

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)
Ballard & Millbury Streets
Worcester
Worcester County
Massachusetts

HAER MA-134
HAER MA-134

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
NORTHEAST REGIONAL OFFICE
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

WASHBURN & MOEN MANUFACTURING COMPANY, QUINSIGAMOND IRON & WIRE WORKS (Washburn & Moen Manufacturing Company, South Works)

HAER No. MA-134

Location: Hurley Square (Intersection of Millbury and Ballard Streets)
Worcester
Worcester County
Massachusetts

UTM Coordinates: A. 19.269101.4679751
B. 19.269336.4679659
C. 19.269210.4679556
D. 19.269081.4679737

USGS Quadrangle: Worcester South, Massachusetts

Date(s) of Construction: 1878-1910

Engineer: Unknown

Architect: Unknown

Present Owner: Various

Present Use: Vacant

Significance: The Quinsigamond Iron & Wire Works (South Works) complex of the Washburn & Moen Manufacturing Company was a major facility of Worcester's largest industry in the late nineteenth and early twentieth century. Washburn & Moen, which manufactured wire of many different types, was the largest producer of barbed wire in the nation and was thus instrumental in the settlement of the American West. The three buildings remaining from the Quinsigamond complex represent types of densely-placed industrial buildings constructed for specific manufacturing functions in the wire production process.

Project Information: This documentation was undertaken as a mitigation measure in compliance with the 1994 Memorandum of Agreement between the Massachusetts State Historic Preservation Office and the Federal Highway Administration in connection with the construction of the Route 146/ Massachusetts Turnpike Interchange Project. This documentation was prepared between 1995-2000 by:

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Description of Complex

The *Washburn & Moen Manufacturing Company*, one of Worcester's most prominent industries during the nineteenth century, had three plants in that city: the Worcester Wire Works (later, I. Washburn & Moen Wire Works), or North Works established in 1834 on Grove Street, the Central Works off Sherman Street in South Worcester established in 1840, and the Quinsigamond Iron & Wire Works (sometimes abbreviated to Quinsigamond Works), or South Works established in 1846 in South Worcester. The latter is the subject of this report.

Three buildings located in Worcester's Hurley Square are all that remain of Washburn and Moen's Quinsigamond Iron & Wire Works complex which, by the late nineteenth century, extended all the way from the northern intersection of Millbury and Ballard Streets to their southern intersection. Hurley Square is a heavily trafficked intersection that abuts the Blackstone River and the active Providence & Worcester Railroad right-of-way, and incorporates a section of State Route 146 which runs from Worcester south through Millbury to Rhode Island.

The two-story brick Wire Rope Building and the one-story brick Barbed Wire Building and the Galvanizing House are located on irregularly shaped sites created by the intersection of streets, railroad tracks and the Blackstone River. These three buildings were located at the extreme northern extent of the former South Works complex. The northernmost and largest of the three is the two-story Wire Rope Building at 760 Millbury Street. Built between 1886 and 1892, with additions through 1910, it sits on a triangular parcel between the main line of the Providence & Worcester Railroad and an active spur line. The building's southern end is close to the Blackstone River. The Galvanizing House at 753 Millbury Street, constructed between 1886 and 1892 with later alterations, occupies a constricted site bounded by the Blackstone River on the south, Millbury Street to the southwest and the active railroad spur line to the northeast. The Galvanizing House is connected to the main Quinsigamond Works manufacturing area by a railroad bridge. The southernmost structure of the three is the surviving portion of the Barbed Wire Building at 10 Ballard Street. Constructed between 1886 and 1892, this was originally a long, two-story, five-section building. It had been substantially altered before the three southernmost sections of the building were destroyed by a fire in the mid-1980s. The Barbed Wire Building is adjacent to the same active railroad spur line as the two other remaining buildings. Nearby, to the west, is the Blackstone River.

The remainder of the extensive site once occupied by Washburn & Moen's Quinsigamond complex now contains open land, an extensive metals recycling operation, and recently built industrial and storage buildings. The railroad spur line that runs along the northeast side of the Wire Rope Building and of the Galvanizing House, and along the southwest side of the

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Barbed Wire Building still services the metals recycling company which occupies 23 acres of the former Quinsigamond Iron & Wire Works site.

Evolution of Site

The first industrial use to occupy the Quinsigamond site was Isaiah Thomas's water powered, two-vat, paper mill established in 1794 on the headwaters of the Blackstone River just below the confluence of the Middle River and Mill Brook at Quinsigamond Falls (present-day Hurley Square) where Thomas constructed his dam (Pierce and Andrews 1795). Thomas sold the paper mill to Caleb and Elijah Burbank in 1798. A second mill, erected by Gardner Burbank *ca.* 1811 just south of the paper mill as a sickle factory, was soon incorporated into the paper production plant (PAL Survey 1991:10; Butler and Stebbins 1831). The original Thomas mill building burned in 1827, but the lower paper mill building continued in use, housing the dominant industrial activity here until 1846. In that year, Ichabod and Charles Washburn purchased the *ca.* 1811 mill building and water rights, including the mill pond (which was actually in the Middle River) and the dam at Quinsigamond Falls. Today, the pond, dam and river remain in their early nineteenth century configuration. In the refitted paper mill, *I. & C. Washburn, Wire Manufacturers* established an iron rod rolling mill, the first such mill in Worcester, to supply the wire mills at their North and Central Works. The rolling mill, with cousin Henry S. Washburn as manager, was located along the just-opened Providence & Worcester Railroad (1847) (Nutt 1918:1107; Stone 1930:1653).

The Blackstone Canal, completed in 1828, connected Worcester and the port of Providence, Rhode Island. A portion of its 45-mile route ran north-south parallel to and west of the future location of Ballard Street and through the large tract of land that Washburn & Moen's Quinsigamond Iron & Wire Works would occupy. Though short lived, the canal was a major transportation improvement, an important engineering accomplishment, and a major factor in the economic and social development of the region. However, plagued by freezing in winter, periods of insufficient water, competition with mill owners for water rights, and a general economic downturn, the canal ceased operation in 1848. It was quickly supplanted by five railroads which had opened in Worcester between 1831 and 1848, linking Worcester to Boston, Providence, Springfield, Nashua, New Hampshire, and New York and creating a regional rail center. When the Washburns purchased the Burbank paper mill in 1846, the Massachusetts section of the Blackstone canal had already closed. As Washburn & Moen's Quinsigamond plant expanded, including segments of both the Blackstone River and the Blackstone Canal within its boundaries, the canal channel was altered many times and filled in for a sequence of industrial uses (PAL Survey 1991:11-12).

The construction of the Providence & Worcester Railroad in 1847 through the Quinsigamond site played an important role in Washburn & Moen's development (PAL Survey 1992:13).

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The railroad generally followed the old Blackstone Canal corridor and was built in part on the canal towpath, sections of which were purchased by the railroad from the canal company. The still-active Providence & Worcester Railroad right-of-way follows the west bank of the Blackstone River through Washburn & Moen's Quinsigamond site north to Quinsigamond Falls where it crosses over just below the dam and continues up the east side of the Middle River into central Worcester. The railroad provided a major supply route for Washburn & Moen's Quinsigamond complex and, over time, a network of spur lines developed within the complex to service individual buildings and processes.

The firm of *I. & C. Washburn, Wire Manufacturers* was dissolved in 1849 when Charles Washburn withdrew from the partnership. Henry S. Washburn remained at the Quinsigamond plant and, in 1850, began manufacturing wire there in addition to operating the iron rod rolling mill. In that same year, the overall firm name changed to *Washburn & Moen* after Philip L. Moen bought a half interest in the company in which he had been a partner with Ichabod Washburn since 1847 (Stone 1930:1667; PAL Survey 1991:15). In 1853, Henry formed a partnership with Charles F. Washburn, Charles' son, and they continued rolling rods and manufacturing wire at the Quinsigamond plant under the firm name of *Henry S. Washburn & Company*. In 1857, when Henry retired, Charles and his son, Charles F., formed the firm of *Charles Washburn & Son* and continued the rolling mill and wire business at Quinsigamond. Throughout, Ichabod Washburn continued to hold a major interest in each of these companies (Stone 1930:1669; Nutt 1919:62).

In 1862, the original rolling mill plant at Quinsigamond (formerly the sickle/paper mill of ca. 1811) was destroyed by fire, but was shortly replaced and enlarged.

In 1865, all of the earlier partnerships were restructured into two corporations: *I. Washburn & Moen Wire Works* and *Quinsigamond Iron & Wire Works*. The latter ran the Quinsigamond plant. In 1868, shortly before the death of Ichabod Washburn, the two corporations were merged into the *Washburn & Moen Manufacturing Company*, with Philip Moen as president.

By 1870, the Quinsigamond complex was comprised of the much-enlarged Quinsigamond Iron and Wire Works building located in the bend of the Blackstone River, along with a machine shop, office, and other smaller buildings. Ballard Street had not yet opened (Beers 1870; PAL Survey 1991:17). In the next few decades as Worcester saw continued industrial

development, new housing construction, an expanding immigrant population, and the growth of newer transportation technologies, the major changes in the character of this area of southern Worcester were due primarily to the expansion of Washburn & Moen's rolling and

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wire mills at the Quinsigamond Works and to the continuation of production at their Central Works, then operating as the *Worcester Wire Works* (PAL Survey 1991:16).

