1889 than in 1880. And, while a given number of employees in 1889 would produce the same number of carriages, those carriages were larger and/or more elaborate and expensive.



1889 employment data has more vertical scatter; the highest employment at a given volume can be double the lowest. Increased scatter reflects increased variety, where some higher employment shops were making larger and more elaborate carriages, shown on page 30 to command higher prices proportional to their added labor input.

Based on 1889 data, eleven Amesbury shops were making 1000 or more carriages per year during the peak production period around 1890.

1889 Amesbury Labor Cost vs. Carriage Sales Price



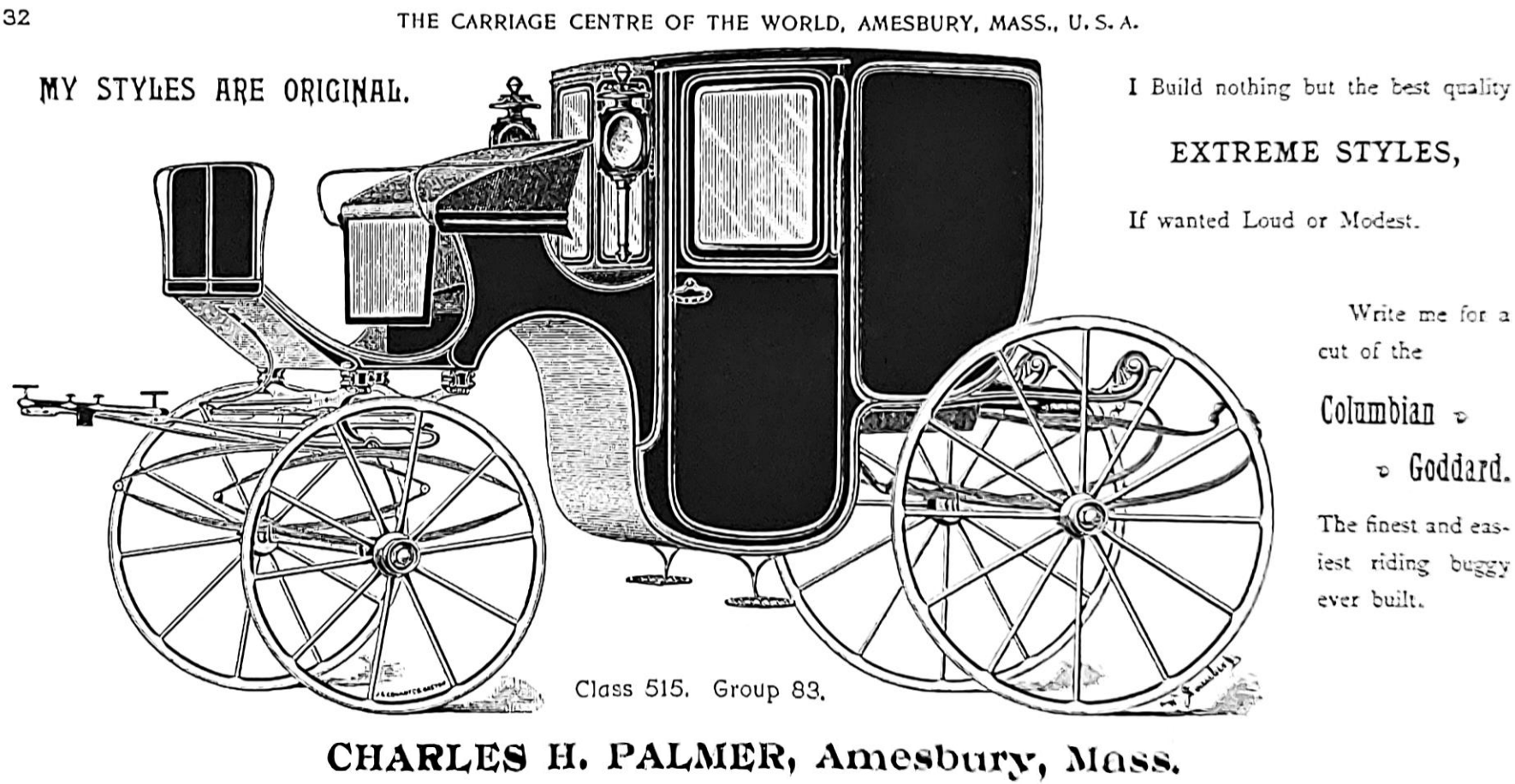
Labor can run 50% of price, but labor cost does not generally rise steeply and so drops in percentage as price increases, likely for several reasons. Higher priced carriages could have contained finer materials, more expensive purchased components, and numerous small add-on feature, none of which necessarily required much additional labor. Also, profit margins tend to run higher for more expensive products. Another contributor is that high-volume shops (800+ carriages per year) reduced their labor cost by paying lower wages (pg. 63). The most expensive carriages ($400) have high (50%) labor cost for their large enclosed construction, doors, and windows, plus elaborate details and finish.

Wm. G. Ellis & Sons Carriage Complex – ca. 1880

Courtesy of APL

This complex was at 99 Friend Street, just before Whitehall road, across from the carriage complexes of Charles Rowell and F. D. Parry. In 1886-7, Ellis built an electric power plant and trolley car factory at the bottom of Oak Street, and then expanded the above facility in 1893. Remnants of the front building existed up until about 2015, where there is now a new residence still having this same street address.

Top-Grade Carriage Work



Standard lines of popular-grade vehicles had either no tops or folding tops that sometimes were after-marked additions. A number of Amesbury makers produced heavy enclosed carriages such has Rockaways and this Brougham by Charles H. Palmer, who had come to Amesbury from Merrimac in 1886 making elaborate carriages of top rank. This illustration is from the 1892 Amesbury catalogue[1] for the World's Columbian Exposition in Chicago, where Amesbury makers exhibited a group 37 carriages.

[1] *Amesbury, Mass. Carriage Center of the World*, reproduction, 2006, Algrove Publishing Limited, Ontario, Canada, pg. 32

Power Machinery in Local Carriage Making

Several data sources (census data and Sanborn maps) recorded boilers, smokestacks, and steam engines for a reliable accounting of steam power, with architectural features of boilers, chimney, engine, and line shafting permanently installed in buildings. About 200 Amesbury carriage business entities rotated through about 200 total buildings that contained only about 12 steam engines during the carriage era (a few adjacent buildings were powered by driveshafts from these buildings). Electricity came to Amesbury in 1887 with a generating plant at the bottom of Oak Street, powering some electric streetlights that year plus the Folger & Drummond Carriage Co. that began early development of the Railroad Ave. area. A new factory by the power plant was also electrically powered, housing machine and woodworking shops plus a few makers of carriages and carriage bodies. Electric factories would have had large electric motors driving typical line shafting and belts to the machines. Other factories began installing electric lights but not power.

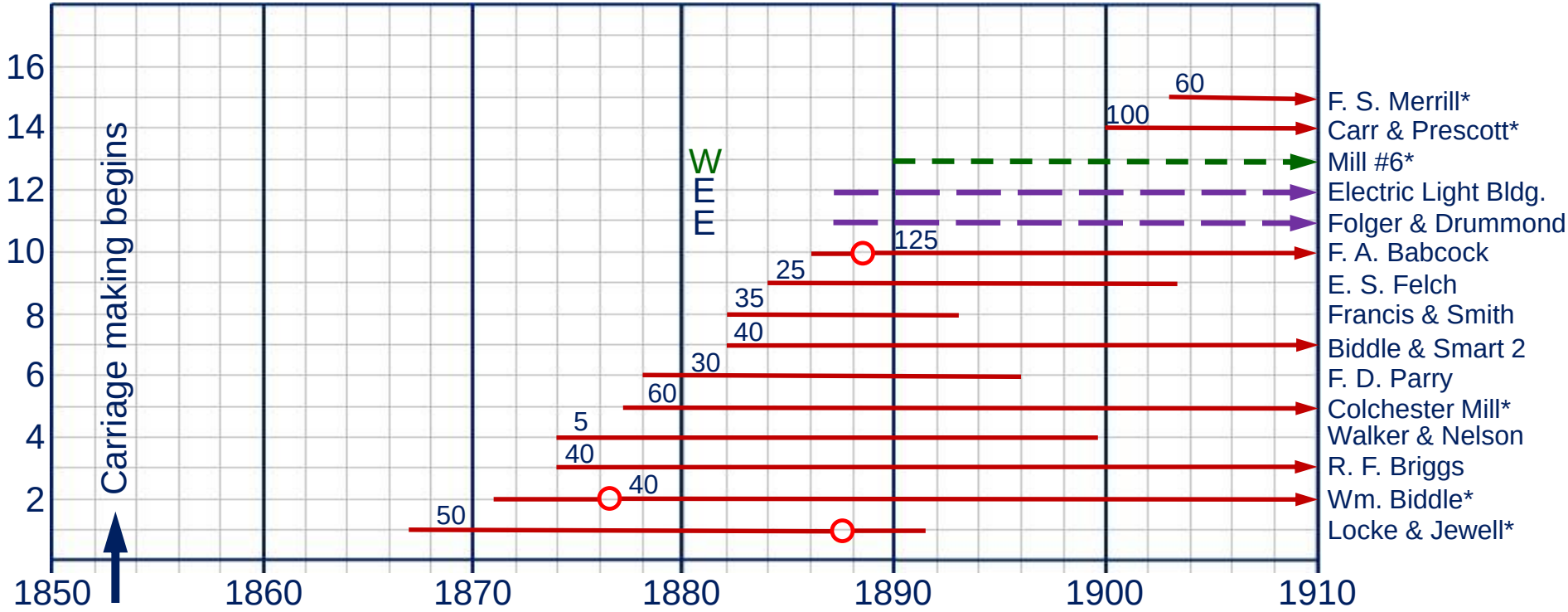
The 1867 Locke & Jewell factory was Amesbury's first wheel maker, a four-wheel set comprising numerous parts and that set being suitable for many carriage types. A wheel had identical spokes and felloes, the latter joining into a wood rim that was tightly bound by an iron tire. Wheels were thus ideal for garnering significant economies of scale that justified the cost of steam power, so that Locke & Jewell started with a 10 HP steam engine, possibly the earliest in Amesbury carriage making, and then stepped up to 20 HP and finally 50 HP over its first four years[1]. From 1870 William Biddle built a powered wheel making business that continued under Biddle & Smart. About four other wheel makers added such specialties as patent iron-bound hubs, rubber tires, and finally rubber pneumatic tires. These all used power to efficiently make the many duplicate parts, and wheel making was a major usage of Amesbury's carriage-related steam engines.

[1] *Carriage Business #3*, The Amesbury & Salisbury Villager, July 20, 1871, pg. 2

Powered Buildings in Amesbury Carriage Making

Most are steam powered with HP indicated, but, E = Electric power, W = Waterpower

O Indicates that fire destroyed an original building, which was then rebuilt with a new engine

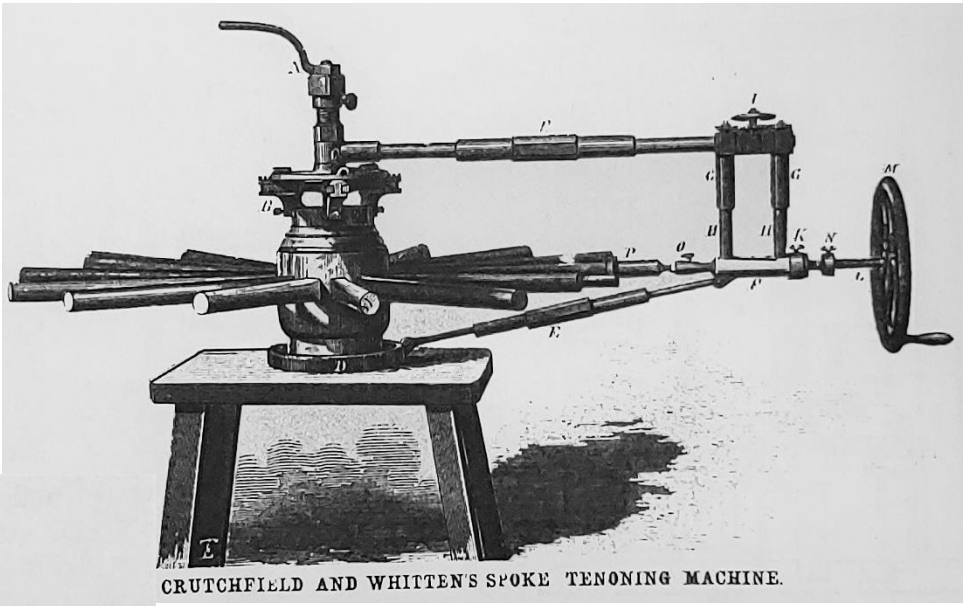


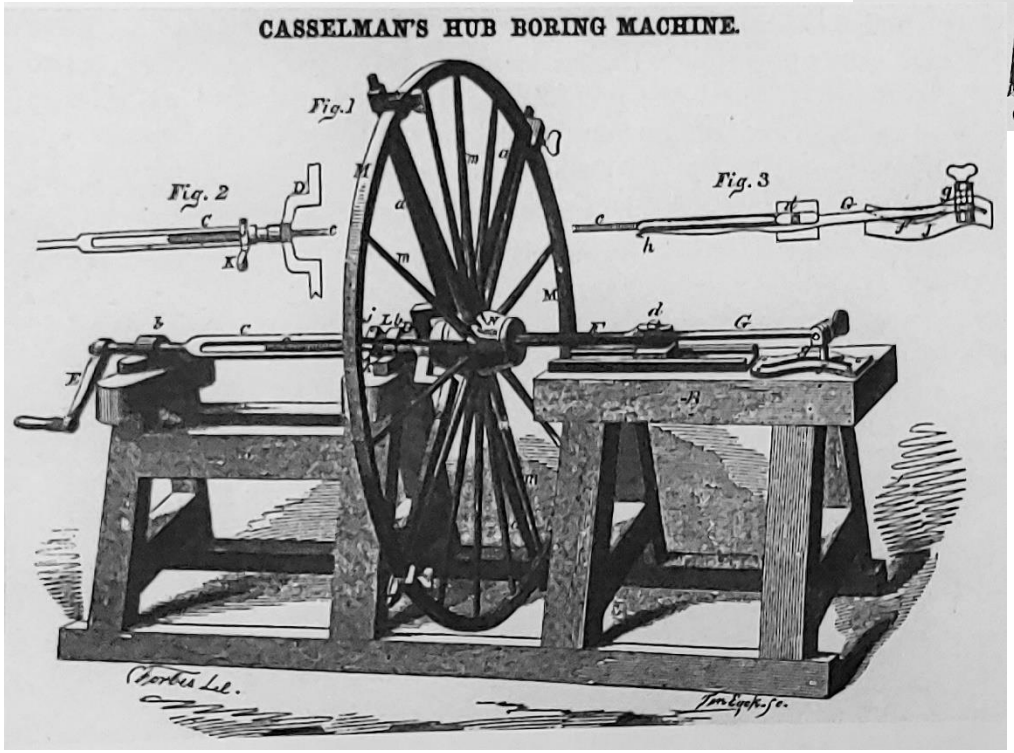
William Biddle merged with William Smart in 1880 becoming Biddle & Smart. After 1882 they had two engines in separate bldgs.
Walker & Nelson manufactured carriage paint and varnish, using a 5 HP steam engine for pigment grinding and mixing.
* Companies or buildings where wheel making was a major use of power

Engine usage increased steadily with prosperity following the Civil War but touched only a few of the ca. 200 carriage related business entities that existed over 50 years. There was a peak of only 10 steam engines in use at one time. After Hamilton Woolen Co. ceased wool work, they leased water powered Mill #6 to carriage related businesses. The Electric Light Building exists today as the brick apartment building at the bottom of Oak Street. Five companies (Locke & Jewell, Biddle & Smart, R. F. Briggs, the Colchester Mill, and the Electric Light Building) used a drive shaft from the engine building to power an adjacent building. The Biddle example is pictured herein.

Machines for Wheel Making

At right[1], a wood frame spoke tenoning fixture that centers on the hub and then rotates around to each spoke-end where a hand cranked cutter machines a shoulder and a round dowel of correct diameter for the mating wood rim. Spoke shoulders thus form a relatively precise circular pattern.


CRUTCHFIELD AND WHITTEN'S SPOKE TENONING MACHINE.



At left[2], a wood frame hand-cranked hub boring fixture in which the wheel is centered in the fixture by its outer rim, and then the hub is bored by a cutter drawn in by a lead screw.

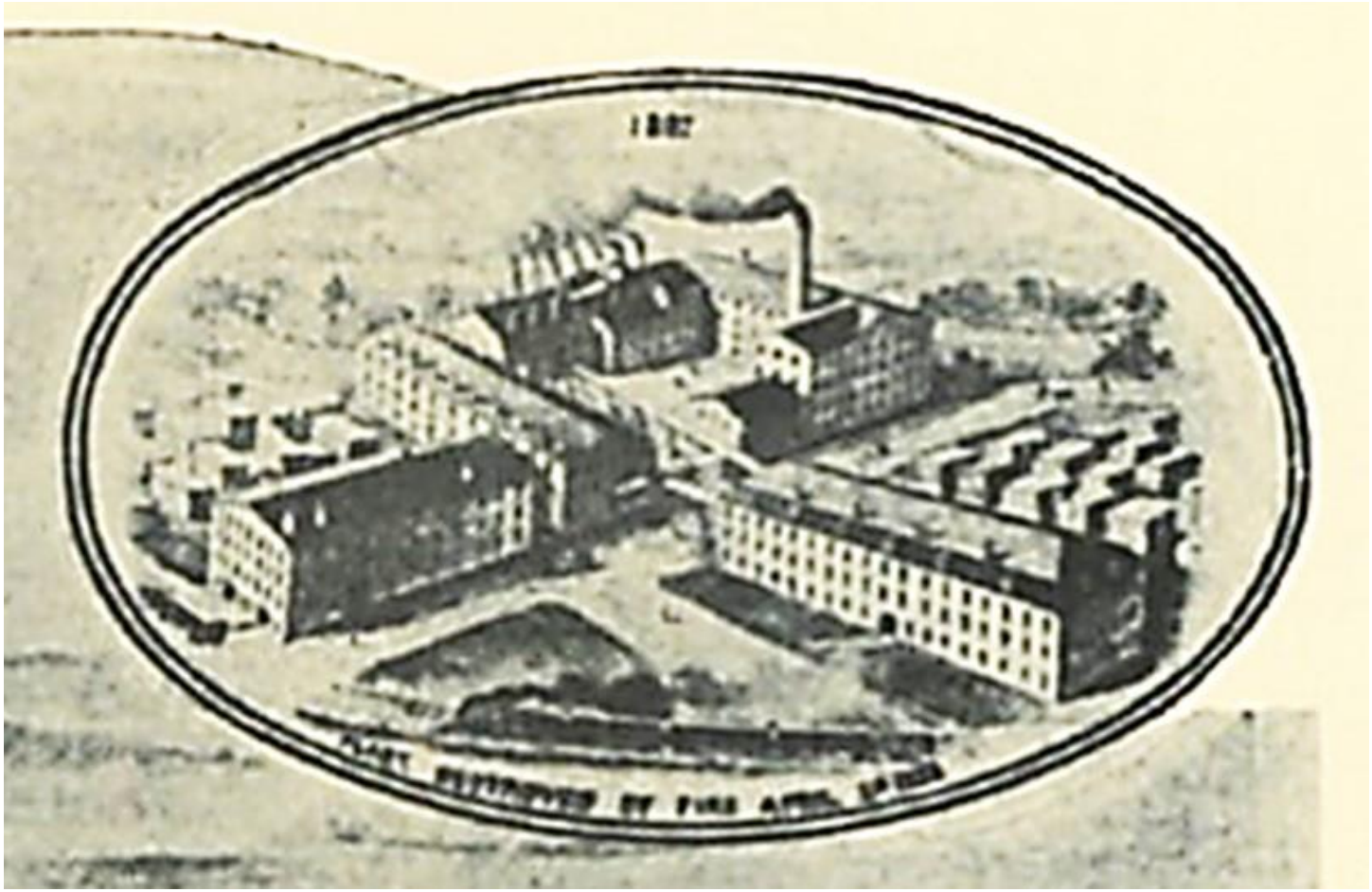
[1] *Carriage and Wagon Makers' Machinery and Tools,* Kenneth L. Cope, 2004, Astragal Press, Mendham, New Jersey, pg. 48
[2] ibid., pg. 37

Upholstery Trimming, Connor Carriage Co. - 1900

photo, Amesbury Carriage Museum collection

Trimming tufted carriage seat upholstery on three different carriage bodies: front Stanhope style phaeton, middle Concord wagon (curved bottom) with canine assistant in the footwell, back panel-seat piano box or phaeton. Iron work is seen around seats that would have been done in the forge shop. This is in the former D. J. Folger building still standing at 12 Oakland Street and pictured elsewhere herein.

Amesbury's Largest Carriage Factory, mid-1880s

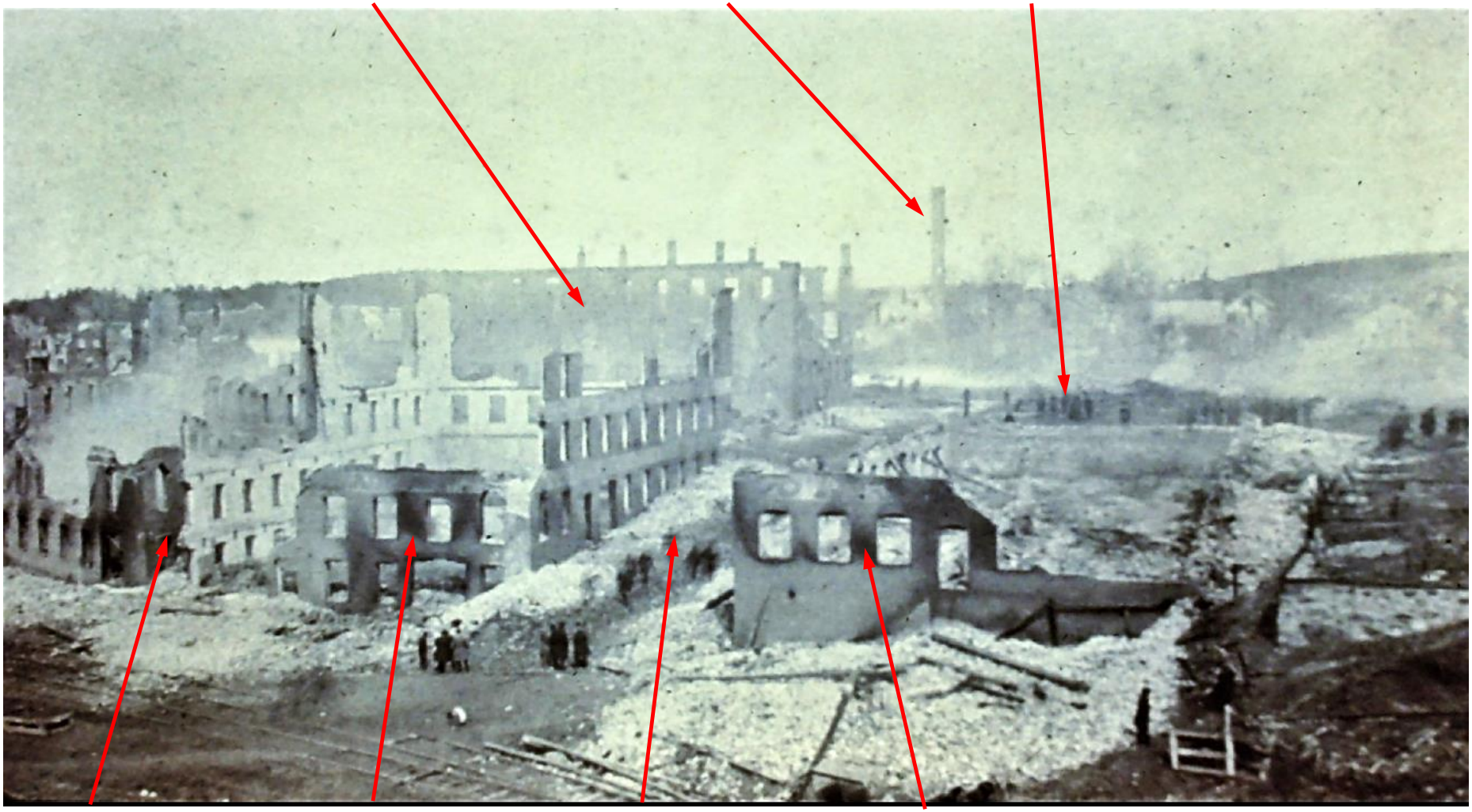


Courtesy of APL

A rare depiction of the 1887 factory complex at the intersection of Chestnut and Oakland Streets on Carriage Hill that belonged to Frank Babcock and Robert Drummond Jr.. Having purchasing a smaller facility in 1884, at the left end of this picture, they expanded it by purchasing the Hume Carriage Co. (remainder of the picture), adding new brick buildings and steam power before it was completely destroyed in the Carriage Hill fire of April 1888 that started somewhere in this complex. See next page for post-fire view of this property.

Looking Up Chestnut Street After the April 1888 Fire

all property left of Chestnut St. was replaced by the 1889 Babcock Building



Courtesy of Salisbury Point RR Historical Soc.

Amesbury Carriage Community vs. the Great Fire

With a few exceptions beyond Morrill Street, the fire of 1888 destroyed all factories on carriage hill, along with a large finished inventory of carriages. Still, many other carriage complexes remained scattered about town that took in companies and their workers, such that there was minimal (considering the circumstances) business disruption. Frank Babcock rapidly built a three-building wood factory on one side of his Chestnut St. property (while his giant brick factory was being built on the other side) that employed 281 workers producing 5000 carriages in 1889. Elsewhere[1],

"Not one single factory closed down and no employee lost his job. The factories that were not damaged, made room for all of the companies that had their factories burned and loaned them money to buy the material that they needed. It was a common practice in the carriage business for a company that was doing a good business to loan another company money to help it stay in business. If a customer visited a shop that did not have a style available, he would be sent to the shop that had it."

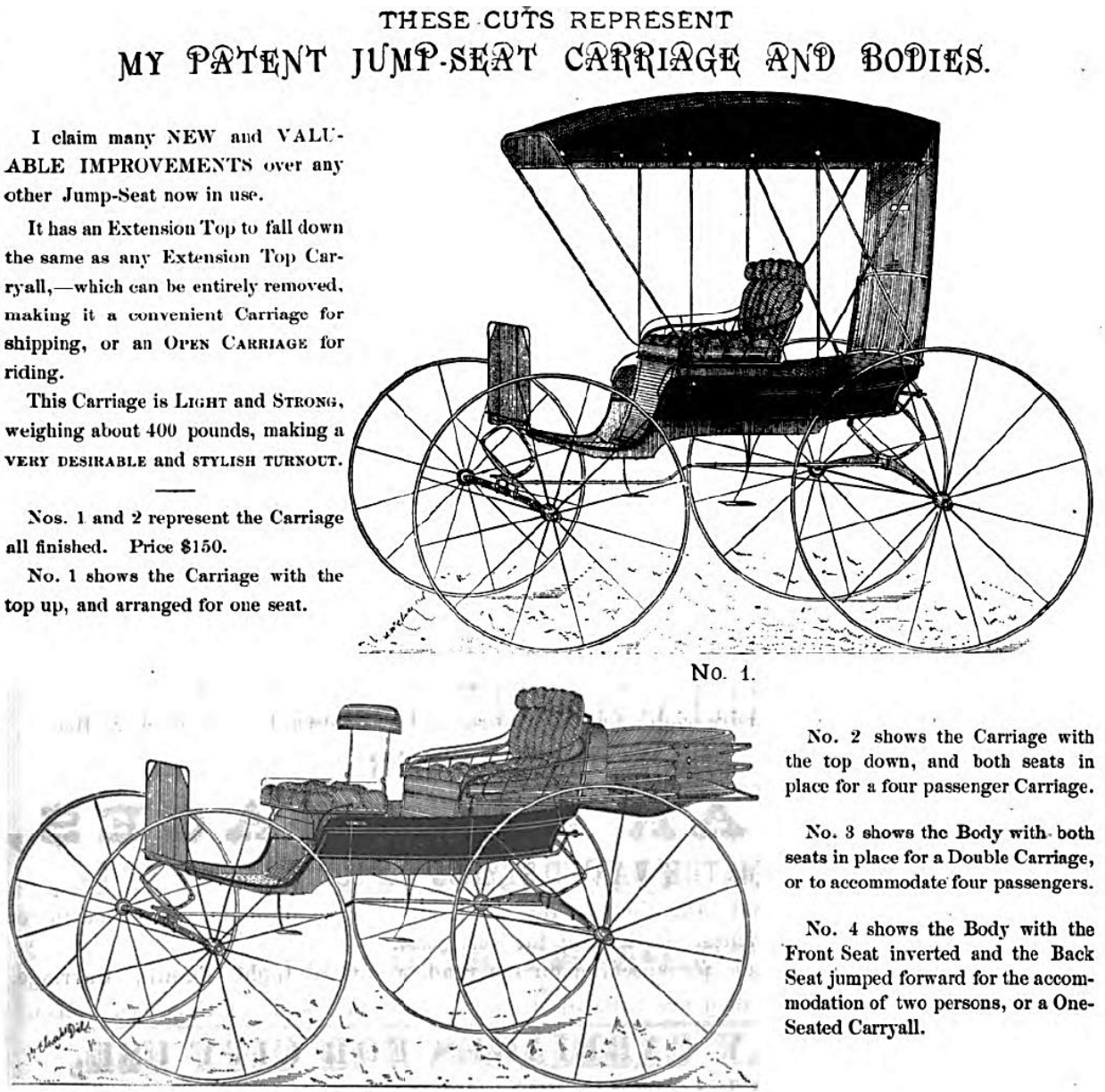
Such was the nature of Amesbury's carriage industry. They were a non-competitive group of cooperating businesses that enjoyed large demand for their products and were otherwise in a run of uninterrupted prosperity since 1880 that continued until 1893. Along the way, having a strong sense of civic and business responsibility, successful carriage entrepreneurs had created manufacturers' banks, purchased the steam powered Colchester Mill on Elm St. in 1882 to make it available for carriage businesses, and created the first Amesbury water distribution system in 1884, available for both domestic use and fire suppression (later bought by the town). By 1887 they had built the town's first electric generation plant, for industrial and domestic use, along with an electric inter-urban trolley line to Haverhill, and a large new coal gasification plant for town and domestic gas lighting. The trade additionally paid its employees well.

[1] quoted from an unreferenced trade magazine article, published by Royal Feltner, Amesbury

Larger Carriages & Novelties

At right is a one-to-two seat convertible carriage with folding top by E. S. Felch[1], whose complex was at Market and Russell Streets. There were a number of such novelties that could stretch the versatility of a carriage. In similar size was the fixed-top 2-seat beach wagon such as can be seen at City Hall. Two-seat “Traps” had a lifting side panel that allowed easier access for people to climb up into the rear seat.

Of opposite size direction was J. Lancaster of Merrimac, who specialized in smaller and less expensive pony carts and wagons.



THESE CUTS REPRESENT

MY PATENT JUMP-SEAT CARRIAGE AND BODIES.

I claim many NEW and VALUABLE IMPROVEMENTS over any other Jump-Seat now in use.

It has an Extension Top to fall down the same as any Extension Top Carryall,—which can be entirely removed, making it a convenient Carriage for shipping, or an OPEN CARRIAGE for riding.

This Carriage is LIGHT and STRONG, weighing about 400 pounds, making a VERY DESIRABLE and STYLISH TURNOUT.

Nos. 1 and 2 represent the Carriage all finished. Price $150.

No. 1 shows the Carriage with the top up, and arranged for one seat.

No. 1.

No. 2 shows the Carriage with the top down, and both seats in place for a four passenger Carriage.

No. 3 shows the Body with both seats in place for a Double Carriage, or to accommodate four passengers.

No. 4 shows the Body with the Front Seat inverted and the Back Seat jumped forward for the accommodation of two persons, or a One-Seated Carryall.

[1] from an 1879 scrapbook of Amesbury printer, J. B. Rodgers, Harvard University collections, available through HathiTrust

Local Inventiveness and Machinery Making

It was noted in 1876 and in Merrill's 1880 town history[1] that Amesbury carriage factories used machinery. Various illustrations herein show that many such "machines" were likely fixtures for guiding hand-powered work, far from automated machines of today. However, such automation was being designed during the 1870s into substantial powered machinery that was entering large industrialized carriage factories in the Midwest.

Joseph Locke and Hiram Jewell, along with Dudley Marston, came from New Hampshire, where Locke had a reputation as a mechanic[2]. They began acquiring, improving, and inventing wheel making machines at their factory, Locke and Marston both obtaining machinery patents. Their shop started with two circular saws, a cutoff saw, two planing machines, three polishing machines, a dressing machine, and two rounding machines[3]. Operating essentially a woodworking shop, they likely made machinery having wood frames and components., Locke & Jewell were then purchasing rough wheel hubs and spokes from suppliers in New Hampshire.

Dudley Marston had moved by about 1871 into the powered Water Street factory of William Biddle, where Marston built new wheel making machinery and a wheel business. After that factory burned, in 1876, he started anew at the steam powered Colchester Mill building on Elm Street. In later years he made and sold some wheel machinery at that location.