At the Quinsigamond complex, the decades of the 1880s and 1890s were periods of major expansion. During that period, the main Quinsigamond Iron & Wire Works (or Quinsigamond Works) building was further enlarged by various additions. Between 1886 and 1892, a new Wire Rope building was built north of Millbury Street and a Barbed Wire building and a Galvanizing House were also constructed (Hopkins 1886; Sanborn 1892; PAL Survey 1991:17-19). These three buildings, which are located to the north and east of the core Quinsigamond manufacturing area, marked the extreme northern extent of the complex and are the sole remaining buildings constructed by Washburn & Moen at Quinsigamond.

By 1886, the Quinsigamond complex was beginning to spread southward from the original core, and, by 1890, included rolling mills and wire mills with attached annealing room, furnace and galvanizing room, and storage for coils of wire and for scrap iron. New additions south of the main works included a new steel furnace and a large new building housing bar, rod, and billet mills. Other new buildings constructed south of the original rolling mill (as rebuilt in 1867), included a new steel mill and a new rolling mill (between 1886 and 1892) and buildings for the manufacture of springs (1891), insulated wire (1892), and Venetian red and copperas (1897). Meanwhile, spur lines off the Providence and Worcester Railroad were threading through the complex to service individual buildings and manufacturing processes. And portions of the Blackstone River, which ran north-south through the site, were being rerouted and channeled (Hopkins 1886; Sanborn 1892; PAL Survey 1991:19).

By the end of the 19th Century, the Quinsigamond complex had expanded to its southernmost boundary where the sulfate of iron and Venetian red buildings were located. The complex now comprised the main functions of steel production: rolling mills; rod and billet mills; buildings for special treatments including galvanizing, annealing and insulating; buildings for specific products, including wire rope and barbed wire; and the many support functions of a major industrial complex: storage for supplies, shipping departments, traveling cranes and machine and carpentry shops (Sanborn 1910; PAL Survey 1991:19).

In 1899, the *American Steel & Wire Company* purchased the *Washburn & Moen Manufacturing Company*, then Worcester's largest employer. *American Steel & Wire* then merged with the *United States Steel Corporation* in 1901, but maintained its name and continued to conduct business as a separate company. The merger initiated a period of increased specialization and gradual decline during the twentieth century. In 1906, for instance, much of the machinery for making barbed wire was moved to several of the Pennsylvania units of United States Steel in order to make room in Worcester for other wire specialties. In 1922, the Quinsigamond complex looked very much as it had two decades

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earlier (Richards 1922). However, shifts in production began to occur among the three Worcester plants and, in the 1920s and 1930s, large departments were relocated from Worcester to United States Steel plants in the west. In 1927, a new \$2,000,000 billet and wire-rod rolling mill was constructed at Quinsigamond that could turn out steel rods faster than ever before. The new rolling mill and its machinery were designed, built, and installed by the *Morgan Construction Company* whose founder, Charles H. Morgan, was also a general superintendent and director of Washburn & Moen for many years (Nutt 1919:529; Stone 1930:1680-82).

By 1937, the original Quinsigamond Iron & Wire Works building had been demolished, the first major demolition to occur at this site (PAL Survey 1991:27; Sanborn 1937). The remaining portions of the Blackstone Canal channel were filled in almost completely by the mid-twentieth century. In the mid-twentieth century, expansion of the American Steel & Wire plant at the Quinsigamond works concentrated in the area near the southern intersection of Millbury and Ballard Streets. New construction here eliminated the early nineteenth century Perry / Whipple Grist Mill which continued operation until at least 1922 (Richards 1922; PAL Survey 1991:27).

In 1943, American Steel & Wire closed the North Works. Production was concentrated at the newer, more modern Quinsigamond plant. Subsequently, the smaller Central Works was also shut down. Competition from new industrial plants in other regions contributed to industrial decline beginning in the 1950s, although the Quinsigamond plant remained in operation until 1977. The closing of the plant and subsequent demolition of the core of the industrial complex created vacant land, some of which has been used for metals recycling operations. In addition, the southern section has been developed as an industrial park and new “Butler-type” buildings have been constructed. The three remaining Washburn & Moen structures – the Wire Rope Building, Barbed Wire Building, and the Galvanizing House stand at the northern fringe of the former Quinsigamond Iron & Wire Works site of the *Washburn & Moen Manufacturing Company*.

Early History of Wire Production in Area

At the beginning of the nineteenth century, transportation improvements and the emergence of new industries initiated a period of technological development and population growth that changed Worcester from an agricultural town to a major manufacturing center.

Transportation improvements linking Worcester to outlying towns and beyond included the Boston and Worcester Turnpike (1807) and the Holland, Worcester and Stafford Turnpike (1810). Local roads were improved as well. The opening of the Blackstone Canal in 1828 was a major factor in the transformation of Worcester industries and their markets since it

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provided Worcester with a link to the port of Providence, Rhode Island. By the time the canal ceased operation in 1848, five railroads had entered Worcester linking it to cities as far away as New York (PAL Survey 1991:12, 15).

Wire making was one of many small industries that started up in the Worcester area during the early nineteenth century to supply individuals and other manufacturers. Card wire was being drawn in Leicester as early as 1809 and in Spencer, by 1812, two entrepreneurs were experimenting in fine wire drawing. In 1813, a wire factory was in operation in West Boylston. The following year, a wire mill on the Ware River in Barre was advertised for sale and a wire manufactory was being carried on in Phillipston. Some time prior to 1815 a building on Leicester Street in Worcester was being used for wire production and by 1820 the wire drawing business in Spencer was well established (Stone 1930:1660).

Washburn & Moen Companies

The history of the Washburn & Moen companies is a chronicle of innovation, expansion, and interlocking partnerships and corporations.

Ichabod Washburn's aptitude as a machinist and his early experiences working in a cotton factory, as a blacksmith, and as a machinist at the Millbury Armory prepared him for a lifelong career of invention and manufacturing. As early as 1820 he was engaged in the manufacture of lead pipe and of machinery used in the production of woolen goods, in partnership with W. H. Howard whose interest in the business Washburn purchased a year or two later. In 1822, Washburn formed a partnership with Benjamin Goddard whom he had met while working in the Millbury Armory where both were machinists. The demand for woolen machinery was then so great that early in 1823 they gave up making lead pipe to concentrate on the manufacture of machinery for carding and spinning wool at their School Street factory in Worcester. They also experimented in the manufacture of wood screws, visiting *C. Read & Co.* in North Providence, Rhode Island where the three Read brothers were producing wood screws under a patent they owned. Subsequently *Washburn & Goddard* arranged to have *C. Read & Co.* bring their screw manufacturing business to

Worcester by canal boat and install it in a wooden factory on Mill Brook in the Northville section of Worcester (Nutt 1919:20; Stone 1930:1665). Ichabod Washburn's first entry into wire production was in 1831 when he and Goddard disposed of their School Street business and began the manufacture of iron wire for making wood screws and card wire in the mill partly occupied by the Reads in Northville. The wire was produced by *Washburn & Goddard* and the screws by *C. Read & Co.*, a firm in which Washburn had an interest (Stone 1930:1665).

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Little wire was being made in the United States when *Washburn & Goddard* began operation, most being imported from England or Germany (Stone 1930:1663). Washburn's experience in manufacturing lead pipe led him to experiment in drawing out wire from iron rods in a similar manner. Because wire drawing required a great deal of energy, various devices were invented over time to pull the wire. The first wire-drawing machine Ichabod Washburn saw was one of self-acting pincers which drew the wire through the die about a foot, then passed it back and drew it through another foot. With this crude machine a man could draw only about fifty pounds of wire a day. Washburn improved on the machine so as to draw about fifteen feet at each pass. He then invented a drawing block that enabled a man to draw 2,5000 pounds of wire a day. The iron rod coils, cleaned of scale, rust and dirt, were placed on a wire drawing frame where a sharpened end was inserted through a die block hole and attached to the draw reels of the draw block. The wire rod was then pulled through the die block reducing its size and extending its length. Fine wires required several drawings to reach the desired finish gauge. Early in his wire-drawing experience, Ichabod Washburn also adopted an improved process for annealing wire to relieve internal stresses and improve its strength, elasticity, and ductility. Previously, the wire had been annealed by being heated in cast-iron pots and allowed to cool slowly. Washburn's improved process consisted in placing the small coils of wire in double air-tight iron pots (Stone 1930:1667).

Within three years, *Washburn & Goddard* had outgrown the limited waterpower at their Northville location. Accordingly, in 1834, a three-story brick factory was erected for them on Grove Street with waterpower from Mill Brook. Goddard continued drawing coarse wire in the Northville factory, while Washburn transferred the making of card wire and fine wire to the new factory. This was the beginning of what later became Washburn & Moen's North Works. On January 30, 1835, Washburn sold his share in the Northville property to Goddard, who continued making wool machinery there, and the partnership was amicably dissolved (Stone 1930:1665). Later that year, Ichabod's twin brother Charles came from Harrison, Maine where he had been practicing law to join his brother in the Grove Street wire business in a partnership that lasted until 1838.

In 1840, Ichabod Washburn, under the name *Ichabod Washburn, Wire Manufacturer*, bought the water power and property at a location off Sherman Street in South Worcester that later became Washburn & Moen's Central Works (PAL Survey 1991:15.) The Sherman Street mill, with his former partner Benjamin Goddard as superintendent, produced card wire to be finished at the Grove Street plant, as well as coarser wire for machinery and telegraph purposes. Thus, from early on, products of one plant were transferred to another for further processing.

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In 1842, Charles Washburn again became a partner in his brother's wire business, their firm name being *I. & C. Washburn, Wire Manufacturers*. This partnership continued until 1849. In the meantime, the wire drawing block invented by Ichabod Washburn had wrought a revolution in wire making so their business prospered.