Charles Pettingell's machine shop had been established by 1873 next door to Locke & Jewell. Pettingell had no machinery patents, two known patents appearing on his machines belonging to Joseph Locke and Dudley Marston, so that this appears to be a synergistic relationship. Pettingell was soon making sophisticated machinery (in his unpowered factory) having cast iron bases and components.

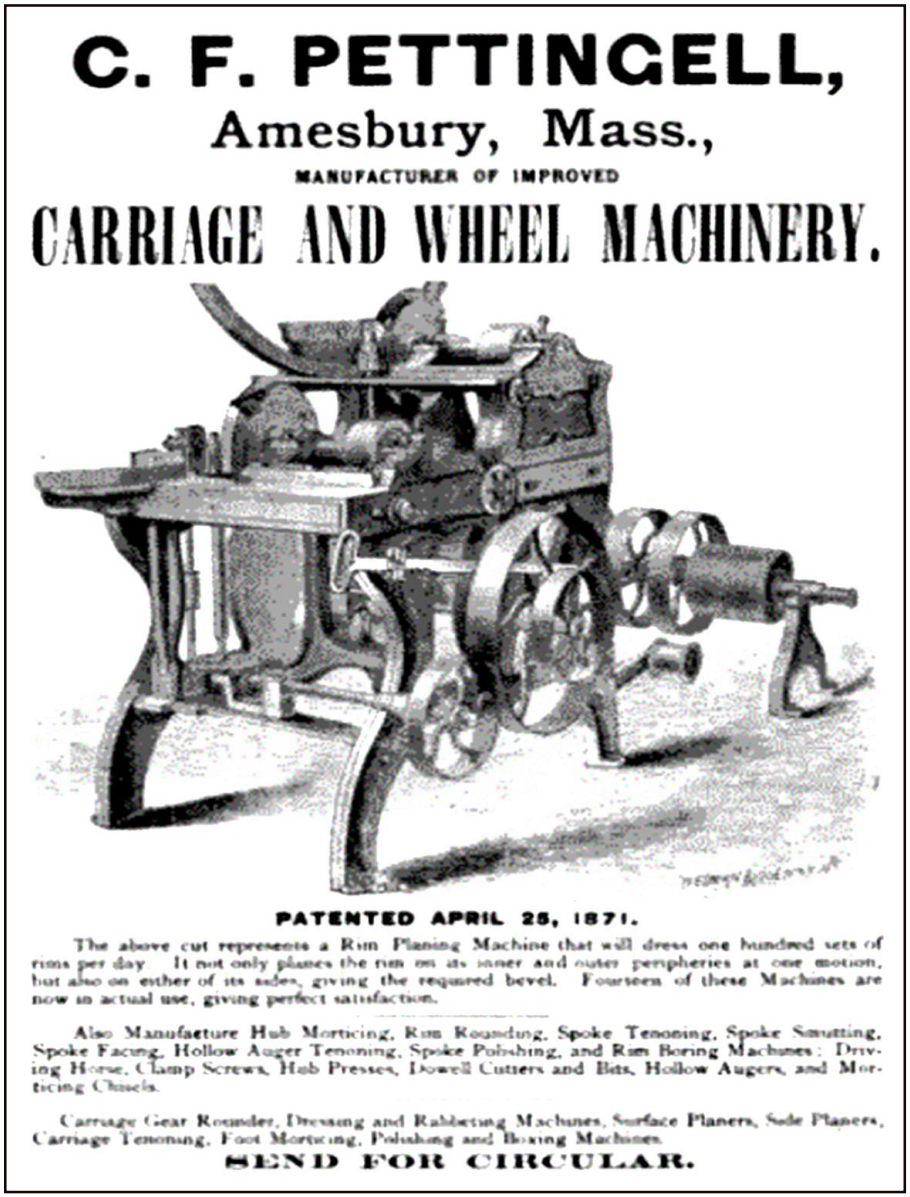
[1] *History of Amesbury*, Joseph Merrill, 1880, pg. 368, "much modern machinery now (1880) in use"
[2] *Carriage Business #3*, The Amesbury & Salisbury Villager, July 20, 1871, pg. 2
[3] ibid.

Locke & Jewell Factory at Patten's Pond - 1884

Photo courtesy of Steve Klomps

Looking up Main St. (with horse-trolley tracks) after an 1884 ice storm, across Patten's Pond to the Locke & Jewell factory with its smokestack (between tree and house) on Mechanics Row, and with the large belfry atop St. Joseph's school above. Two peaked roofs at right of the factory (and tree) are Carr & Allen carriage-making sheds, then absorbed by Locke & Jewell. The fence on the right side of Main St. fronted the Amesbury Woolen Mill (today's Post Office location) that had burned the previous year. The house at left, corner of Carpenter St. had been built ca. 1863 by mill operator Robert Bleakie, and was later purchased by carriage maker Patrick Connor.

Pettingell Machine Company – formed 1873



C. F. PETTINGELL,
Amesbury, Mass.,
MANUFACTURER OF IMPROVED
CARRIAGE AND WHEEL MACHINERY.

PATENTED APRIL 25, 1871.

The above cut represents a Rim Planing Machine that will dress one hundred sets of rims per day. It not only planes the rim on its inner and outer peripheries at one motion, but also on either of its sides, giving the required bevel. Fourteen of these Machines are now in actual use, giving perfect satisfaction.

Also Manufacture Hub Morticing, Rim Rounding, Spoke Tenoning, Spoke Smutting, Spoke Facing, Hollow Auger Tenoning, Spoke Polishing, and Rim Boring Machines; Driving Horse, Clamp Screws, Hub Presses, Dowell Cutters and Bits, Hollow Augers, and Mortising Chisels.

Carriage Gear Rounder, Dressing and Rabbeting Machines, Surface Planers, Side Planers, Carriage Tenoning, Foot Morticing, Polishing and Boring Machines.

SEND FOR CIRCULAR.

1874 Pettingell Advertisement

At left a Pettingell rim planing machine on cast iron base, driven by leather belts. The 1871 patent was the first of Dudley Marston's 11 patents, this one developed while he was next door at the Locke & Jewell factory.

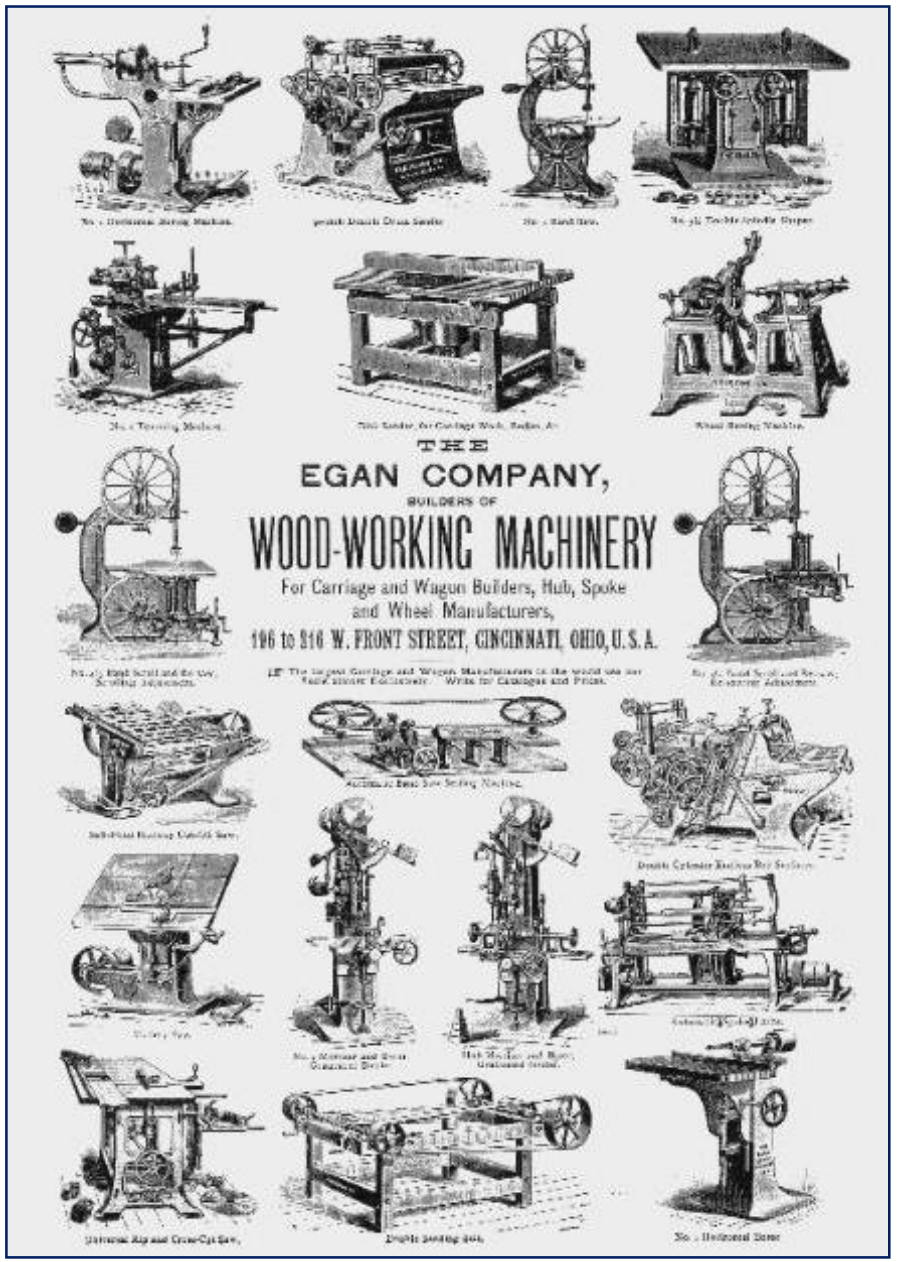
Below[1] a Pettingell spoke tenoner, having both a vertical and horizontal circular saw that cut the tenon surfaces and shoulder that mate with mortice slots in the wheel hub.

[1] http://vintagemachinery.org/photoindex/detail.aspx?id=19202

Large-Scale Industrial Carriage Making Machinery

Expanding extensively during the 1870s were numerous Ohio machine makers and Cleveland companies making nuts, bolts, and carriage iron. The Egan Co. and J. A. Fay of Cincinnati and the Defiance Machine Works made such large powered carriage machinery as table saws, band saws, flat sanders, planers, belt sanders, borers, Blanchard lathes, hub morticing machines, and others. Several machines shown at right are mounted on wood frames. Two vertical automatic hub turning and morticing machines (bottom center) stand about half-again taller than their human operator.

Such machinery was not coming to unpowered Amesbury factories, but simpler floor-mounted foot-treadle machines (made in Amesbury or elsewhere) could provide effective factory carriage production. That was how much local carriage making was conducted. The eventual result was that highly capitalized and industrialized factories began cutting into Amesbury's markets.

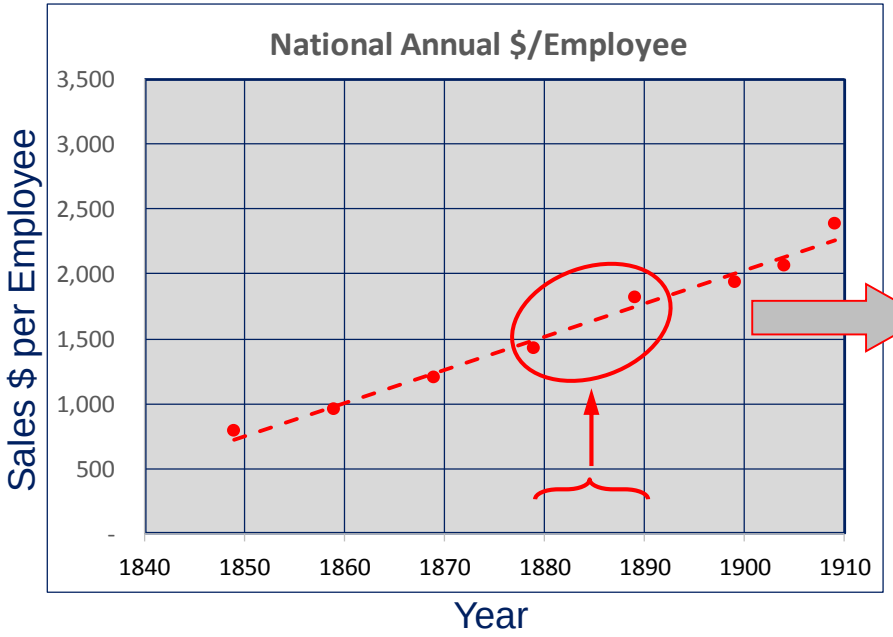


Annual Sales $/Employee – Local vs. National Trend

Amesbury 1880 and 1889 carriage data compared to national trend

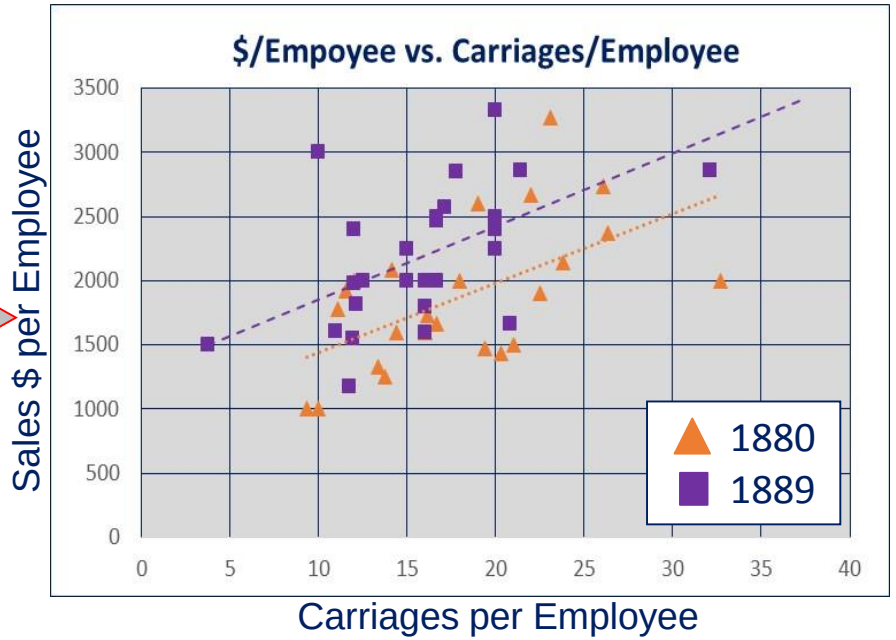
The national trendline for thousands of then-existing wagon & carriage companies rose over the decades, driven by industrialized factories using widespread heavier machinery. Amesbury Sales-$ per employee matches the national trend and Amesbury makers had generally increased Sales-$ per employee in 1889, over 1880, by moving up-market as lower carriage grades were encroached upon by industrial makers.

National Average for Sales $/Employee



National average includes data for both carriages and wagons, and companies both large and small. There would actually be considerable scatter about the trendline. Kinney, pg. 34

Amesbury 1880 & 1889

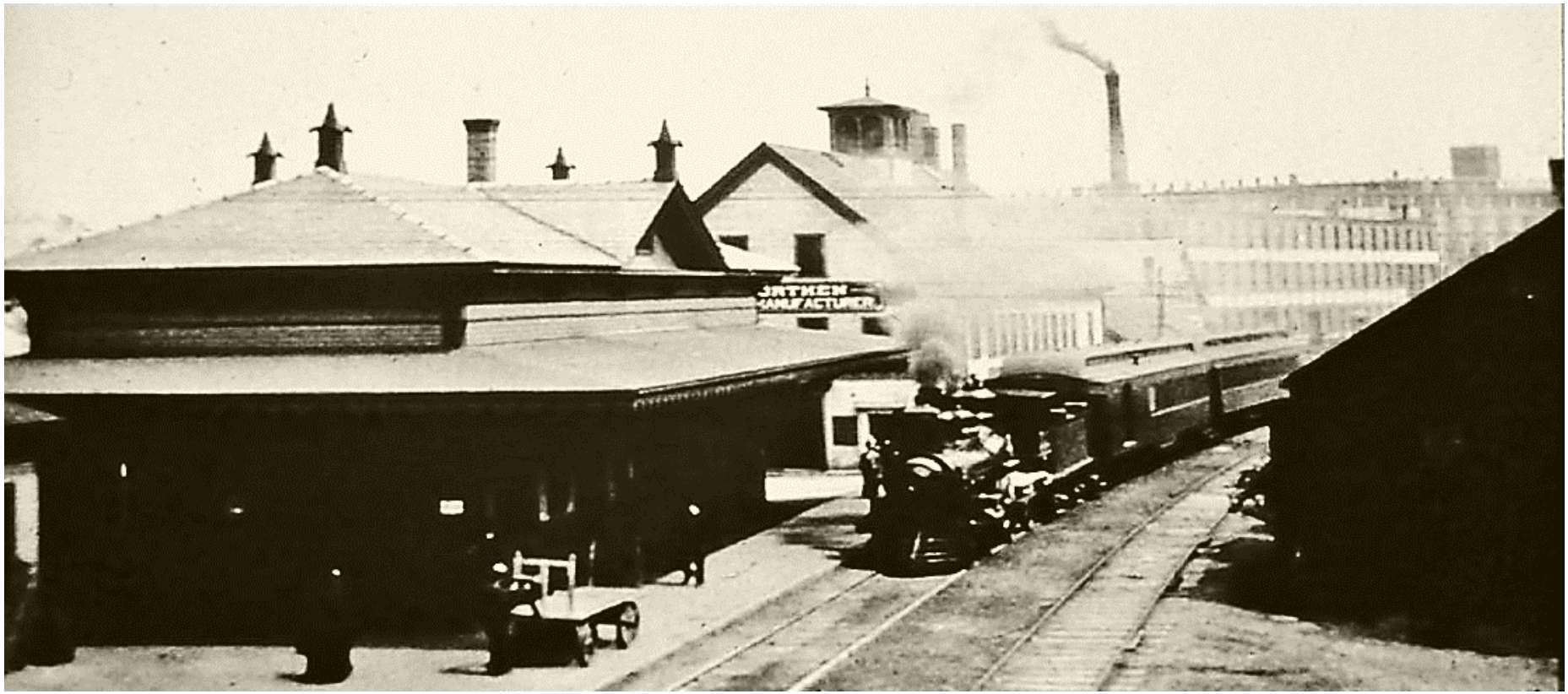


Amesbury sales $ per employee matches or exceeds the national trend. Shops that produce more carriages per employee naturally produce more sales $ per employee.

Amesbury data fits well with the National trend for the 1880s. Amesbury carriages are more expensive than the national average, yielding higher sales $ per employee. 1889 sales $ per employee has risen, compared to 1880, as Amesbury moves up-market.

Passenger Station & Barn Restaurant ca. 1905

with Railroad Avenue factories in background, right



Courtesy of Salisbury Point RR Historical Soc.

In a view we can barely recognize today, looking past the passenger station (now Crave Restaurant) from Water Street. Behind the station is the current Barn restaurant building, with cupola on top. That had previously been part of the Charles W. Long carriage complex, which was then owned by Charles F. Worthen at the time of this photo, as seen by the sign. Two sets of tracks at the station curve to the right as they cross the trestle over Back River and then past the white-striped Folger & Drummond carriage factory on Railroad Avenue. Within a few years of this photo, those buildings were all converted to auto body manufacture, and now are all gone. Today that factory area is mostly empty.

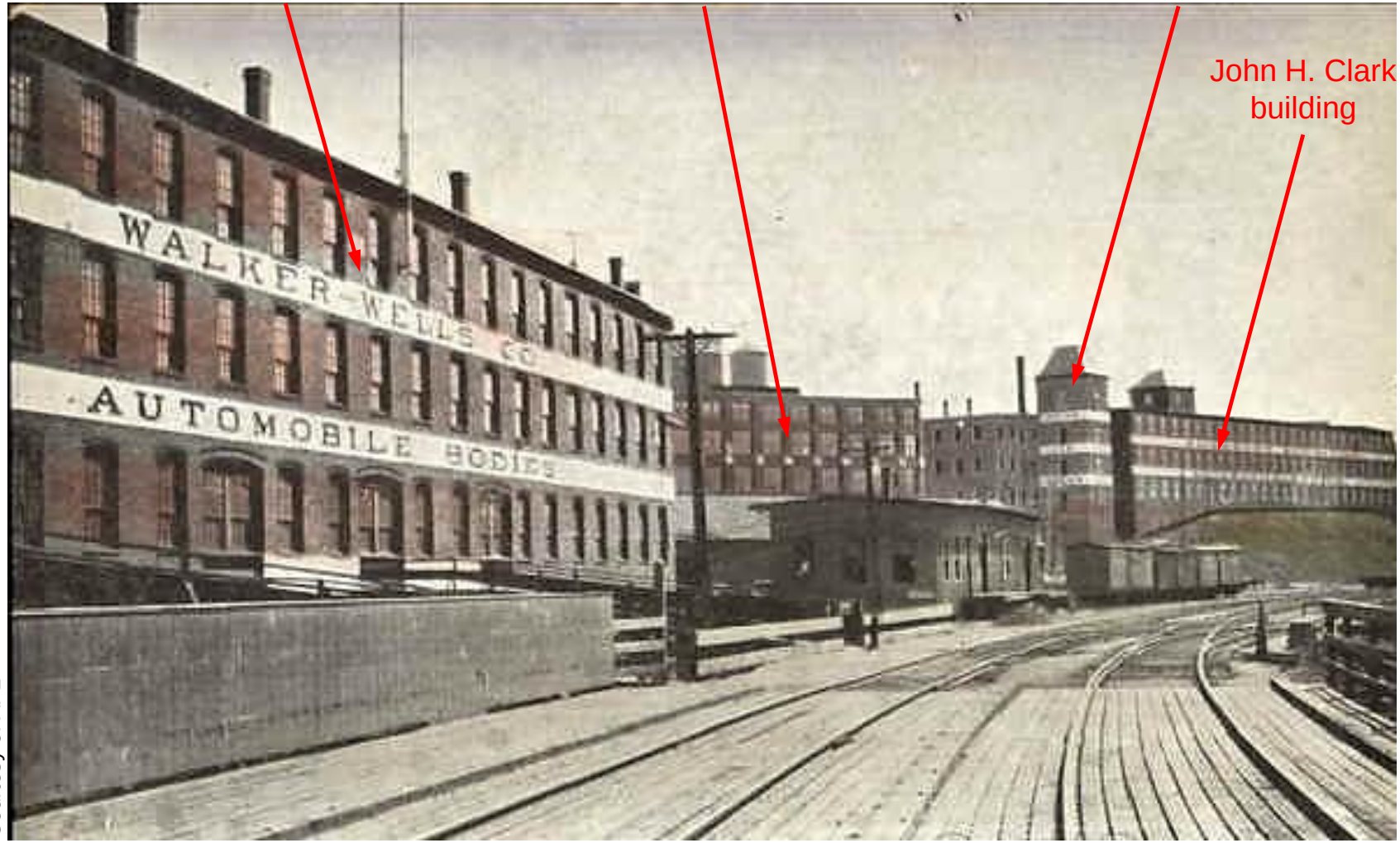
View from Railroad Trestle Over Back River – ca. 1914

Walker - Wells Co. factory, formerly Folger & Drummond

Babcock Building – Bailey Electric Car, then Biddle & Smart after 1915

Hollander & Morrill, later Walker Body Co.

John H. Clark building

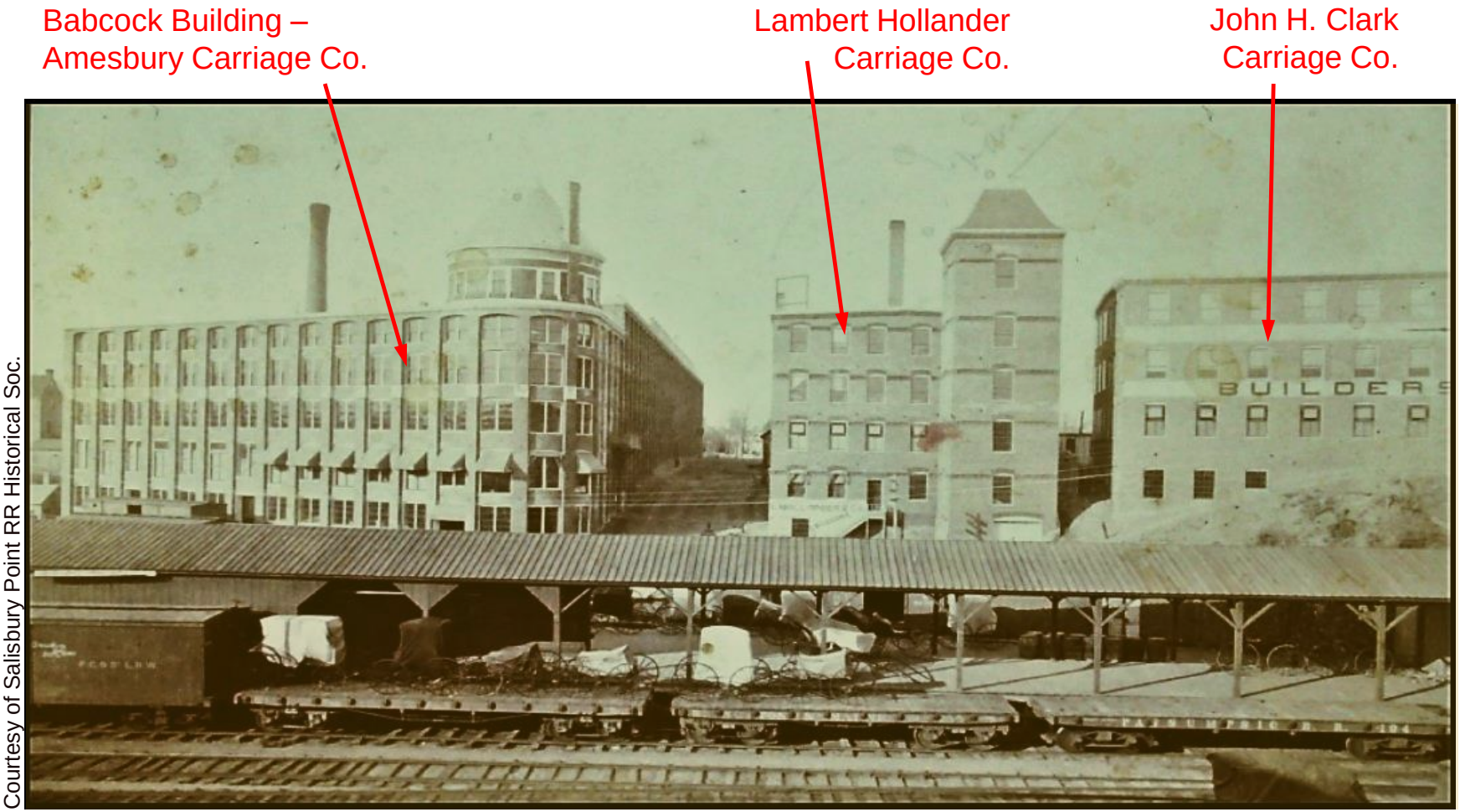


Courtesy of APL

Moving past the Barn restaurant, this is the Railroad Avenue factory view from the middle of the railroad trestle. The former Folger & Drummond factory is here owned by Walker-Wells, making auto bodies. Bailey electric cars are being made in the Babcock Building. The Hollander & Morrell and John H. Clark buildings still exist on Oakland Street.

Looking Up Chestnut Street & Carriage Hill – ca. 1890

Seen from large brick Biddle & Smart 1882 factory, located where lower Chestnut St. is today



Courtesy of Salisbury Point RR Historical Soc.

Within two years of the 1888 fire, the new Babcock building was the largest factory in town with 185,000 ft^2 of space, functioning as an industrial condominium because no single company could fill it until the auto body era. The right two buildings still exist. Chestnut Street did not then cross the railroad tracks coming downhill. Muslin covered carriages are being gathered at the freight sheds for loading onto flatbed railroad cars.

Looking Up Chestnut St. Today, from Lower Chestnut St.

Looking up from the intersection of Chestnut and Water Streets

Black fence around metal scrapyard

Entrance to German AutoSport

Lambert Hollander Carriage Co.

John H. Clark Carriage Co.

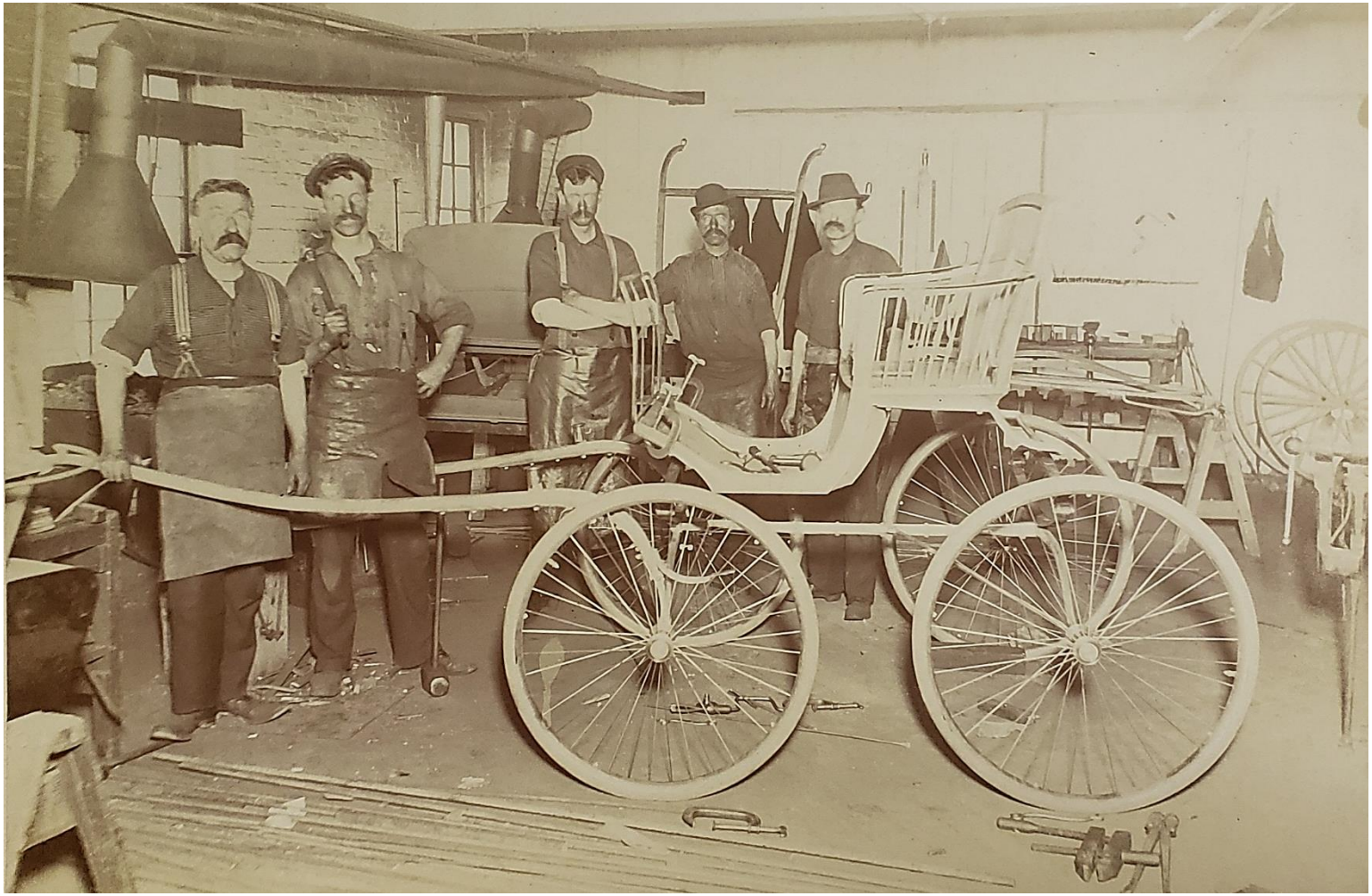
two long red warehouses that are directly on the old rail bed

Looking up Chestnut from Water St.
Railroad Avenue area is to the left, in the metal scrapyards

Quonset hut of Bartley Machine Co.

The front of the Babcock building roughly followed the black fence, above, to the left of Chestnut Street. The side of the building ran up Chestnut Street to the Biddle & Smart office building that still exists near the top of Chestnut. The Babcock building was five stories tall in the front, four stories tall in the back, but because of the hill, it lost two lower stories and gained one upper story along the way. The photo on the previous page was taken from a building that stood right here in lower Chestnut Street.