From 1837 to 1847 all of the 12-foot by 1-1/8 inch iron billets used by Ichabod Washburn for making wire were purchased in Sweden. Washburn engaged a distant cousin, Henry S. Washburn, who lived in Boston, to go to the Custom House there to accept the shipments. Before the Washburns could use the iron for making wire, the billets had to be rolled into rods at plants in Fall River, Massachusetts, Troy, New York, or Windsor Locks, Connecticut, these being the plants closest to Worcester that were equipped to do the work (Stone 1930:1666). The rods were then shipped to the Washburns' facility. In 1845, Ichabod Washburn proposed that his cousin move to Worcester to supervise the construction and operation of a mill for rolling the iron rods needed for their wire making. With such a mill in operation, *I. & C. Washburn, Wire Manufacturers* would no longer have the expense of depending on rolling mills elsewhere. Ichabod agreed to back Henry financially, accepting as compensation the economic advantage of securing wire rods at cost from a local source. By the terms of their contract, the rods were to be sold to Ichabod at actual cost while Henry's profit was to depend on the outside sale of whatever surplus rods remained. Henry agreed to this proposal. Accordingly, in 1846, *I. & C. Washburn* bought the Burbank paper mill property at Quinsigamond Falls in order to refit it into an iron rod rolling mill. Soon after, the *Quinsigamond Iron & Wire Works*, Henry S. Washburn, Proprietor, came into being. This was the first such mill in Worcester and enabled the Washburns to supply their wire mills at the North (Grove Street) and Central (Sherman Street) Works. Swedish bars were rolled into rods at the Quinsigamond plant then the rods were further reduced at the South Worcester plant before going to the Grove Street plant to be drawn into wire. The new rolling mill, located along the just-opened Providence & Worcester Railroad (1847), became the nucleus of Washburn & Moen's South Works.

The firm of *I. & C. Washburn, Wire Manufacturers* was dissolved in 1849 when Charles Washburn withdrew from the partnership. The company name became *I. Washburn & Company*. In 1853, Henry S. Washburn formed a partnership with Charles F. Washburn, Charles' son, and they continued rolling rods and manufacturing wire at the Quinsigamond Works under the firm name of *Henry S. Washburn & Company*. In 1857, when Henry retired, Charles and his son, Charles F., formed the firm of *Charles Washburn & Son* and continued the rolling mill and wire business at the Quinsigamond Works. Ichabod Washburn continued to hold a major interest in all of these companies. During that period, most of the common market wire manufactured at the Quinsigamond plant came from scrap iron piled on eighteen by eight inch boards, heated to welding heat, and rolled into rods. The equipment for the production of wire rods consisted of three furnaces; a large train of two rolls in which the pile

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of heated scrap was rolled to 1 1/8th inch, 100 pound billets; and a small train of rolls three high, by which these billets were rolled into 3-1/2 by 4, Stubs gauge, wire rods (Stone 1930:1669; Nutt 1919:62).

Philip L. Moen of New York married Ichabod Washburn's daughter in 1846, moving the following year to Worcester to join Washburn as a partner in the rolling mill enterprise at the Quinsigamond site (Stone 1930:1667). The rolling mill firm was called *Washburn & Moen*, then *Washburn, Moen & Company* when brother Charles shortly thereafter became a silent partner. In 1850, the same year that Henry S. Washburn added wire manufacturing to the rolling mill operation at the Quinsigamond site, Moen bought a half interest in *I. Washburn & Company*. Moen assumed the financial part of the business while Ichabod Washburn oversaw the manufacturing (Nutt 1919:29; Stone 1930:1667; PAL Survey 1991:15).

Much of Washburn & Moen's success over time derived from the company's ability to respond to demands for new wire products, based on Ichabod Washburn's abilities as an inventor and entrepreneur. Early uses for wire included wood screws, carding equipment for wool production, and machinery of all sorts. In 1847, the telegraph passed from the experimental to the practical stage and lines were being erected throughout the country. The Quinsigamond Works was initially established to provide the wire rods for telegraph wire. Ichabod Washburn, began to produce steel telegraph wire that was not galvanized, but painted or boiled in oil to prevent oxidation (Stone 1930:1666).

In 1850, at the request of Jonas Chickering of Boston, Ichabod Washburn also turned his attention to the production of steel piano wire, which until then had been monopolized by English manufacturers. Experiments conducted by Washburn in 1856 led to his patent for a continuous process for hardening and tempering steel wire during the drawing process. As a result, Washburn & Moen was for many years the only manufacturer in the country of wire for musical instruments of all kinds (Nutt 1919:61; Stone 1930:1667).

Washburn & Moen also supplied at least 50 percent of the country's crinoline petticoat wire during the 1860s, with a maximum output of 1,500 tons annually (Stone 1930:1670). Again, the continuous hardening and tempering process invented and patented by Ichabod Washburn made the development of this wire possible, starting in about 1859. His process also made it feasible to temper a cheaper grade of cast steel, reducing the cost of the strong, flexible hoops in the crinoline petticoats used beneath fashionable ladies' "hoop" skirts (PAL Survey 1991:15). In a related enterprise, Ichabod Washburn and his partners, in 1863, built a cotton mill at the Grove Street (North Works) plant which they operated for about ten years to produce yarns sufficient to cover four tons of crinoline wire daily (Nutt 1919:61). In 1856, in yet another reorganization, the Grove Street (North Works) plant had been designated the

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Worcester Wire Works, Ichabod Washburn & Company – Ichabod Washburn and Philip L. Moen, Proprietors (Stone 1930:1669).

Ichabod Washburn's inventive skills in developing the first successful American wire sizing gauge (1849), the first continuous wire tempering process (1850), and the introduction of an English invention for continuous annealing, cleaning, and galvanizing (1860), were major contributions to the firm's success and to the wire making industry. Washburn also introduced improved processes for the manufacture of card wire by which Swedish steel bars, 1 –1/4 inches square, were rolled at the Quinsigamond Works into wire rods of a little less than one-quarter inch in diameter. The rods were then sent to the North and Central Works to be drawn to the necessary sizes (Stone 1930:1668). In July, 1859, the Washburn & Moen works altogether employed 120 men and produced three tons of wire a day (Nutt 1919:61; Stone 1930; Ceccacci and Pfeiffer 1979; PAL Survey 1991:15).

A fire in 1862 totally destroyed the original Quinsigamond rolling mill (formerly the ca. 1811 sickle/paper mill) of *Charles Washburn & Son*, which for a time put a strain on manufacturing operations at the North Works (then called the *Worcester Wire Works*) on Grove Street and on the Central Works on Sherman Street. The rolling mill was soon replaced and enlarged, however.

In 1865, earlier partnerships were restructured into two corporations: *I. Washburn & Moen Wire Works* (the former *Worcester Wire Works* [North Works]) and *Quinsigamond Iron & Wire Works* [South Works]. Philip L. Moen became president, William E. Rice, treasurer and general manager, and Charles F. Washburn, secretary of the latter corporation which succeeded the firm of Charles Washburn & Son.

An increasing demand for wire in long lengths for the rapidly expanding telegraph system and for other uses could not be met by wire rods weighing thirty pounds or less which was what was available to American wire producers. Therefore, in 1867, Ichabod Washburn commissioned William Rice to visit George Bedson in England. Bedson had invented, patented and was installing a continuous rolling mill which, together with a Siemens gas furnace, could roll 75 to 150 pound billets into iron rods of smaller gauge and greater length than was previously possible. Based upon Rice's largely favorable report, Washburn sought to patent and install such a mill in the United States. However, subsequent investigation revealed that patents for substantially the same equipment had already been obtained in France by Joseph S. Levis (1854) and in the United States by Henry B. Comer (1859). Washburn acquired both patents. The *Quinsigamond Iron & Wire Works*, under Rice's management, was then developing rapidly and appeared to Rice and other officers of the company to be the logical location for the Bedson mill. Washburn, apparently intent on maintaining the prestige of his North Works on Grove Street, wanted the new mill installed

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there. Rice then made a surprise proposal to surrender his interest in the *I. Washburn & Moen Wire Works* and to organize a new company to purchase and operate a Bedson mill near New York City. Ichabod Washburn countered with a proposal that included a merging of the *I. Washburn & Moen Wire Works* and the *Quinsigamond Iron & Wire Works* into the *Washburn & Moen Manufacturing Company* and the siting of the Bedson mill at the North Works on Grove Street. This was agreed to, with the merger finalized in February, 1868. Ichabod Washburn was chosen president, Philip L. Moen, vice-president, William E. Rice, treasurer, Charles F. Washburn, secretary, and Charles H. Morgan, superintendent. Ichabod Washburn died in December of 1868 and, in deference to his wishes the Bedson continuous wire rod rolling mill was installed at the North Works in 1869. Henry Comer, one of the original patent holders, was engaged to come to Worcester and operate the new equipment. (Stone 1930:1671; PAL Survey 1991:19).

In 1870, William Rice traveled to Sweden and negotiated for a supply of softer grade iron and steel in order to successfully operate the Siemens furnace and the Bedson continuous rolling mill. Washburn & Moen thus became the first American company to import this type of iron and steel from Sweden (Stone 1930:1672).