“Ironing” a Carriage, Connor Carriage Co. - 1900

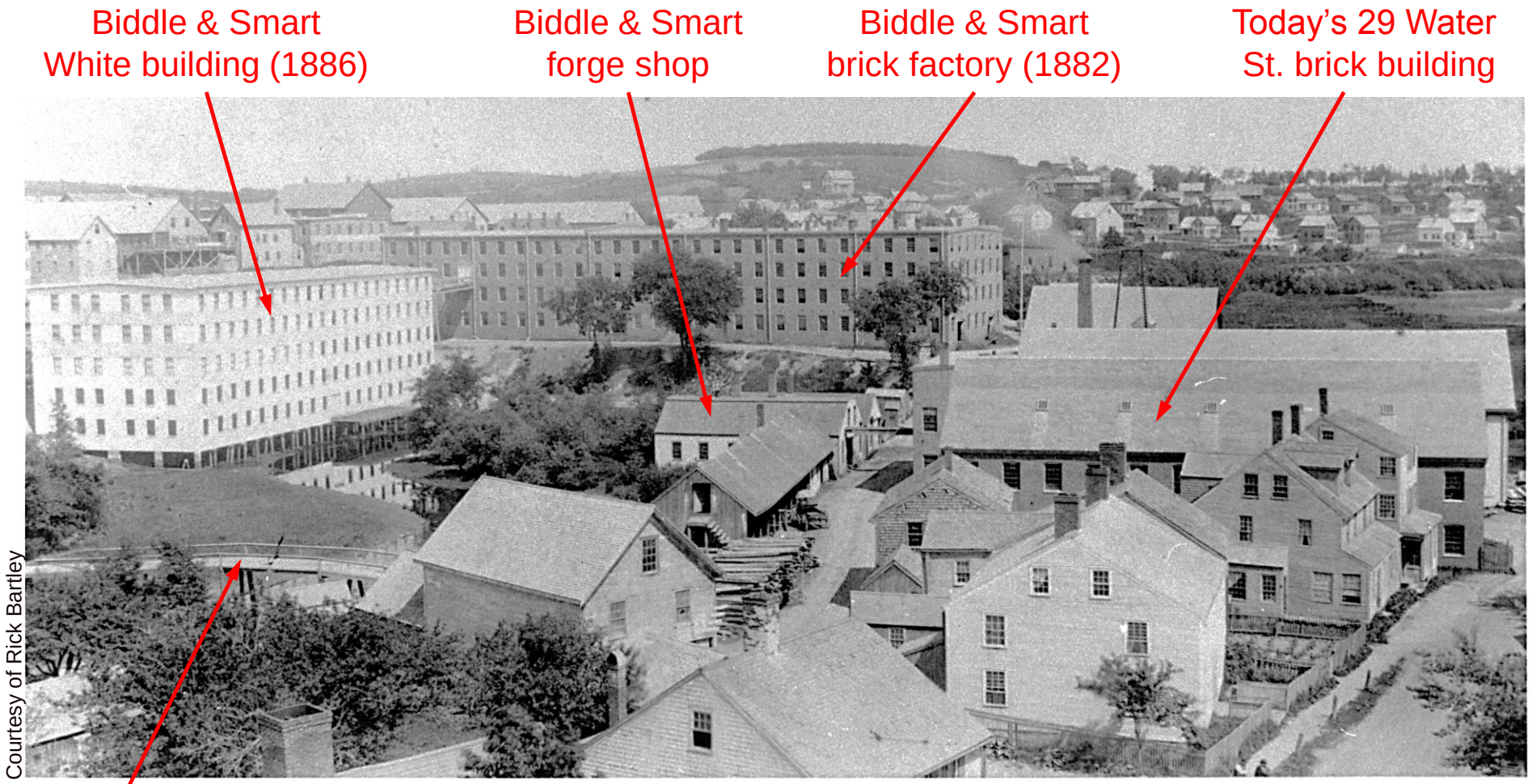


photo, Amesbury Carriage Museum collection

A forge shop of the Connor Carriage Co. in the former D. J. Folger building, with vents for two forge fires in the background. A dashboard frame, later to be leather covered, is being assembled to a still-incomplete phaeton body. Other iron work is around the seat. Wheels and gear (undercarriage) have pneumatic rubber tires on “bicycle” spoked wheels, and a metal frame, very up-to-date for 1900 carriage comfort. Connor claimed to be the town’s earliest user of pneumatic tires.

Biddle & Smart Water St. Factory Complex – ca. 1887

showing the density of buildings on lower Water St.

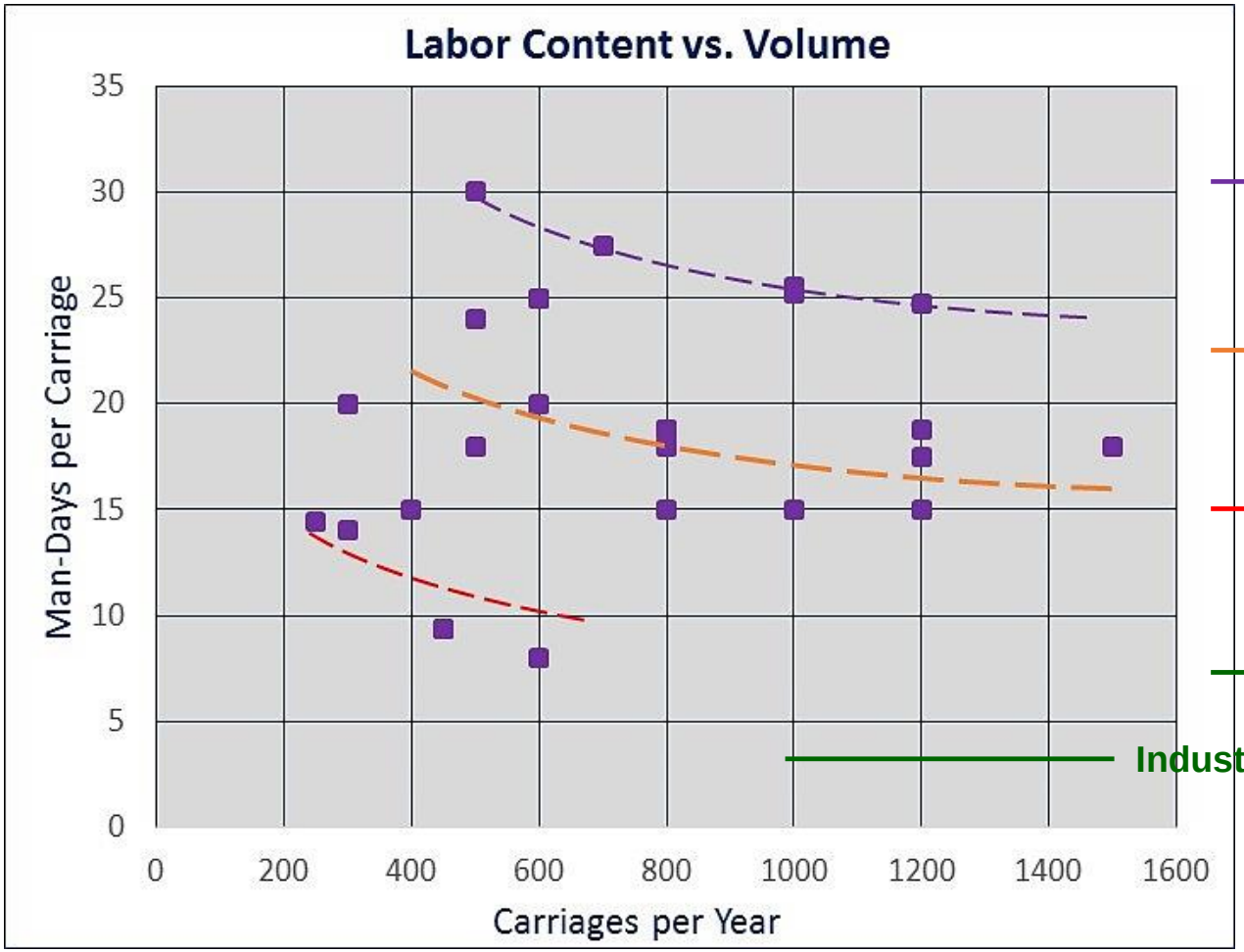


Courtesy of Rick Bartley

The White building is in the now driveway into German AutoSport, while the 1882 building is in today's lower Chestnut Street. Roofs above these buildings are up on Carriage Hill, and burned in April of 1888. The forge shop has several small forge chimneys with blowers powered by a 2nd story drive shaft seen extending across Water Street. The Back River foot bridge (left) is in the same location as today.

1889 Strata of Amesbury Craft-Built Carriages

Labor input generally falls vs. production volume, demonstrating economy of scale for ascending grades of carriages. (Trendlines estimated by author.) Various strategies affect price, but labor content is a major influence. All of Amesbury's craft niche prices are above those of industrially mass-produced carriages. Data strongly suggests rationalized Amesbury quasi-industrial manufacture, with tiers of labor content for ascending product grades (bearing in mind that this is a macro-view and that some other subtleties may also be occurring). This is the condition of Amesbury carriage making during its peak years, with most production in the upper two strata.



Amesbury carriage grades

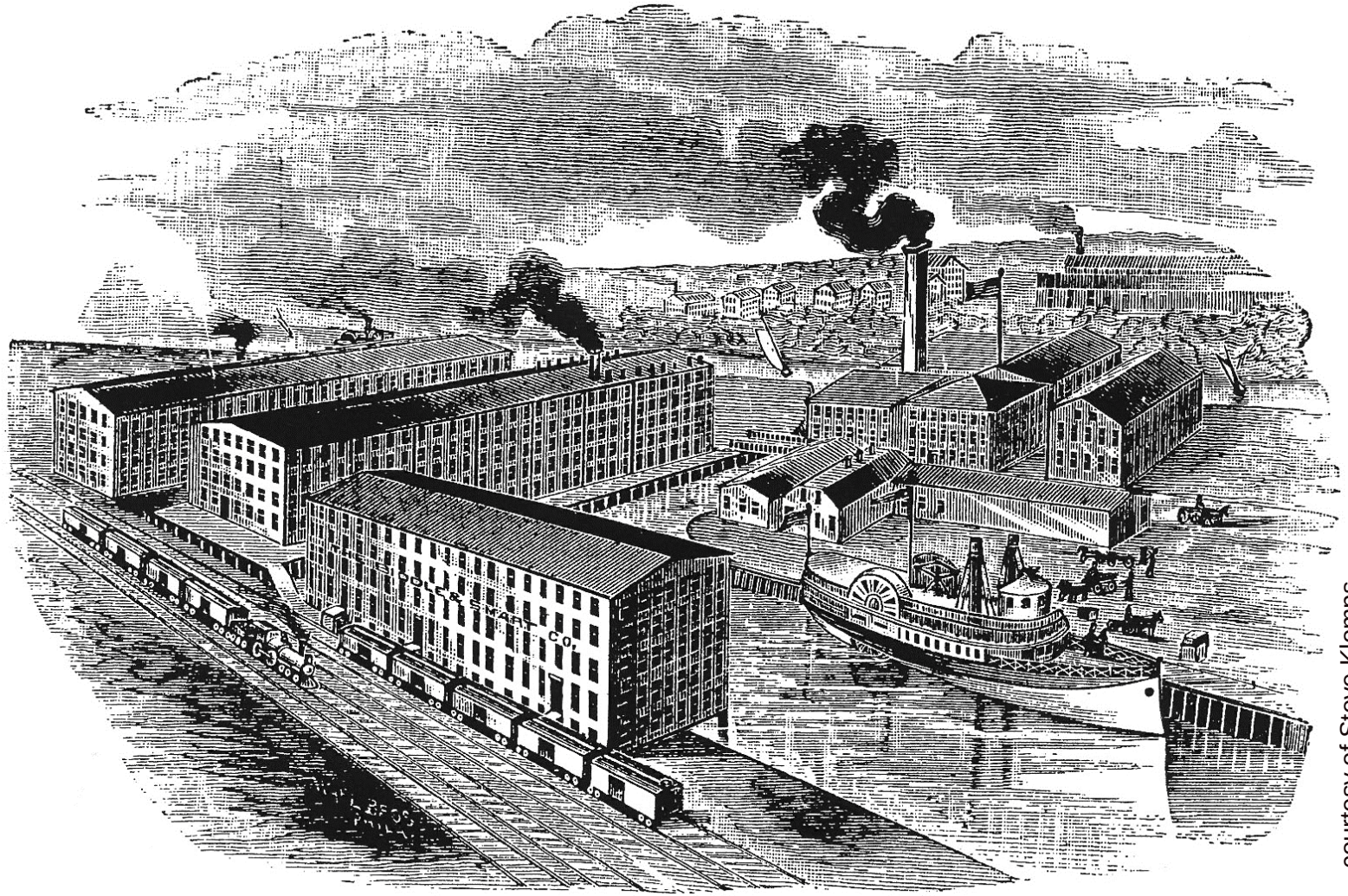
Premium grade, above 25 man-days labor

Higher grade, 15-25 man-days labor

Upper grade, below 15 man-days labor

Industrial commodity grade, 3 - 4 man-days labor

Biddle & Smart Carriage Co. - Water Street ca. 1900



courtesy of Steve Klomps

Amesbury's largest carriage complex was Biddle & Smart, formed in 1880. with 11 buildings on Water Street totaling 150,000 square feet. At mid-height, far right, is seen a horse and wagon just right of the present #29 Water Street brick building, which is the only remaining structure from this drawing. The three buildings along the railroad tracks are pictured on the next page. The steamship could not possibly have navigated into Back River.

Biddle & Smart on Lower Water Street, ca. 1890

as seen from the Babcock building

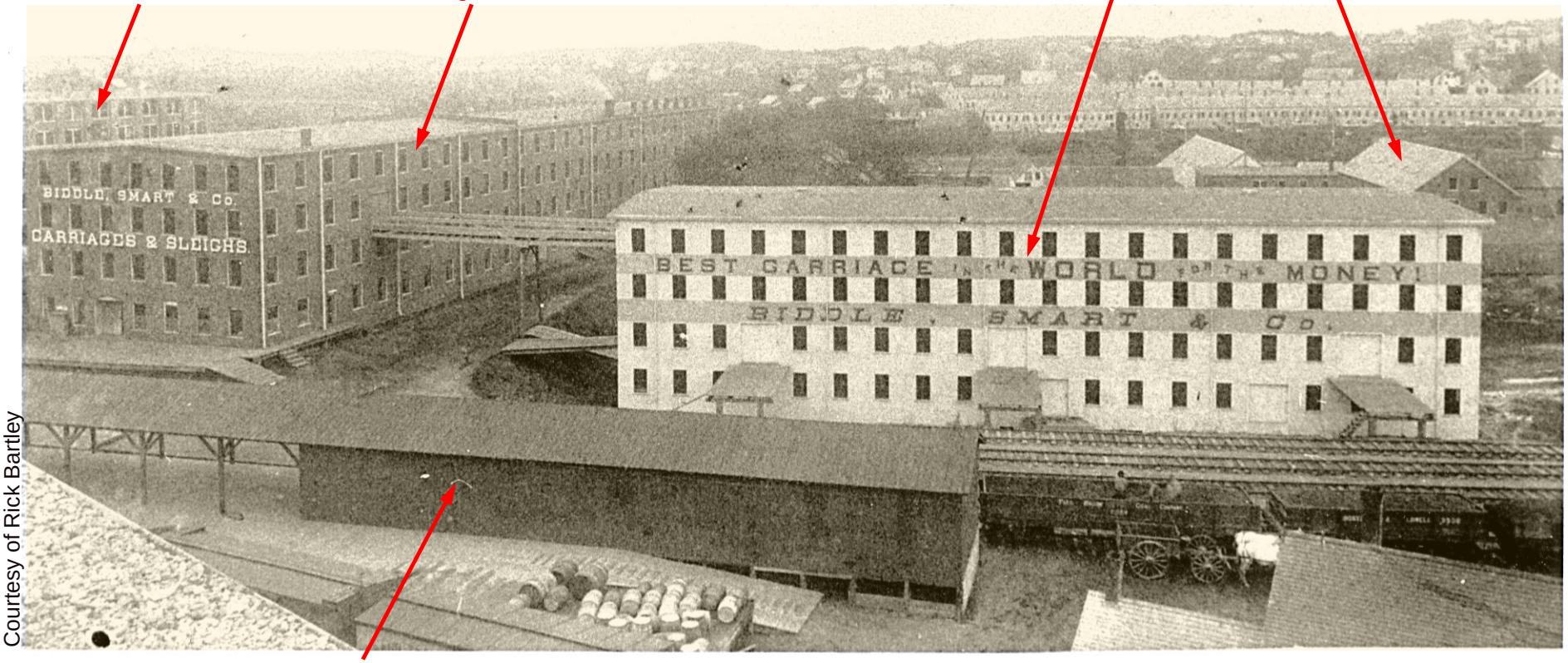
The Biddle & Smart complex was an exception. Neighborhood complexes had several large barns totaling perhaps 25,000 square feet. Downtown factories tended to have only a few closely coupled buildings, if more than one.

Biddle & Smart White Building (1886) directly across the tracks from the Babcock building

Biddle & Smart (1896), current site of Bartley Machine

Biddle & Smart (1882), 3rd largest factory in town. Current site of Bartley Machine Quonset huts & lower Chestnut Street

William Biddle 1876, now alone as 29 Water St.



Courtesy of Rick Bartley

Carriage loading sheds along railroad tracks

The Biddle & Smart White Building resided on the now-driveway into today's German AutoSport. A 20-foot high embankment to the right of that driveway rises up to the old railroad bed.

The Carriage Center of What!!

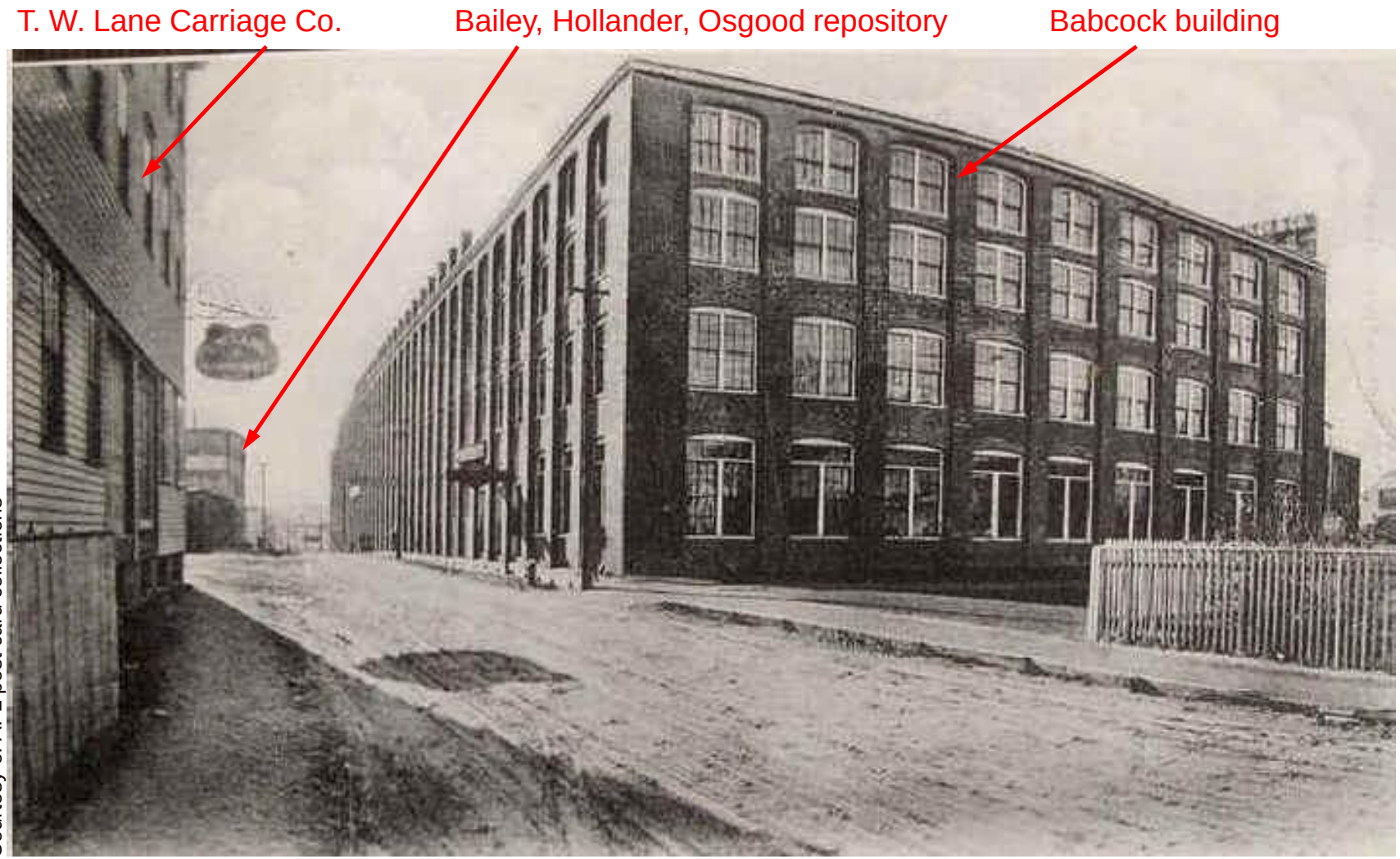
Amesbury carriage making prospered with little self-promotion, and no makers exhibiting at the 1876 Philadelphia Centennial Exposition. That had changed by Chicago's 1893 Columbian Exposition, when fifteen Amesbury carriage makers exhibited 37 Carriages. Amesbury's profile had been elevated by articles and news updates in trade publications, *The Hub* and *The Carriage Monthly.* Local makers began participating in the chief trade organization, *Carriage Builders National Association* (CBNA), formed in 1872.

Only two Amesbury firms participated when CBNA began (F. D. Parry & Hume & Morrill) but increased participation brought notice and import to the local reputation. As Amesbury reached peak production of 18,800 carriages in 1890, articles were noting its trade prominence and J. R. Huntington's creation of the wholesale carriage business. Also, CBNA had created a New York City trade school in 1880, being attended by 2nd generation Amesbury carriage makers, learning modern design, style, and drafting. By 1890 Amesbury was publishing the *Amesbury Vehicle* trade paper and took initial steps in 1892 to create its own design and training school, but these ambitious projects were dashed by the general economic collapse of 1893.

The Amesbury Board of Trade was created around 1888, akin to a chamber of commerce. They began organizing week-long annual spring openings in 1889, with carriage parades, banquets, and thousands of carriages in local repositories for visiting agents and merchants to peruse. By 1892, the Board had self-branded Amesbury as the "Carriage Center of America", and by the following year the "Carriage Center of the World." No specific attribute was noted as meriting this title (none is evident), which was mainly an exercise in sloganeering. However, Amesbury had earned a prominent national reputation for a small industrious town.

Looking Down Chestnut Street – ca. 1912

Viewed from across where the Biddle & Smart office building is today at 6 Chestnut

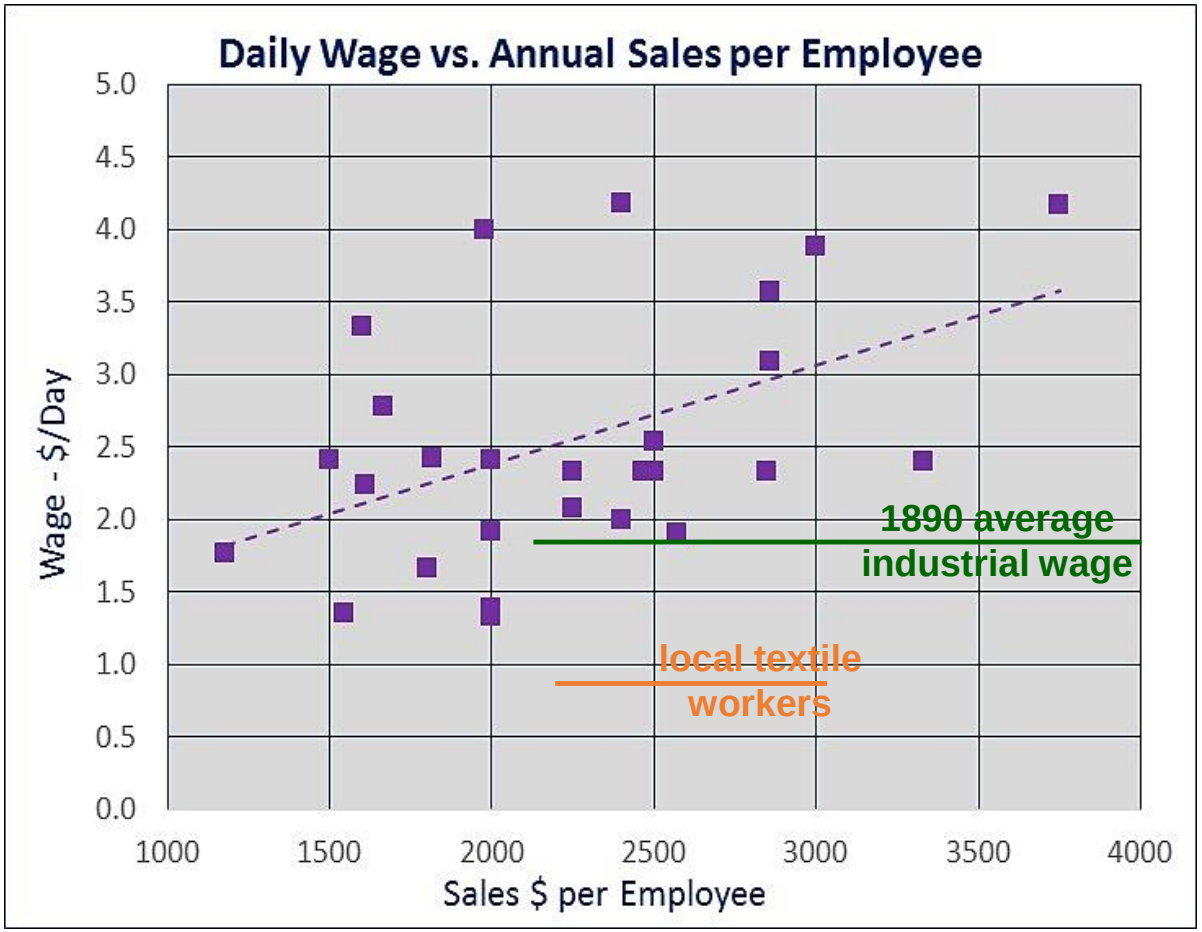


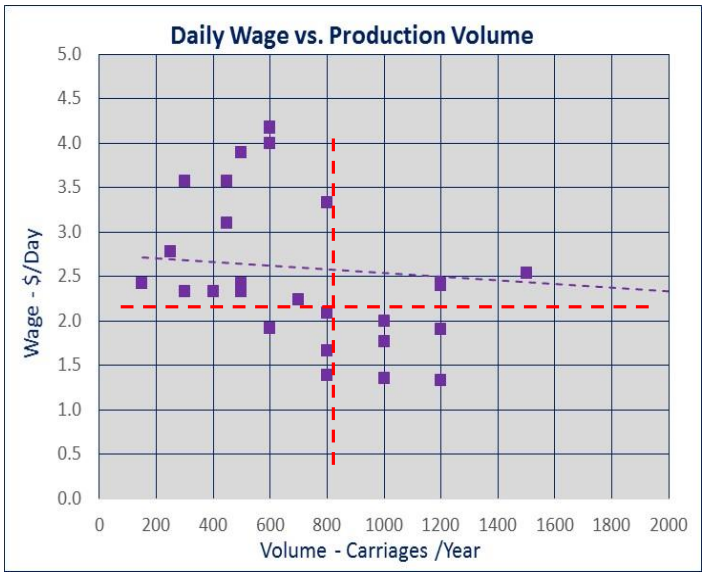
Courtesy of APL post card collections

The Babcock building from the back, then owned by S. R. Bailey. At left, T. W. Lane's carriage company at the top of Chestnut that operated into the 1920s. The building further down, called "the arc", functioning as a repository for S. R. Bailey, Lambert Hollander, and George Osgood, was at the corner of Oakland, opposite Hollander's factory.

1889 Daily Wages for Amesbury Craft-Built Carriages

Amesbury carriage wages trended well above the national average, and many carriage workers owned their own homes. The best correlation is in relation to Sales-$-per-employee. Shops that garnered higher income per employee tended to pay higher wages. Highest paying were lower-volume shops (fewer than 800 carriages/year, graph below right) paying $2.30 or more somewhat independent of carriage sell-price. Lowest paying were high-volume shops (800 or more carriages/year) paying below $2.30. Period sources verify that skilled Amesbury carriage workers made above $3 per day[1]. The textile mills in town then paid about $0.75 per day.

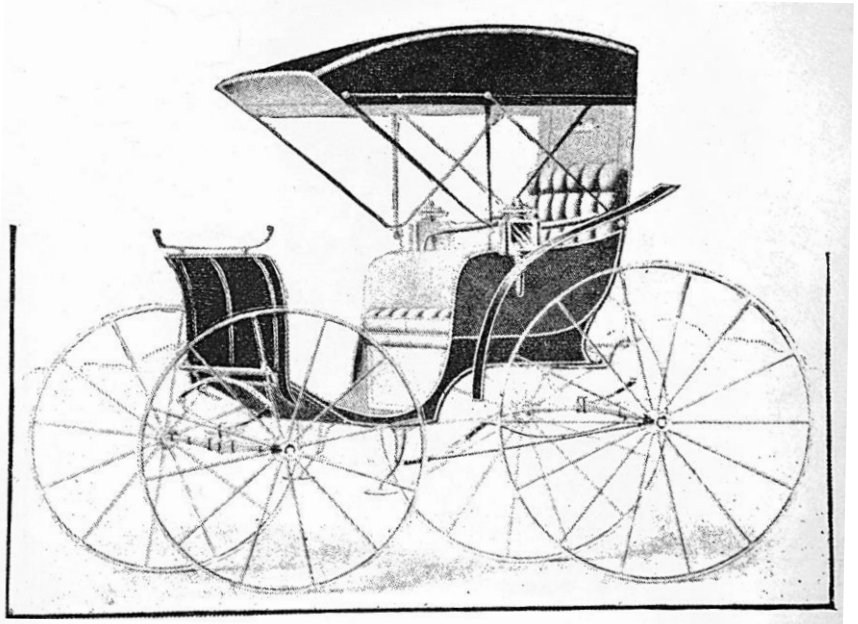




Above, there is a clean wage split between low and high volume shops. High volume shops likely had more technology and less dependence on high skill.

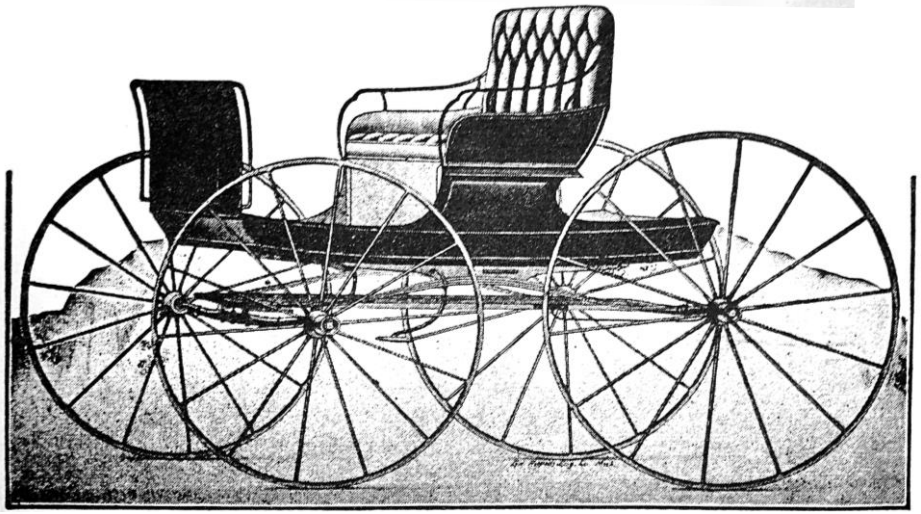
[1] from an unreferenced trade magazine article, published by Royal Feltner, Amesbury

Early 20th Century Amesbury Carriages

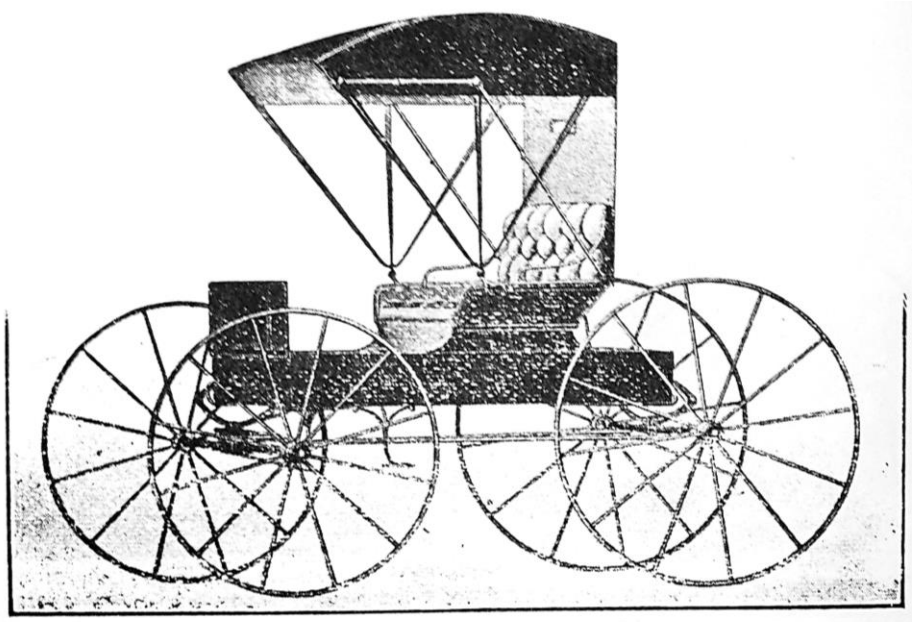


No. 267. CLARK PHAETON.
High Grade Vehicle. Seats low, and very easy riding.

Three carriages from the 1910 catalogue of Amesbury's last carriage maker, Thomas W. Lane. There is today a T. W. Lane Concord carriage (below left) at the Amesbury Health Center on Highland Avenue. Phaetons can be seen in several of the carriage shop photos herein. Shown are both 12 and 14-spoke wheels, but 12 spokes were allegedly more common. These carriages have iron tires on their wheels, but were also available with rubber tires and ball bearing axles.