The *Washburn & Moen Manufacturing Company's* best known product became barbed wire. Beginning in 1867, the U. S. Patent Office granted over 350 patents for wire fencing with points or projecting barbs. In 1873, Joseph F. Glidden of De Kalb, Illinois was the first to invent and patent a barbed wire in the form seen in use today. In 1874, he sold a one-half interest in the patent to Isaac L. Ellwood and they built a factory in De Kalb to manufacture the product. Charles F. Washburn, then vice-president and secretary of Washburn & Moen, saw the potential and necessity for his company's entrance into the barbed wire field to solve the problem of fencing for America's farmers. In 1876, he visited factories in Illinois where he witnessed the production of barbed wire. In De Kalb, Washburn negotiated the purchase by Washburn & Moen of Glidden's one-half interest in the patents and assets of Glidden and Ellwood's *Barb Fence Company*. Once this transaction was complete, Glidden retired and Washburn and Ellwood formed the firm of *I. L. Ellwood & Company* to succeed the *Barb Fence Company*. The De Kalb factory was enlarged and the western market for barbed wire was assigned to it, while the eastern and southern trade was to be supplied from Worcester by the *Washburn & Moen Manufacturing Company*. The first barbed wire machinery was installed at the North Works (Stone 1930:1676). *I. L. Ellwood & Company* and Washburn & Moen then went about acquiring other barbed wire patents until they established a practical monopoly of the barbed wire business in the United States. In 1877 they extended their patent protection to England and the European continent (Stone 1930:1676). The Barbed Wire Building, part of which still stands at Quinsigamond site, was constructed sometime between 1886 and 1892.

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Despite early skepticism on the part of hardware dealers, farmers, free range grazers and a public concerned about the injuries to livestock resulting from its use, barbed wire soon became a commodity much in demand, being strong, durable, cheap, easily transported, and totally practical for its intended purpose. Patent infringers appeared, seeking to establish cases of prior use and insisting that there was no invention in arming a wire with pricking spurs. Thousands of pages of testimony were taken. In December 1880, the United States Circuit Court for the Northern District of Illinois sustained Washburn & Moen's patents and gave the *Washburn & Moen Manufacturing Company* and its associate, *I. L. Ellwood & Company*, control of the barbed wire business (Stone 1930:1676). Washburn & Moen issued licenses to most of those infringing on their patents and purchased upwards of 250 additional patents for barbed wire and barbed wire machinery in order to protect the company's interests and those of their licensees (Stone 1930:1676-1677).

The refusal of certain inventors and manufacturers of barbed wire either to sell patent rights, or to acknowledge the supremacy of Washburn & Moen and *I. L. Ellwood & Company*, and the determined persistence of those inventors and manufacturers in the claimed right to independent manufacture and sale, resulted in the appearance on the market throughout the Midwest and Southwest of quantities of so-called moonshine wire. On February 29, 1892, after a lengthy struggle in the Federal courts marked by findings and reversals in original and appellate tribunals, the United States Supreme Court rendered a final decision establishing the claim of Washburn & Moen and Ellwood over all competitors (Stone 1930:1677). The adoption of Bessemer steel by Washburn & Moen in 1876 created a revolution in the wire business as it substituted a stronger and cheaper wire than could be made from Swedish iron. And coming as it did at the beginning of barbed wire (and wire nail) production, it saved American farmers a great deal of money (Stone 1930:1672). Previously, wire breakage had been a constant problem, no matter how sophisticated wire drawing machinery became. The crude and varied mixtures of ingredients put into the crucibles, and poor control of heat, air, and water resulted in metals of inconsistent quality. The traditional method of producing steel was by stirring and puddling the molten iron by hand to bring impurities to the top for skimming. The process developed by British engineer Sir Henry Bessemer (1813-1898), with substantial contributions by several American engineers, forced a blast of air into the bottom of the converter to float the impurities to the top of the molten iron. This proved far faster than the traditional puddling process and produced a much better quality of steel. The first Bessemer process plant in the United States was erected in 1867.

The quantity of barbed wire used in the United States increased from five tons in 1874 to a probable output of 150,000 tons (over 850,000 miles) by 1888. Of this amount, the *Washburn & Moen Manufacturing Company* made about 18,000 tons (over 100,000 miles) during that period. The introduction of automatic machinery during that time decreased the cost of

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barbed wire from 18 cents per pound to less than 5 cents. The importance of the production of barbed wire, and wire nails, to Washburn & Moen is evident from the fact that, in 1875, the firm employed 700 hands at the Worcester plants. In 1880, the total reached 2,100 operatives and, by 1889, 3,000 (Stone 1930:1678).

Copper wire for telephone, telegraph and electrical purposes became an important product of Washburn & Moen beginning in about 1884 after the company developed a process for hard-drawing the wire to increase its strength. Copper had always been preferred to iron for its greater conductivity but had previously lacked the requisite strength.

Among the other wire products introduced by Washburn & Moen in the last decades of the nineteenth century were galvanized steel wire cable for suspension bridges; phosphor-bronze and copper wire rope; transmission and standing rope; galvanized wire seizing (a binding or lashing for marine use); hoisting rope; tiller rope; switch rope; copper, iron and tinned sash cord wire; clothesline and picture cord wire; galvanized iron wire rope for ship rigging; galvanized crucible cast-steel wire rope for yacht rigging; wire rope for cable railways; insulated wire; wire ties for hay bales; and fine and heavy springs for a variety of uses. By 1889, the company was producing 418 different kinds of wire with an output of 245 tons a day (Stone 1930:1678-1679).

The steadily increasing demand in the west for various kinds of wire and wire products led Washburn & Moen, in 1890-91, to open a \$2.5 million steel plant in Waukegan, Illinois. This was designed and its construction supervised by Fred Harris Daniels, General Superintendent of all of Washburn & Moen's plants (Stone 1930:1679).

At the Quinsigamond Works, in 1891, Washburn & Moen built a factory for the manufacture of springs of every description, which was followed, in 1892, by a factory for the manufacture of all types of insulated wire for electrical purposes and cables insulated with paper or rubber, lead encased, or steel armored for aerial, underground or submarine uses in connection with incandescent lighting or transmission of power. During the early 1890s, the company also began to manufacture copper rail bonds for bonding electric railroad rails (Stone 1930:1679). Upon the death of Philip L. Moen, in April, 1891, William E. Rice became president of Washburn & Moen, holding that position until 1899 when the *American Steel & Wire Company* purchased the Worcester units of the *Washburn & Moen Manufacturing Company*, then Worcester's largest employer. The following year, the *American Steel & Wire Company* merged with the *United States Steel Corporation*, but maintained its name and continued to conduct business as a separate organization. The merger initiated a period of increased specialization and gradual decline during the twentieth century. In 1906, to make room for other wire specialties, much of the machinery for making barbed wire was moved to several of the Pennsylvania units of United States Steel. Other

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shifts in production began to occur among the three Worcester plants and, in the 1920s and 1930s large departments were relocated from Worcester to United States Steel plants in the west. In 1927, a new, \$2,000,000 billet and wire-rod rolling mill was constructed at the Quinsigamond Works that could turn out steel rods faster than ever before. The new rolling mill and its machinery were designed, built, and installed by the *Morgan Construction Company* whose founder, Charles H. Morgan, was also a general superintendent and director of Washburn & Moen for many years (Nutt 1919:529; Stone 1930:1680-82).

In 1943, the American Steel & Wire Company, an independent company of the United States Steel Corporation, closed the North Works. The company then concentrated production at the newer, more modern Quinsigamond plant and subsequently shut down the smaller Central Works. Competition from new industrial plants in other regions contributed to industrial decline beginning in the 1950s, although the Quinsigamond plant, or South Works, operated until 1977. The closing of the plant and subsequent demolition of the core of the industrial complex created vacant land, some of which has been used for metals recycling. In addition, the southern most section of the site has been developed as an industrial park where new “Butler-type” buildings have been constructed. The three remaining Washburn & Moen structures – the Wire Rope Building, the Galvanizing House, and the remains of the Barbed Wire Building stand at the northern fringe of the former *Washburn & Moen Manufacturing Company*’s Quinsigamond Iron & Wire Works site.

Individuals Associated with Quinsigamond Iron & Wire Works

Ichabod Washburn (1798-1868), inventor, industrialist and philanthropist, was the founder and creative genius behind the vast enterprise that became the Washburn & Moen Manufacturing Company.

Ichabod Washburn was born in Kingston, Massachusetts. His father, a sea captain, died when Washburn was an infant, leaving the family in straightened circumstances. At the age of nine, Ichabod went to work with a chaise and harness maker in Duxbury, where he stayed for five years while attending school during the winter term. Successively, he worked in a cotton mill in Kingston, as a blacksmith’s apprentice in Leicester and Auburn, as journeyman blacksmith in Millbury, as a machinist at the Millbury Armory, and then found employment with a machinery manufacturer in Worcester, gaining a knowledge of forging and of finishing all kinds of machinery.

Ichabod Washburn was a Deacon of the Union Congregational Church and bequeathed much of his fortune to educational, religious, and charitable institutions in Worcester as well as elsewhere in the country. These included the Worcester County Free Institute for Industrial Science (now the Worcester Polytechnic Institute or WPI), of which he was an active trustee,

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and Lincoln (now Washburn) College in Topeka, Kansas. His bequest founded Memorial Hospital in Worcester, established by an act of the Legislature in 1871 and endowed with 450 shares of *Washburn & Moen Manufacturing Company* stock. He was a founder as well of the Mission Chapel and the Home for Aged Women, both in Worcester. He contributed \$25,000 toward the construction of Worcester Mechanics Hall and was a promoter of the Bay State House, being of the belief that Worcester should have a good hotel. Washburn's desire to promote practical experience for students led him to build a model manufacturing facility, the Washburn Shops, on WPI's campus to augment classroom learning (National Encyclopedia of American Biography 1892-1929: 448; Nutt 1919:60-61; Stone 1930:1664).

Charles Washburn (1798-1875), Ichabod's twin brother and early business partner, graduated from Brown University in 1820 after which he was admitted to the bar. He practiced law in Harrison, Maine and served in the Maine Legislature (1830-1833) before coming to Worcester in 1835 to join his brother in the wire manufacturing business. In addition to his continued involvement as a director active in the management of the wire business, Charles Washburn served on the Worcester School Committee, on the Worcester Common Council, and as a State Representative.