No. 102. RAISED PANEL CONCORD.
Four sizes. Have features not found in other makes.



No. 91-T. TOP PIANO.
Solid moulding on seat. Shifting top.

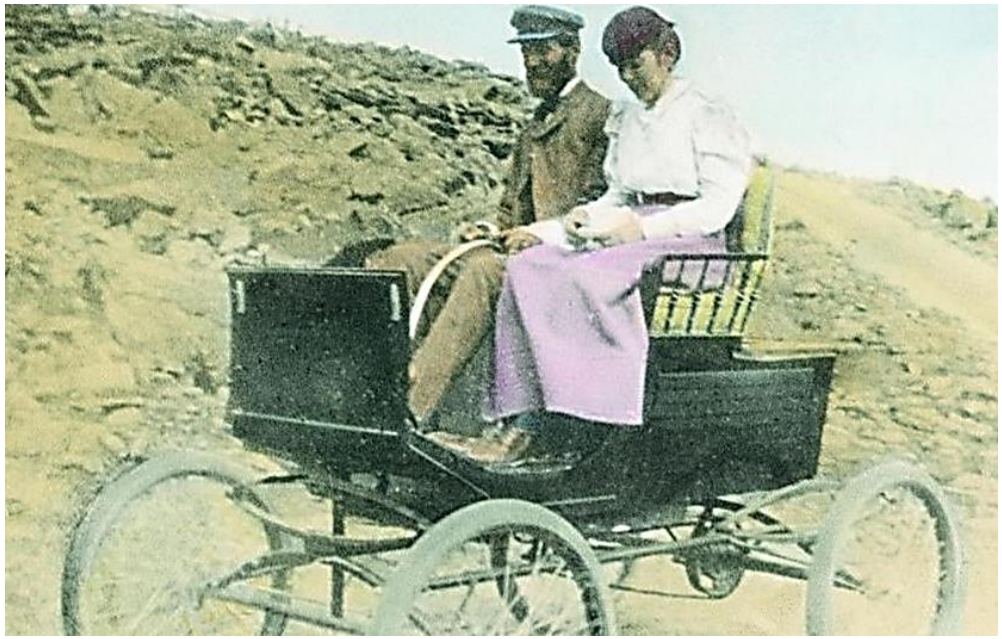
Into Decline

Carriage owners were of a financially robust class that carried Amesbury makers through a disruptive late-1870s recession that closed town textile mills for three years. The economy slowed again after 1890 but more serious was creeping market disruption from large industrial makers that were expanding into better-grade vehicles, including heavy enclosed carriages. Next, the 1890s bicycle craze, where a new chain-driven safety bike (as opposed to high-wheelers) could cost $100, drained discretionary spending away from such niceties as watches, jewelry, and carriages. Then, the substantial crash of 1893 inconvenienced even the upper-class. That was all coupled with chronic regional issues of relatively high wages, high state tax structure, and remoteness from many American markets. Proximity to harbors did help promote foreign sales for many Amesbury makers.

Even with recovery, the population of Amesbury carriage businesses declined ever-after. Amid such unpropitious conditions, agitation by the Carriage and Wagon Workers International Union instigated an unlikely strike in 1902-3, when local carriage workers were already paid well above the average industrial wage. Six-hundred striking workers demanded a nine-hour day and increased pay, resisted especially by S. R. Bailey, who imported workers from New York and Nova Scotia. The strike collapsed in 1903.

No new carriage related business entities were formed after 1904, when workers were being increasingly attracted to the growing auto body business. The shift was not unlikely, for many early autos were essentially carriages with motors. Even as shapes evolved, body construction was all-wood for another decade, relying heavily on Amesbury's long-held skills. A credit recession in 1907 helped weaken remaining carriage businesses, at which point there were twenty auto body makers. Carriages resisted more expensive autos for many years, and T. W. Lane allegedly made the last Amesbury carriage in about 1928.

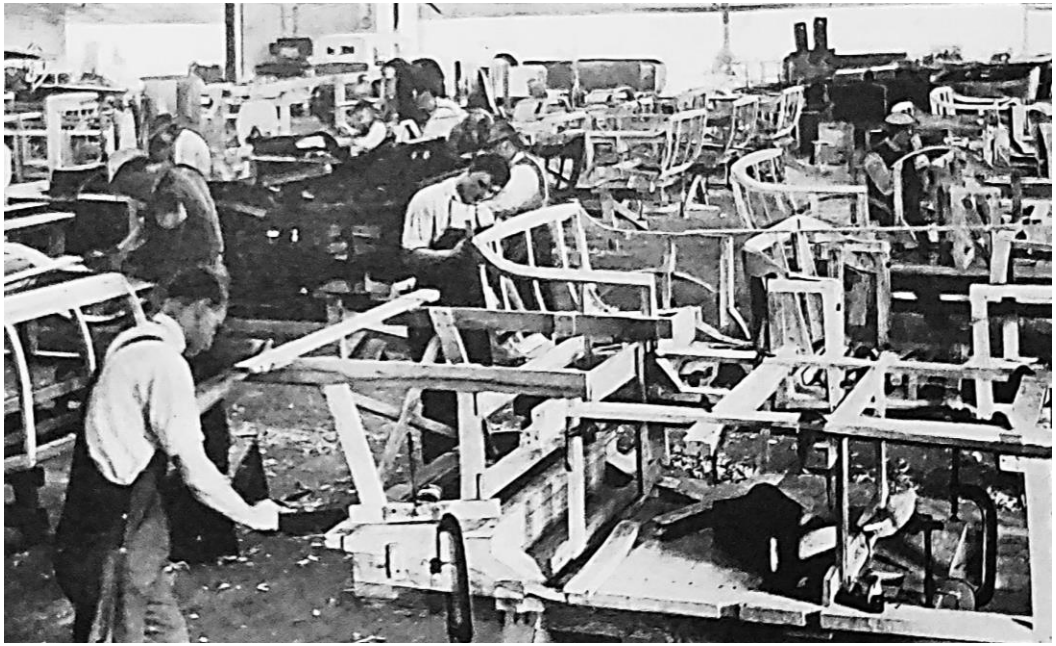
From Carriages to Cars



Courtesy of massmoments.org

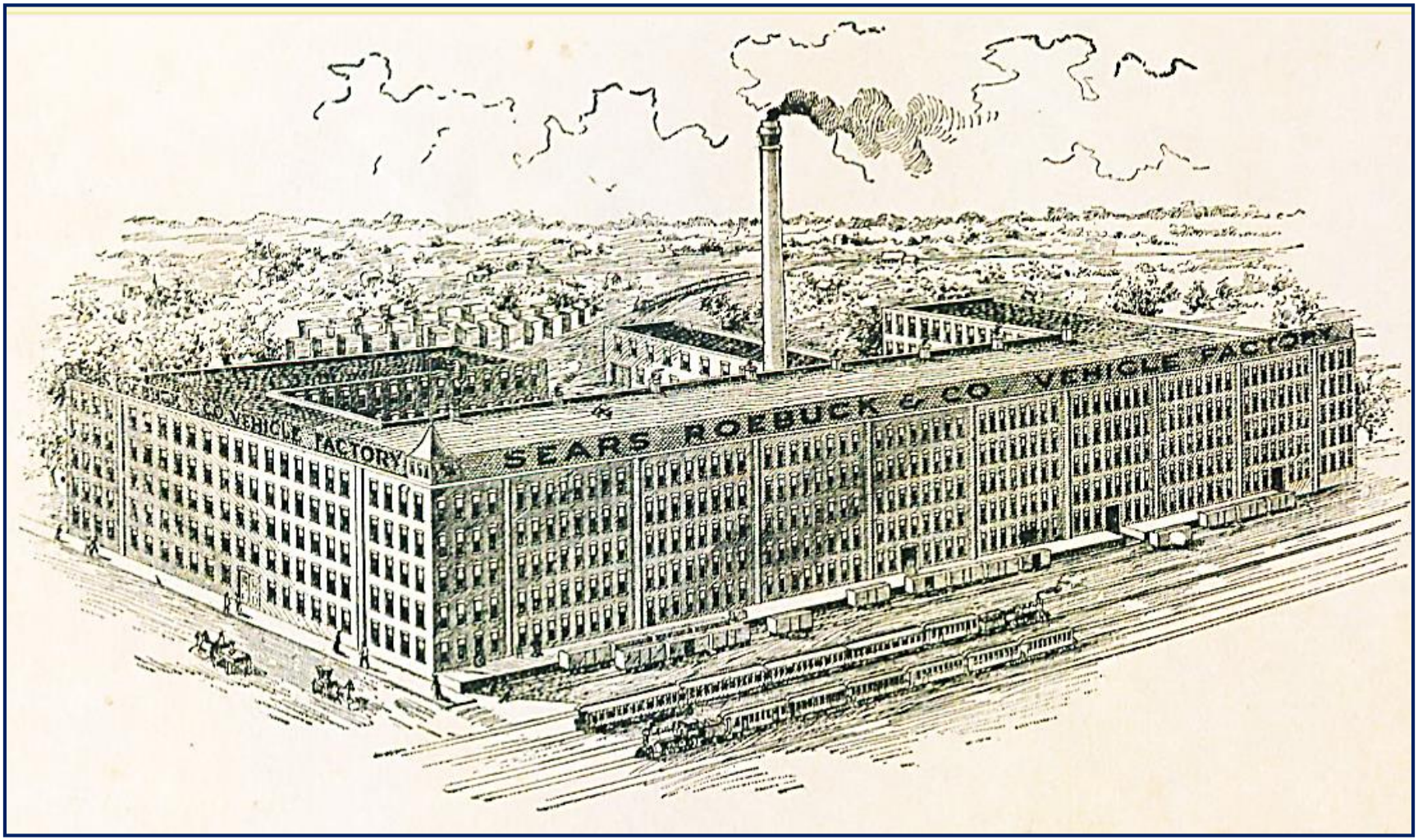
Freelan O. Stanley (of Stanley Steamer) and his wife, Flora, drive their Locomobile as the first car to climb Mt. Washington, August 31,1899. The vehicle is simply a light carriage having tiller steering and a steam engine inside, built on a "modern" metal undercarriage having pneumatic tires and metal "bicycle" wheels. Many Locomobile and Steamer bodies were made in Amesbury.

Hand making wood auto body structural frames for the Leach auto, ca. 1920. Such work continued for some years to be closely related to carriage making, even as these wood frames shifted around 1910 from having wood panels to being covered by formed aluminum outer panels.



Sears & Roebuck Vehicle Factory – 1902 Catalogue

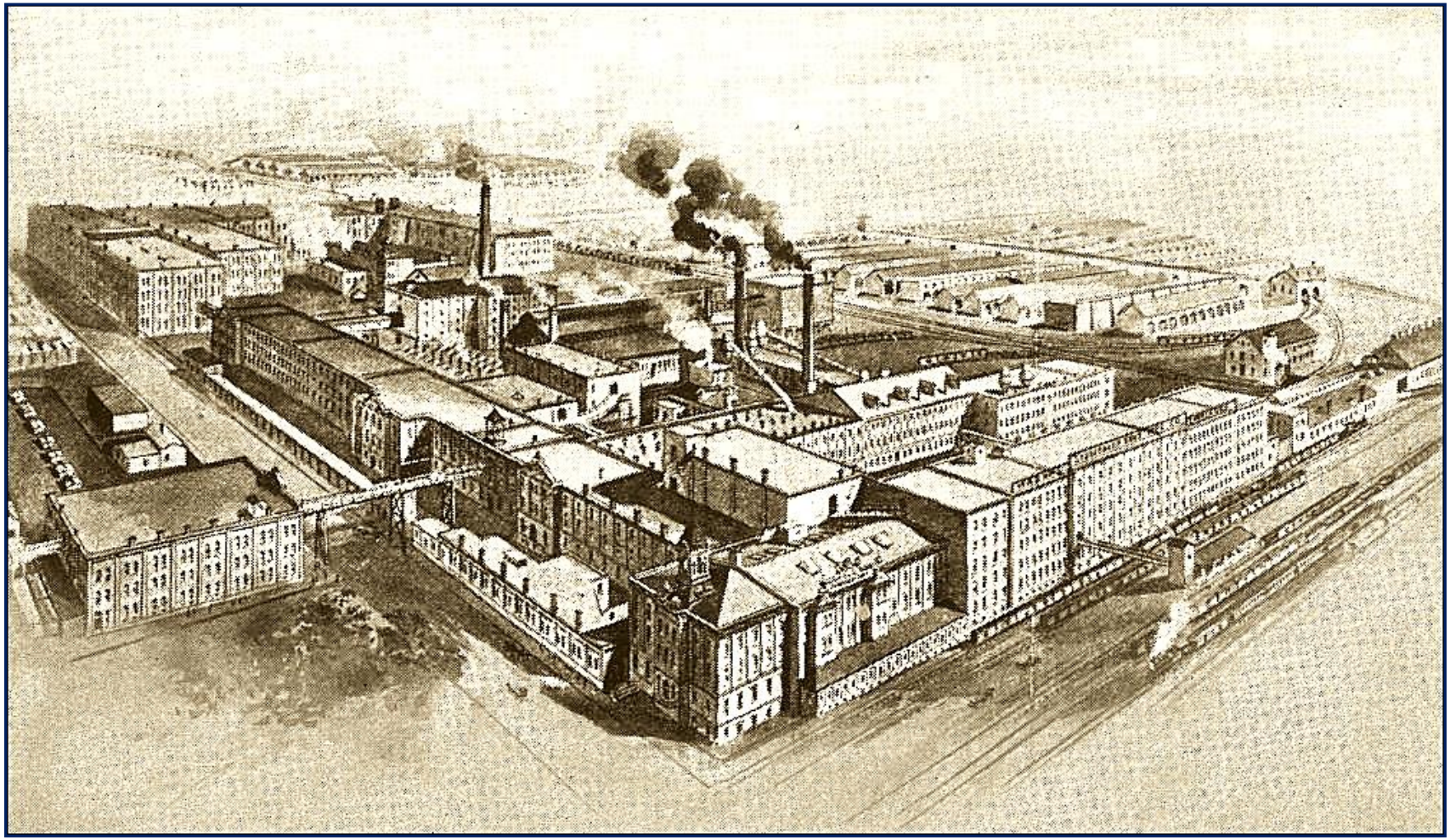
This 5-story factory in Indiana was stated to be filled with the most modern and efficient machinery, and Sears sold retail-direct through catalogues, eliminating wholesale markup. Piano-box buggies ranged from $20 to about $47. Nicer phaetons and better coaches ranged from $50 to $90. Amesbury's average wholesale price was $100-$150.



The mid-west had large factories making both carriages and carriage-making machinery.

Studebaker Vehicle Factory Complex – 1890

Studebaker's carriage and wagon factory in South Bend, Indiana occupied 23 acres. Three major smokestacks indicate large steam engines, while at least 3 smaller chimneys could be lesser engines. This plant manufactured around 15,000 vehicles per year. The plant was larger than all of Amesbury downtown carriage factories combined.



Such factories recovered after the 1890s depression, which is part of why Amesbury carriage making did not.