Charles F. Washburn (1827-1893), Charles Washburn's son, began his business career in the Washburn rolling mill at the Quinsigamond Works. After the consolidation of earlier partnerships and corporations into the *Washburn & Moen Manufacturing Company*, he became secretary and director, later a vice-president. It was upon his urgent advice that the corporation interested itself in the manufacture of barbed wire. He believed that the introduction of the product would not only solve the fencing problem of western farmers but of agriculturists in all sections of the country. His outstanding service to Washburn & Moen was his successful conduct of the negotiations and the establishment of the company's policy relating to barbed wire, as well as his skillful care of company interests during the famous legal controversies over the barbed wire patent rights (Stone 1930:1665,1677).

In addition to his work for Washburn & Moen, Charles F. Washburn served on the Worcester Common Council, as vice-president of Memorial Hospital, and as president of the Home for Aged Women (Nutt 1919:62).

Henry S. Washburn (1813-1903), manufacturer, legislator and public official. When Ichabod and Charles Washburn started their plant for rolling iron rods at the Quinsigamond site; Henry, a cousin was brought in as proprietor. He continued to manage the Quinsigamond plant for eleven years, first as proprietor and later as business partner. After retiring from the Quinsigamond Works in 1857, he continued in the wire business elsewhere in Worcester until he moved back to Boston in 1862. There he served as a member of the school board for seventeen years and as a member of the State legislature for four

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years, two terms in the House of Representatives and two terms in the Senate. Henry S. Washburn achieved national fame for his contribution to Civil War memorabilia when, in 1861, he composed and published his long-famous song, "The Vacant Chair" (Stone 1930:1669).

Philip L. Moen (1824-1890), manufacturer, partner of Ichabod Washburn, and vice-president, president and treasurer of the *Washburn & Moen Manufacturing Company*. Moen acquired his business education in his father's hardware store in New York City. In 1846, he married Ichabod Washburn's daughter, moving to Worcester the following year to become a partner in *I. Washburn & Co.* In 1850, the firm name was changed to *Washburn & Moen* after Moen bought a half interest in the rolling mill business. He assumed the financial part of the business while Ichabod Washburn oversaw the manufacturing in a partnership that endured through several reorganizations until Ichabod Washburn's death in 1868. Moen then succeeded him as president of the *Washburn & Moen Manufacturing Company*. In 1875, Moen became company treasurer as well (Nutt 1919:29; Stone 1930:1667).

Philip L. Moen was also a director and trustee of several banks and life insurance companies; first president of the board of trustees of the Memorial Hospital, founded by provisions of Ichabod Washburn's will; a trustee and treasurer of the Worcester Polytechnic Institute; trustee of the Home for Aged Women; a director of the Worcester Public Library; Worcester School Committee member; and president of the board of trustees of the YMCA (Nutt 1919:29-30; National Cyclopaedia of American Biography 205).

William Ellis Rice (1833-1919), served as president and treasurer of the *Washburn & Moen Manufacturing Company*. Rice was first employed by Ichabod Washburn as bookkeeper and general clerk from 1852 until 1859 when he formed *William E. Rice & Company* in partnership with Dorrance Goddard, son of Benjamin Goddard, to manufacture wire first in Windsor Locks, Connecticut and then in Holyoke. After this partnership dissolved in 1865, Ichabod Washburn purchased the wire-drawing equipment Rice owned and moved it to Worcester. Rice then became treasurer and general manager of the *Quinsigamond Iron & Wire Works* (Stone 1930:1671). When the *Quinsigamond Iron & Wire Works* and the *I. Washburn & Moen Company* merged, in 1868, into the *Washburn & Moen Manufacturing Company* Rice became treasurer of the new corporation. He became president in 1891 after the death of Philip L. Moen, retiring when Washburn & Moen was purchased by the *American Steel and Wire Company* in 1899 (Stone 1930:1671).

Charles H. Morgan (1831-1911) worked in a number of industries before he came to Worcester in 1864 to work as a general superintendent for Washburn & Moen, a position he held for twenty-three years. He was also a director of the corporation for eleven years. During that time he designed the first hydraulic elevator in New England. In the course of his

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work, Morgan made many trips to Europe to study steel and wire mills in England, Belgium, Germany, France and Sweden. He also designed improvements in wire manufacturing methods and machinery.

A manufacturer in his own right, he established the *Morgan Spring Company* in 1881 and the *Morgan Construction Company* in 1888. The latter manufactured rolling mill, wire drawing and hydraulic machinery. Morgan oversaw the completion of the Washburn Shops at Worcester Polytechnic Institute after Ichabod Washburn's death.

Fred Harris Daniels (1853-1913), an inventor and mechanical and chemical engineer, was head of the combined drafting room and chemical laboratory of the *Washburn & Moen Manufacturing Company*, as well as Superintendent of Buildings for the company, and General Superintendent of all the Washburn & Moen plants. Daniels was educated in Worcester public schools and at the Worcester Polytechnic Institute. After graduating in

1873 he entered the employ of Washburn & Moen, for which he had previously done important work designing hydraulic elevators. One of his first tasks was to make drawings for changes to the Siemens furnace under the direction of Charles H. Morgan. He also worked in the company's machine shop. As he was particularly interested in research and felt the need for further training, he spent a year studying chemistry at Lafayette College. Upon his return to Worcester he equipped a combined drafting room and chemical laboratory for testing metals for Washburn & Moen. He was given charge of this new department with the title of mechanical and chemical engineer.

In 1877, Daniels went to Europe with Charles Morgan to study advanced methods in the manufacture of iron and steel. Daniels was so impressed by the results obtained in the open-hearth steel works and rod mills in Sweden that he arranged to remain for some months as a workman in the Bofors Iron and Steel Works. His experience resulted in new designs for improved steel making machinery and equipment. In 1879, Daniels was promoted to the position of Superintendent of Buildings for Washburn & Moen. Eight years later he became Assistant General Superintendent, and in 1889 General Superintendent of all the Washburn & Moen plants. He also designed and supervised the construction of a \$2.5 million steel plant at Waukegan, Illinois for Washburn & Moen in 1890-91.

Daniels then went to San Francisco where he established the Halide Works, later the California Wire Works of the American Steel and Wire Company. When the latter acquired Washburn & Moen in 1899, Daniels was made Chief Engineer over the thirty plants of American Steel and Wire and succeeded Philip W. Moen (Philip L.'s son) as a director of the company. In 1901, after the *American Steel and Wire Company* merged with the *United*

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States Steel Corporation, Daniels was appointed Chairman of the Board of Engineers in charge of 143 plants in addition to his position as chief engineer.

Daniels was also a consulting engineer to several steel companies, designing and constructing steel plants in San Francisco, Cleveland, and Birmingham, and held over 150 patents related to iron and steel manufacture. In 1894, for instance, he designed copper rail bonds for electric railways, giving Washburn & Moen a monopoly on that product. Another of his inventions won a gold medal at the 1900 Paris exposition. He was a trustee of the Worcester Polytechnic Institute and director of other local institutions and civic groups. (National Cyclopedia of American Biography 306-307; Nutt 1919:86-87)

Social Development and Ethnic History

The factory workers at Washburn & Moen's Central Works and Quinsigamond Iron & Wire Works (South Works) were predominantly Yankee and Irish in the first three-quarters of the nineteenth century (Estus 1989). In the latter part of the nineteenth century, Swedes began to form a significant part of the Washburn and Moen work force and by 1915, nearly a quarter of the workers at the Quinsigamond plant were Swedish (Ceccecci and Pfeiffer 1979).

The first Swedish immigrants arrived in Worcester in 1868, and by 1895, they had become the second largest immigrant group in the city (PAL 1991:26). The initial settlement coincided with a severe famine in Sweden, which triggered a major surge of emigration to the United States. By the end of the major Swedish migration in 1920, Worcester had become one of the two most important centers of Swedish settlement in the eastern United States (Thernstrom 1980:972-974).

The 1868 date was somewhat early for Swedes to be seeking an urban destination in this country. Until the 1890s most Swedish immigrants were rural dwellers who settled in the homestead areas of the Midwest. However, some inhabitants of Sweden's iron mining areas came to American manufacturing centers. Like most immigrants, the Swedes tended to settle in places about which they already knew something, or where they already had friends or relatives. And Worcester was already known in Sweden to those involved in one of that country's leading businesses – iron mining and manufacturing. Washburn and Moen's contacts with Sweden began in its first decade of existence and continued to strengthen as the company grew. From 1837 to 1847 all of the iron billets used by Washburn and Moen for making wire and rods were purchased in Sweden (Stone 1930:1666). In the late 1850s, Ichabod Washburn introduced improved processes for the manufacture of card wire, using Swedish steel bars 1 1/4 inch square (Stone 1930:1668). In 1870, William E. Rice, then the company treasurer, visited Sweden to negotiate for a supply of steel and iron in the softer grades for the Siemens furnace and the Bedson continuous rolling mill, making Washburn

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and Moen the first company in the United States to import the softer grades of iron and steel from Sweden (Stone 1930:1672). In 1882, Philip Moen's son was sent to Sweden for two years to study the Swedish mining and iron industry and to recruit workers (PAL 1992:26).

Yankee and Irish workers lived in "The Island" along Millbury and Cambridge Streets and in Quinsigamond Village (PAL 1992:16). Swedish immigrants to Worcester at the end of the nineteenth century settled primarily in three neighborhoods: Greendale, associated with the Norton Co. ceramic and abrasive wheel manufacturers; Belmont Hill, associated with Washburn and Moen's North Works; and Quinsigamond Village, associated with the South Works. A smaller number lived in the Vernon Hill area, across Millbury Street from the South Works (Estus 1989).

Quinsigamond Village seems to have been the most self-contained of the Swedish settlements, in part because of its geographical and topographical isolation (PAL 1992:26). By 1875, there was significant Swedish settlement in the Quinsigamond Village area. By 1880, Swedes made up 25% of the Village population of 829 individuals; by 1900, they comprised 79% of an expanded total of 2,786 persons (Estus 1989). By 1900 Quinsigamond Village contained a cohesive Swedish speaking community, and many of its institutions served the entire Swedish population of the city. The first Swedish Cooperative Store was established at 26 Greenwood Street in 1883 and soon formed the heart of a small enclave of privately owned stores. The first Swedish Methodist Episcopal Church, the first Swedish church in Worcester, was formed in 1878, and by 1900 there were no fewer than four Swedish churches in Quinsigamond Village. These included the Swedish Methodist Episcopal Church and the Quinsigamond Baptist Church on Stebbins Street, and the Emmanuel Lutheran Church and the Second Swedish Congregational Church on Greenwood Street (PAL 1991:27).

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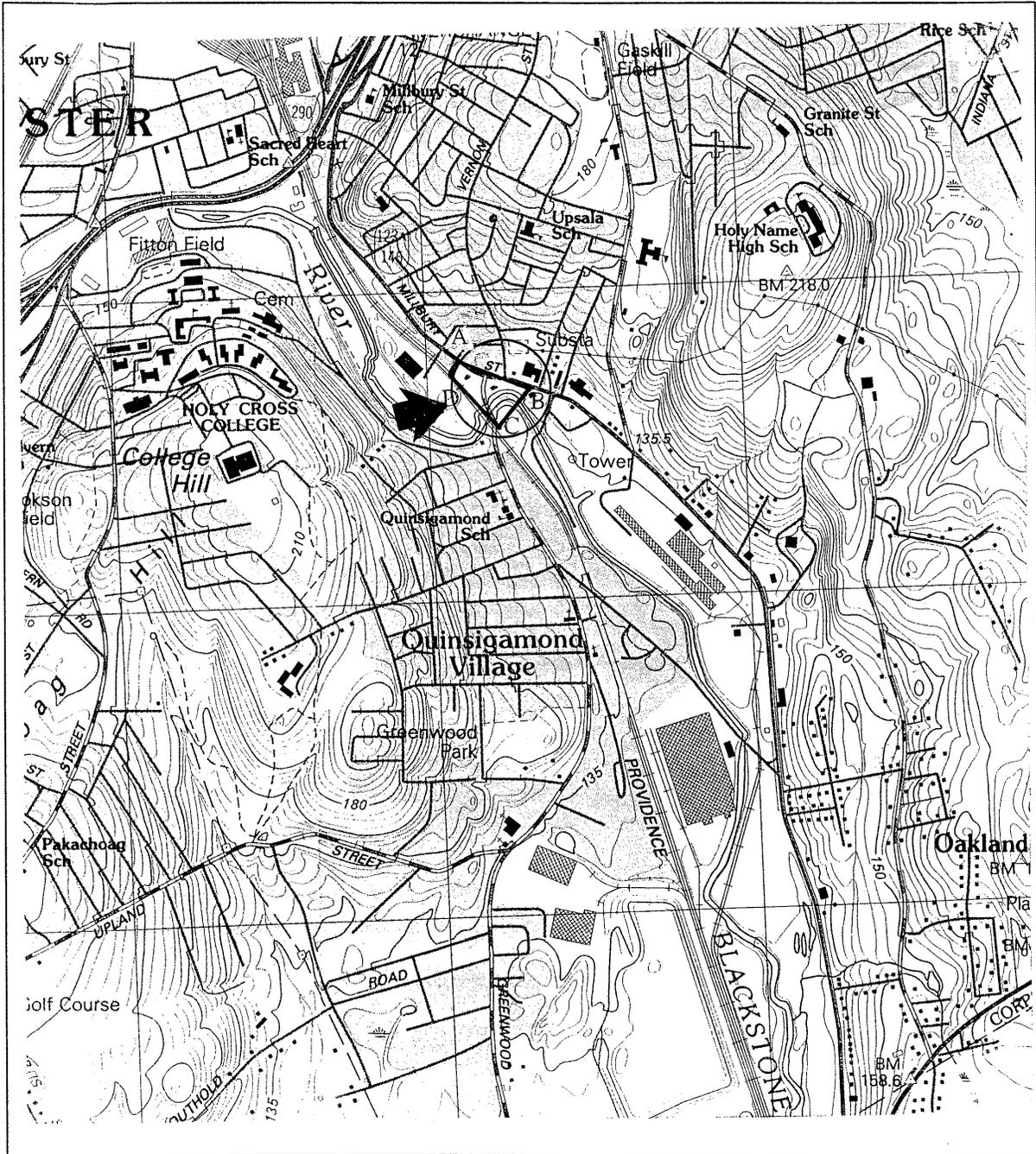
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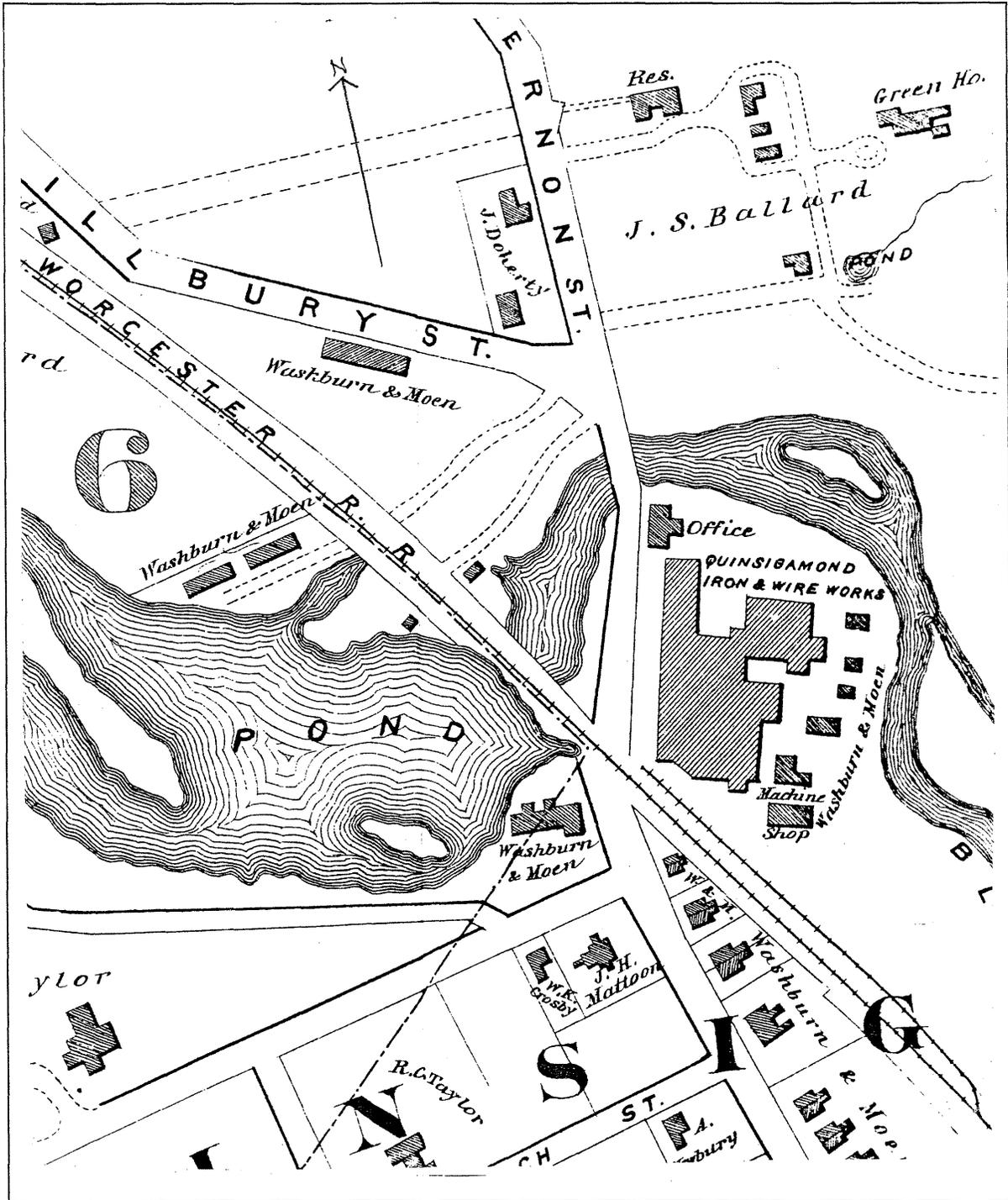
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[USGS Quad: Worcester South, Massachusetts, 1983]