Appendix

The impact of J. R. Huntington and Amesbury carriage making, as demonstrated by responses in Merrimac business practices.
(for the data inclined)

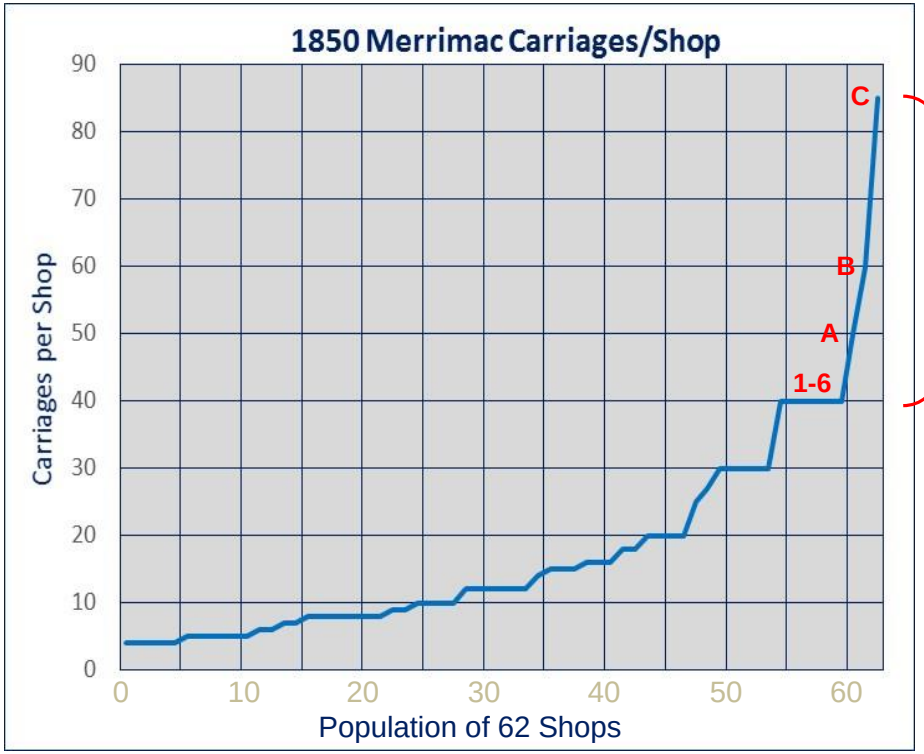
It was seen on page 12 that 1850 Merrimac makers enjoyed the luxury of higher market demand for carriages than there was supply, which allowed a myriad of small producers to readily sell their wares. Many of the 62 shops were small family operations making no more than 4-5 carriages per year. The result was a lot of casual variation in business practices because this was essentially a non-competitive environment

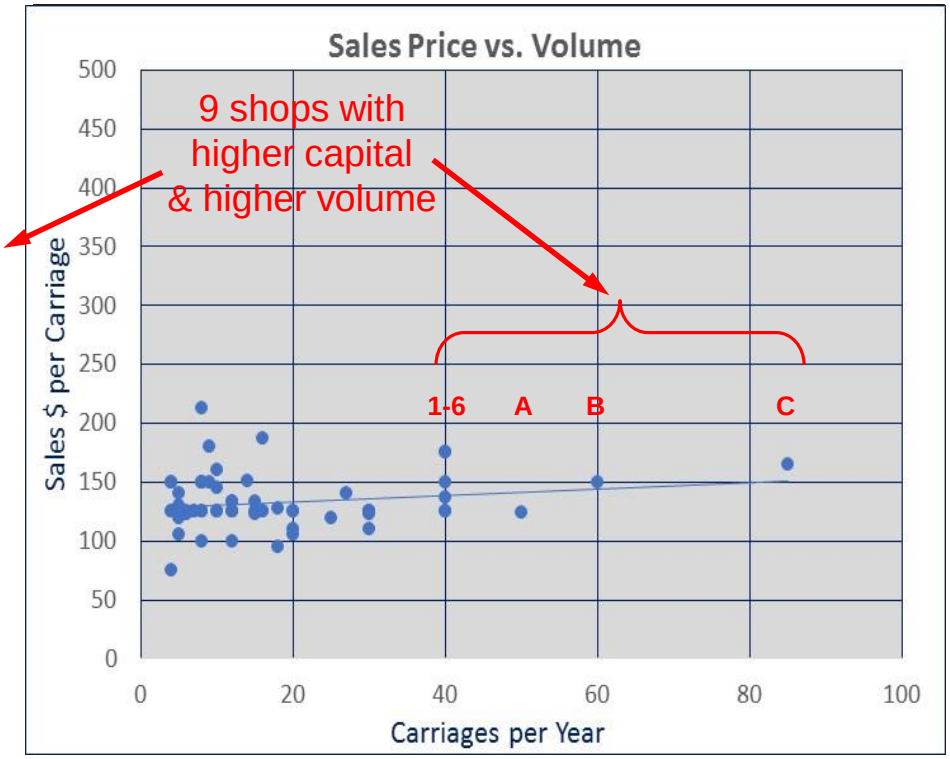
We are accustomed to expect that higher volume will garner economies of scale, in turn allowing a lower sell price. However, that is a characteristic of a competitive market and page 12 data indicates that such was not the case in 1850 Merrimac. The following data expands that latter view and shows how Merrimac in later years was forced toward more rationally disciplined business. Huntington was inspired in 1853 more by the larger overall market opportunity than by specific craft and business practices he observed in Merrimac, although some larger new shops may have presented encouraging results that could be achieved from accessible levels of capitalization.

Merrimac Carriage Shops of 1850

1850 Merrimac shops employed 188 people making 1122 carriages that year. As seen below, most shops were making 30 or fewer carriages per year, many less than 10 and with fewer than 5 employees. In the previous and following data, six numbered points are shops that all reported making 40 carriages per year while the three lettered shops made 50-85 carriages.

The left graph shows 1850 shop output in ascending order, with most shops being of low production. At right, average sell price per shop vs. annual production shows essentially no economy-of-scale. On average, higher volume shops have higher prices rather than lower. This virtually horizontal price data indicates non-competitive behavior where price does not respond to logical manufacturing inputs, as was also seen on page 12. A similar result is obtained with sell price vs. number of employees.



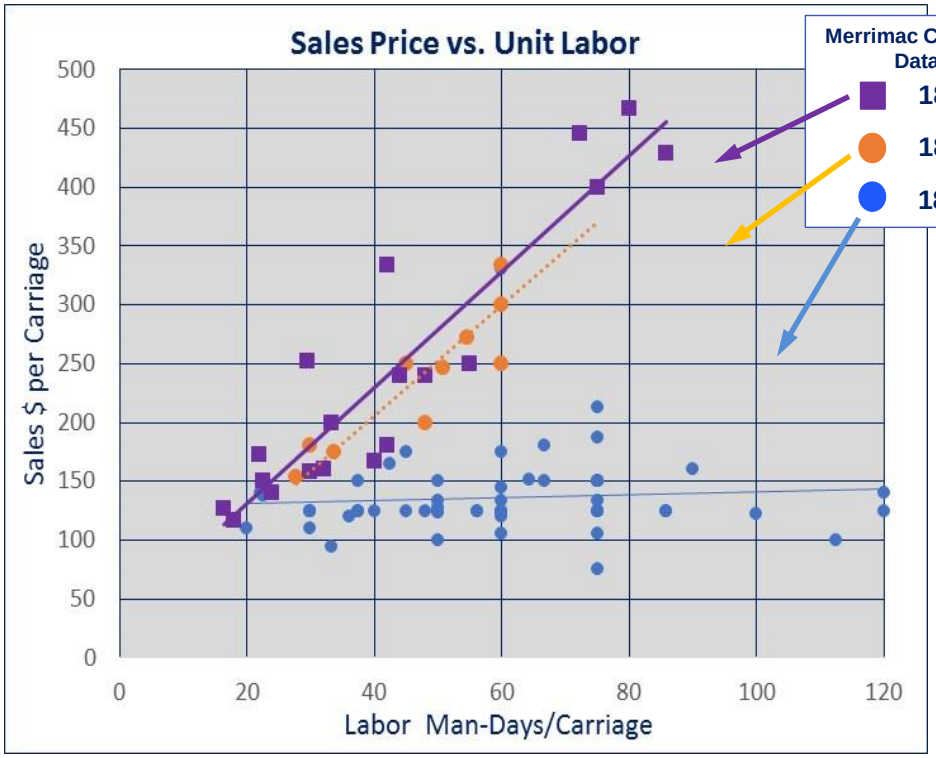


Merrimac Carriage Prices 1880 & 1888, vs. 1850

The left chart below shows sell price vs. labor content per carriage. 1850 data again demonstrates flat non-responsive pricing while 1880 and 1888 data presents a crisp rational competitive pattern: lower labor yields lower price. This is what Huntington's Amesbury business model has created in the local business climate. The general 1888 trendline is higher than in 1880, as Merrimac concentrates on an upper quality niche of finer carriages.

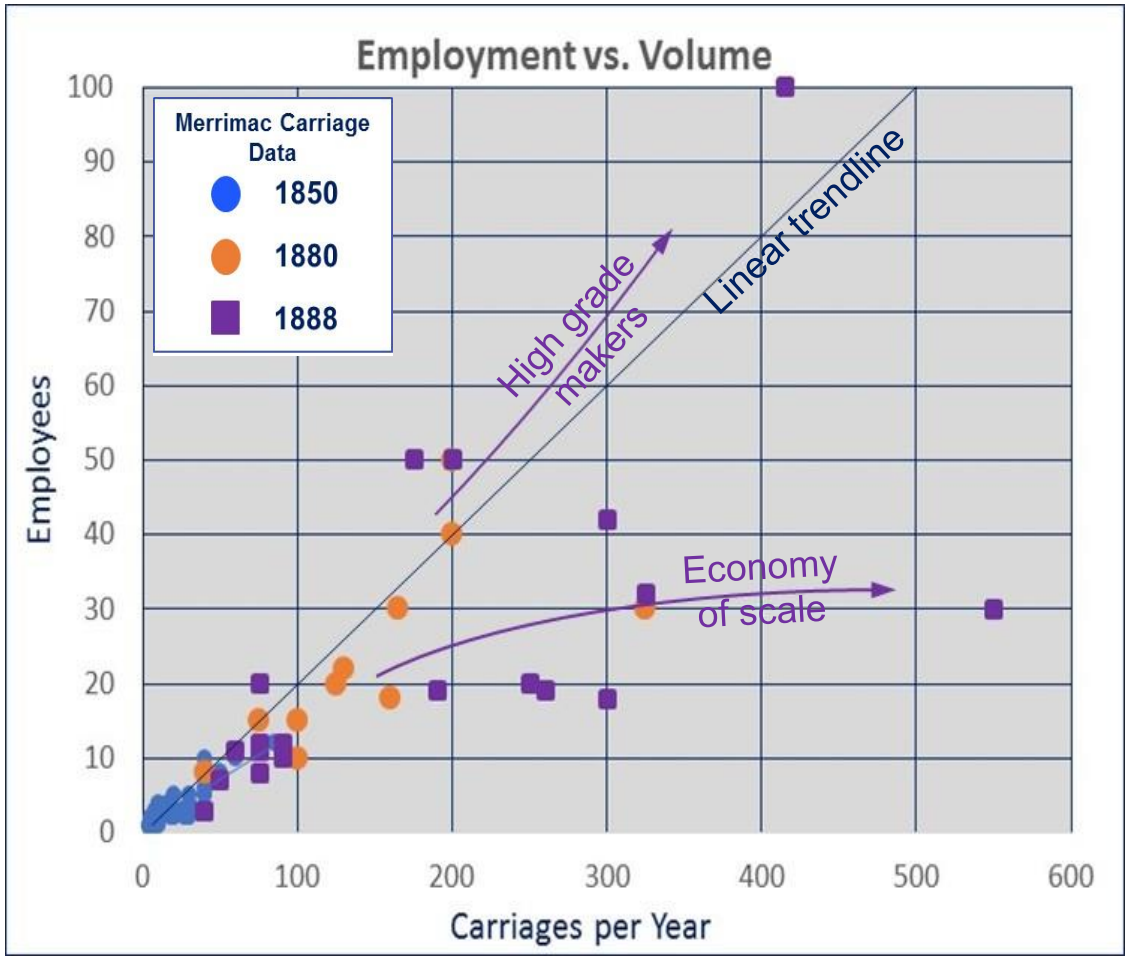
The right chart shows sell price vs. production volume (carriages/year).The 1850 data presents a tight cluster of little discernable trend. 1880 and 1888 data shows the larger volumes produced by light-industrial efficiency, which have separated into non-overlapping strata of carriage grades. A lower group of makers focuses on low-to-moderate cost carriages in high volume while another group is selling high-end carriages at high prices. Price now clearly drops with increasing volume (economy of scale), as expected in a competitive market.

It can be seen how out of character the 1850 data is, compared to later organized business practices.



Another Look at Economy of Scale

The chart below overlays Merrimac employment data from 1850, 1880, and 1888. Data for 1850 and some of the 1880 data projects a linear trend seen with the light blue line, indicating that 20 employees make 100 carriages per year, which simply doubles to 40 employees making 200 carriages. However, economy of scale implies that double the production is possible with fewer than double the employees, even without technology changes. The lower data curve (purple arrow trend), suggested by actual 1880 and 1888 data, shows a trail of high-volume makers that are well below the linear trendline, manufacturing far more production volume than in 1850 without proportionally increasing employment. This is economy of scale.

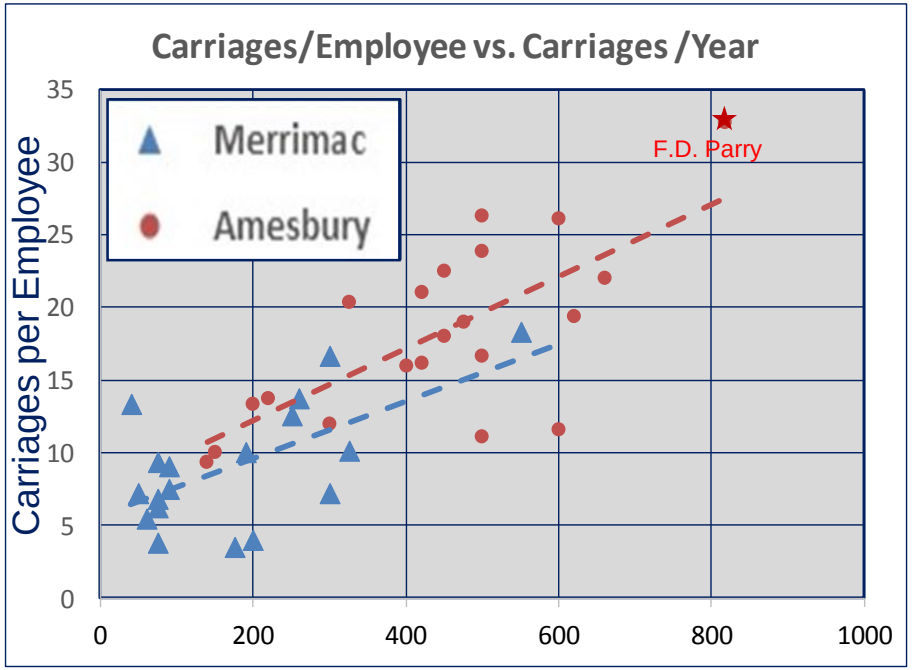


Economy of scale is primarily sub-division of labor and management of shop space to improve efficient use of time. Even with no technology changes workers become more adept at specific tasks and waste less time shifting from one task to another. Less-skilled employees can perform “roughing out” work, while skilled workers focus on details.

Another curve, above the trendline, shows rising numbers of employees for several shops, which might be viewed as anti-economy-of-scale. These shops are moving into higher-grade and more elaborate carriages, at notably higher prices. They fit a rational pattern of price vs. labor content, where increased labor is adding increased value.

Price & Productivity – Scaling up Carriage Production

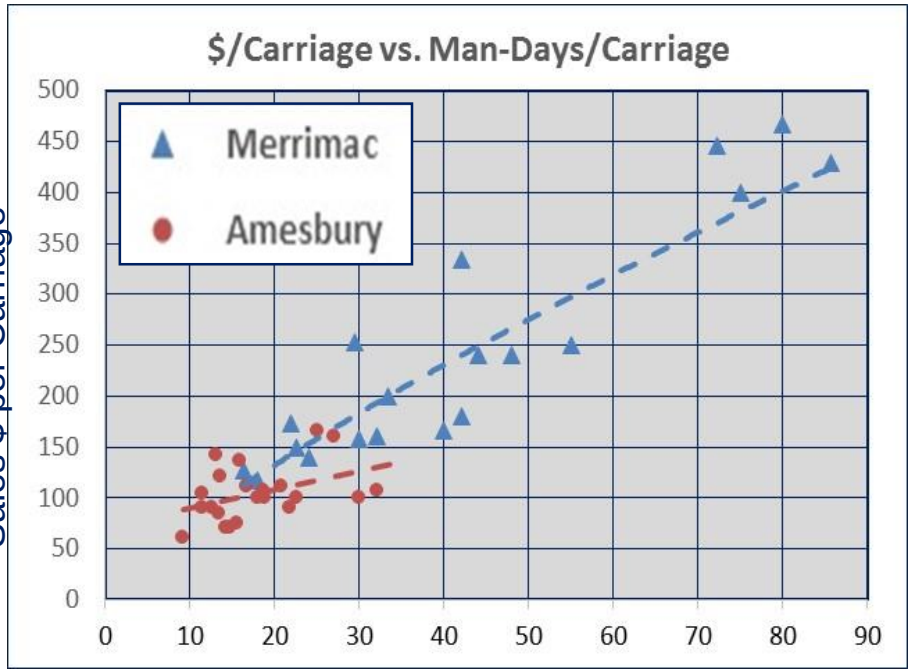
Merrimac 1888 & Amesbury 1880 carriage data



Based on later 1889 manufacturers' data, eleven Amesbury shops were making 1000 or more carriages per year during the ca. 1890 peak production period.

Data for Local carriage shops:

As production-oriented shops expand and use rationalized methods to maximize use of worker-time and factory-space, they produce increasing numbers of carriage per employee. This is facilitated by larger factories, having more room to accommodate larger staff, many different simultaneous operations, and numerous carriages in process.



Data for Local carriage shops:

Amesbury makers are using convenient carriage styles and labor efficiency to reduce labor hours per carriage, and thus sell at lower prices than in Merrimac