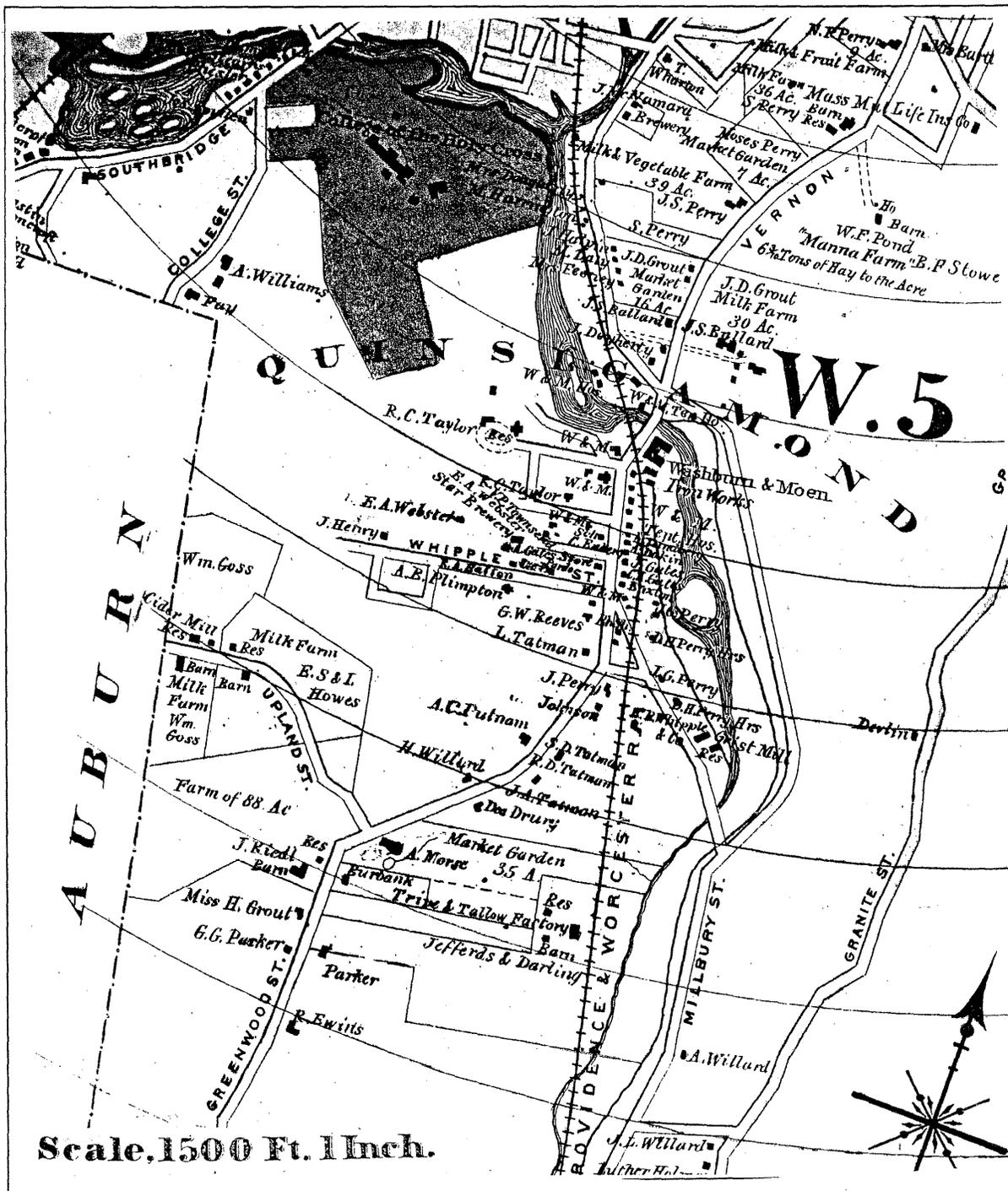
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F. W. Beers, *Atlas of the City of Worcester, Massachusetts*, 1870

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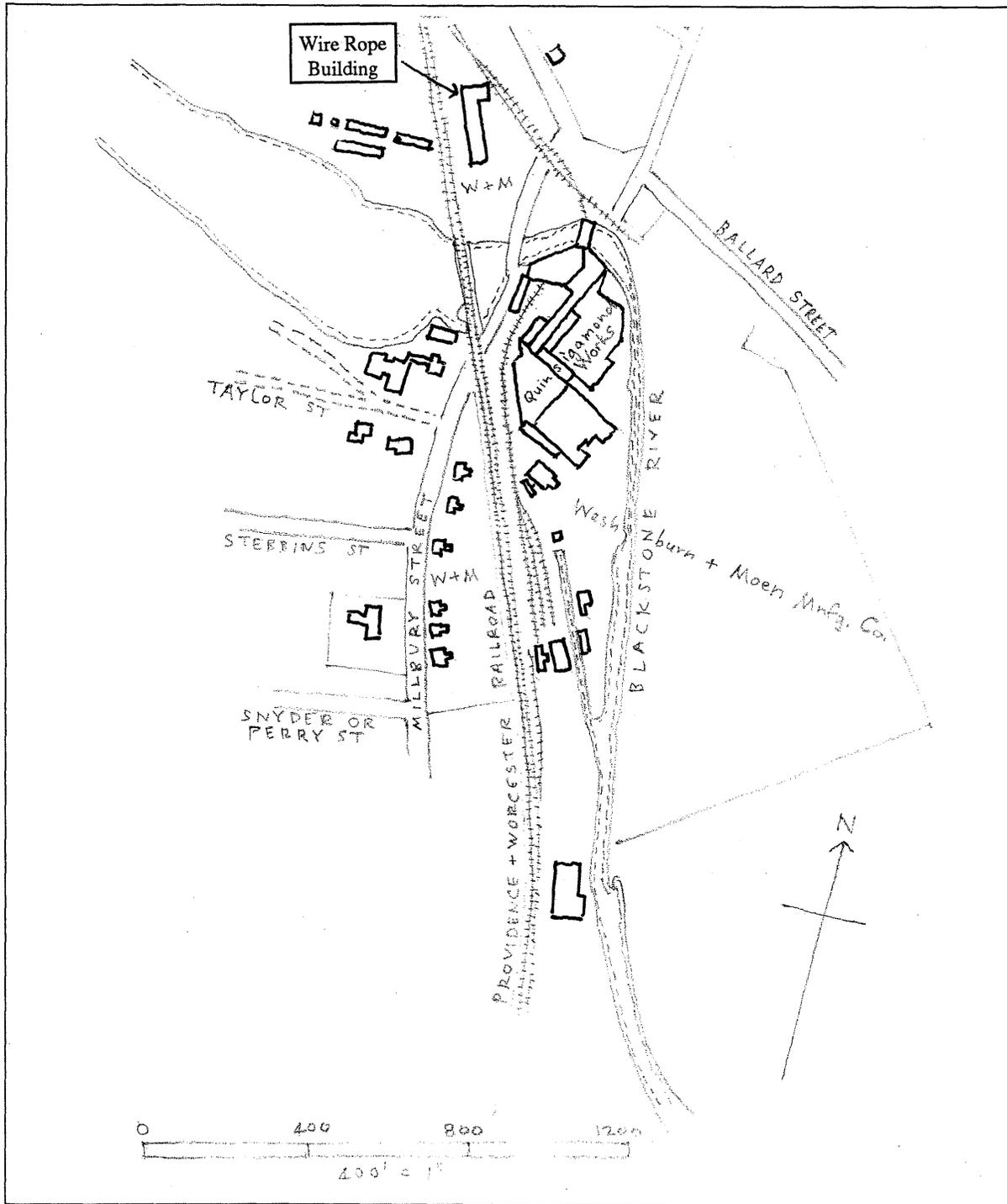


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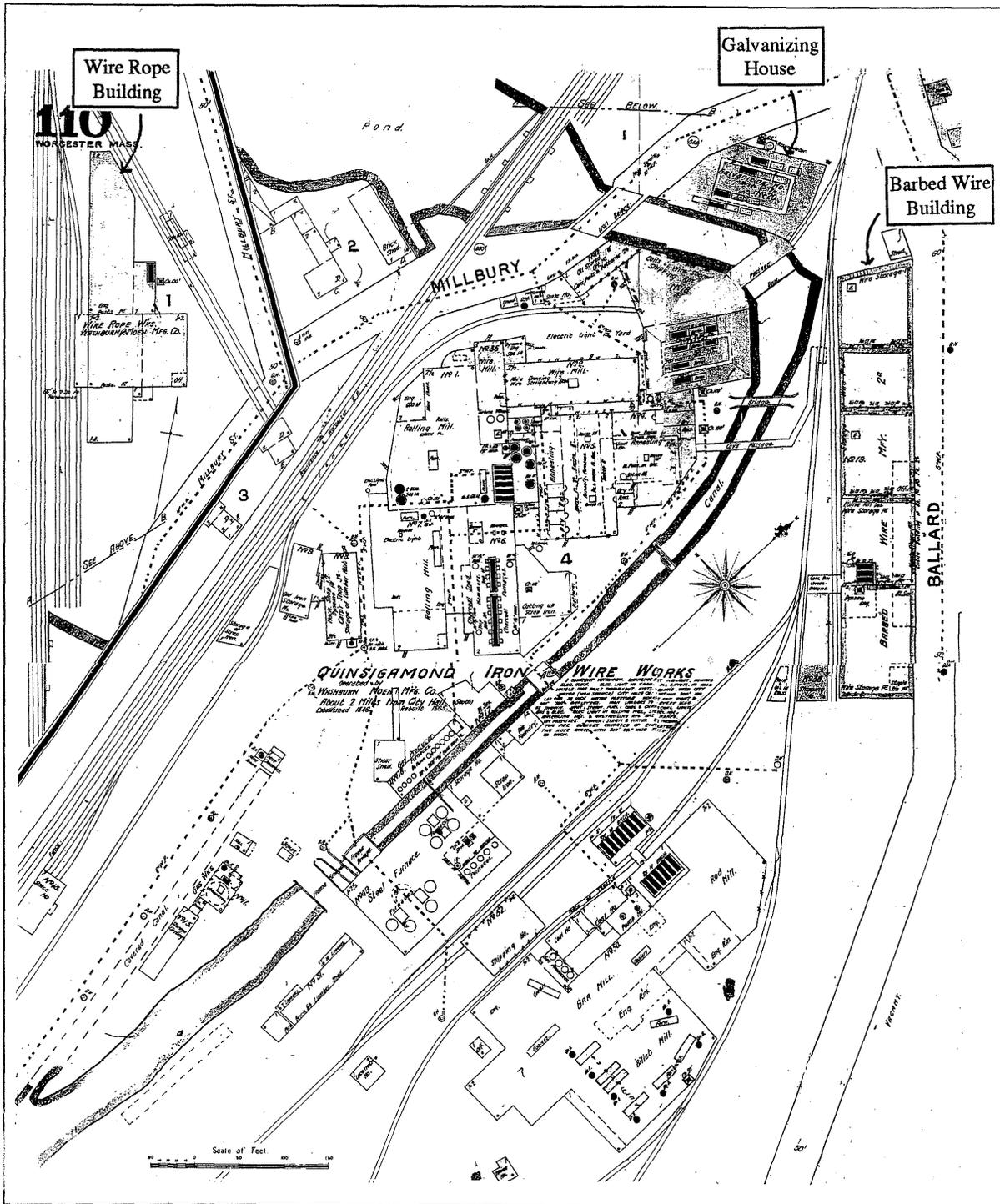
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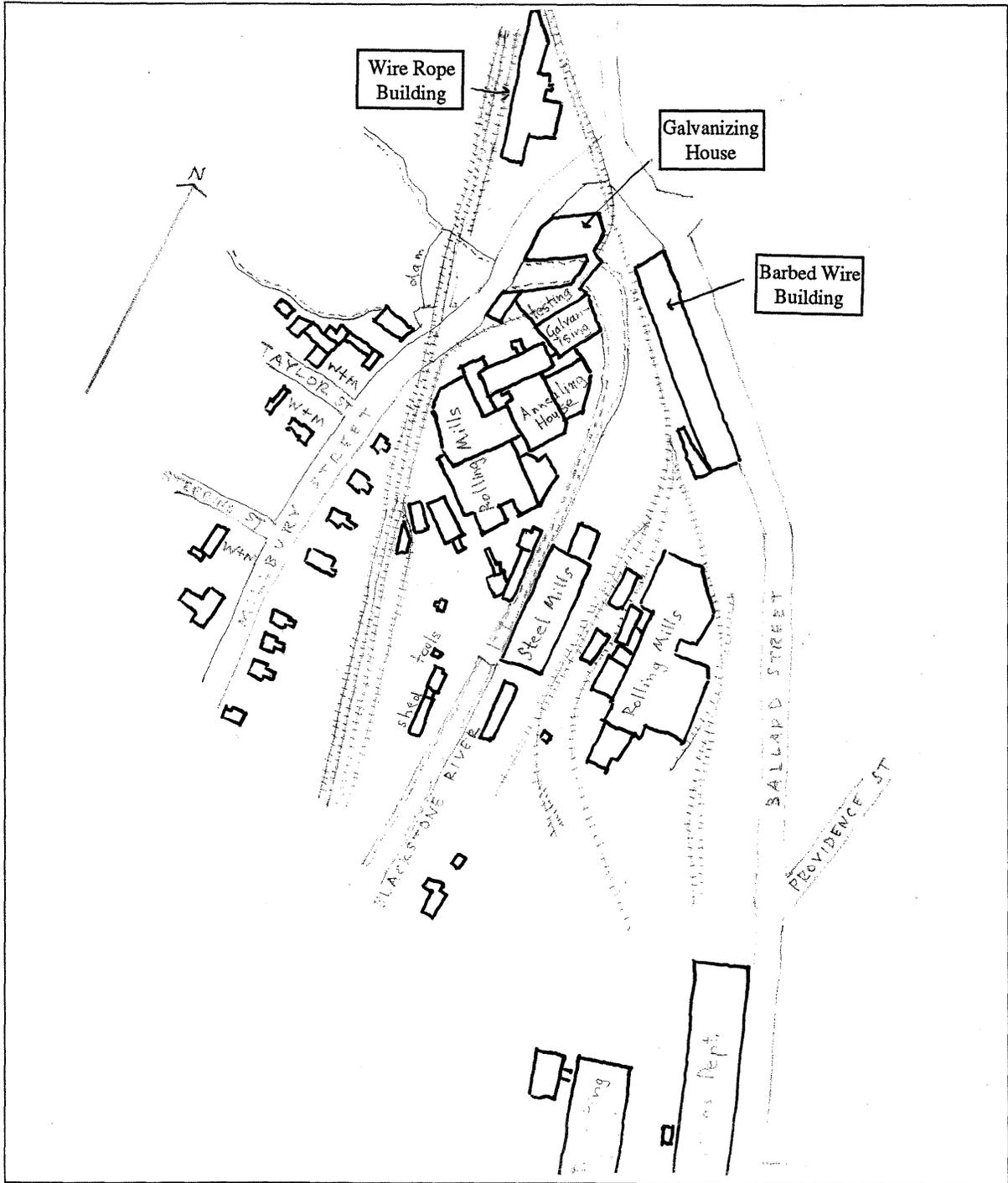
G. M. Hopkins, *Atlas of the City of Worcester, Massachusetts*, 1886

WASHBURN & MOEN MANUFACTURING COMPANY,
 QUINSIGAMOND IRON & WIRE WORKS
 (Washburn & Moen Manufacturing Company, South Works)
 HAER No. MA-134
 (page 28)



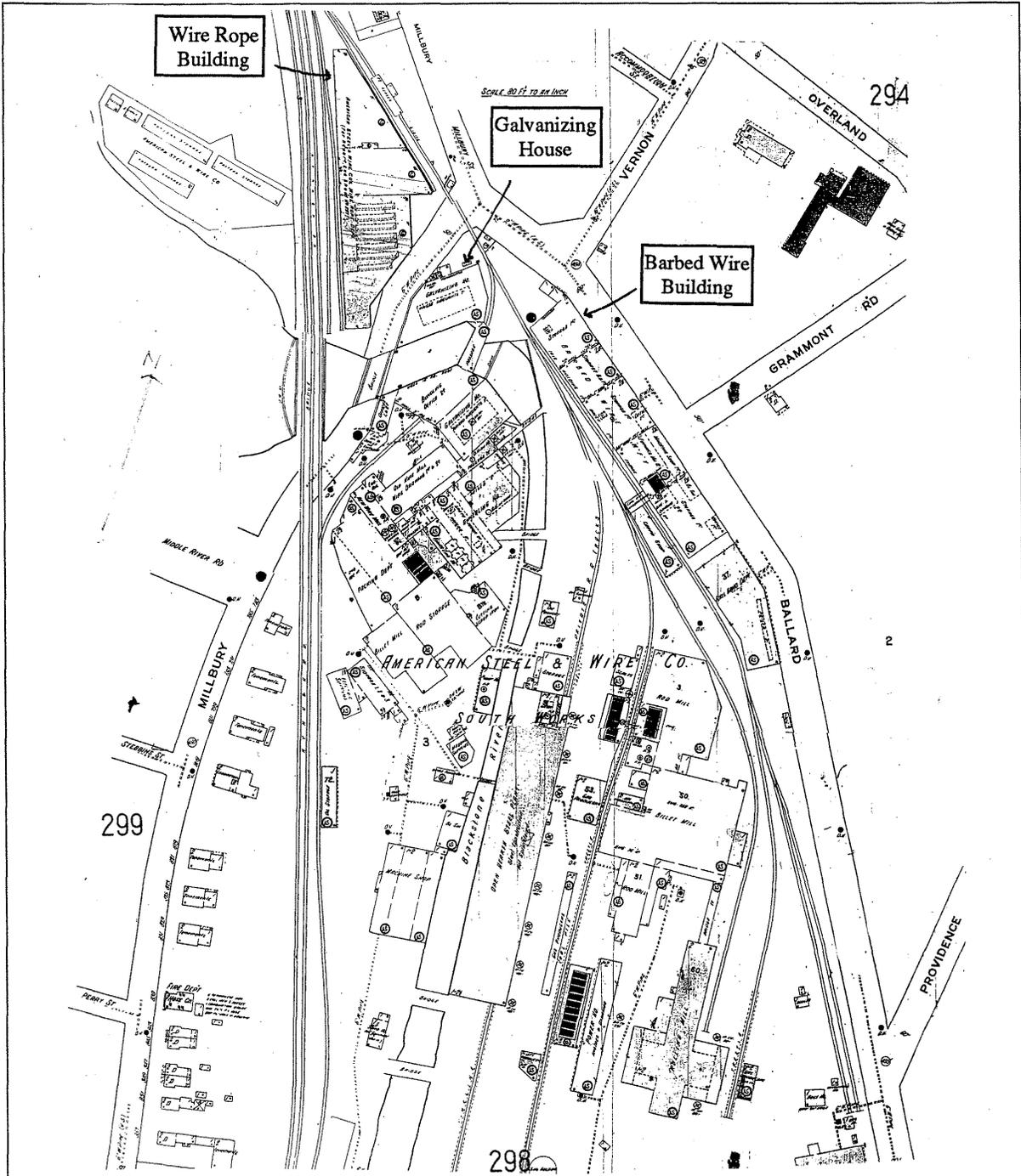
Sanborn Perris Map Co., Insurance Maps of Worcester, Massachusetts, 1892

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)
HAER No. MA-134
(page 29)



L. J. Richards, *Atlas of the City of Worcester, Massachusetts, 1896*

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)
HAER No. MA-134
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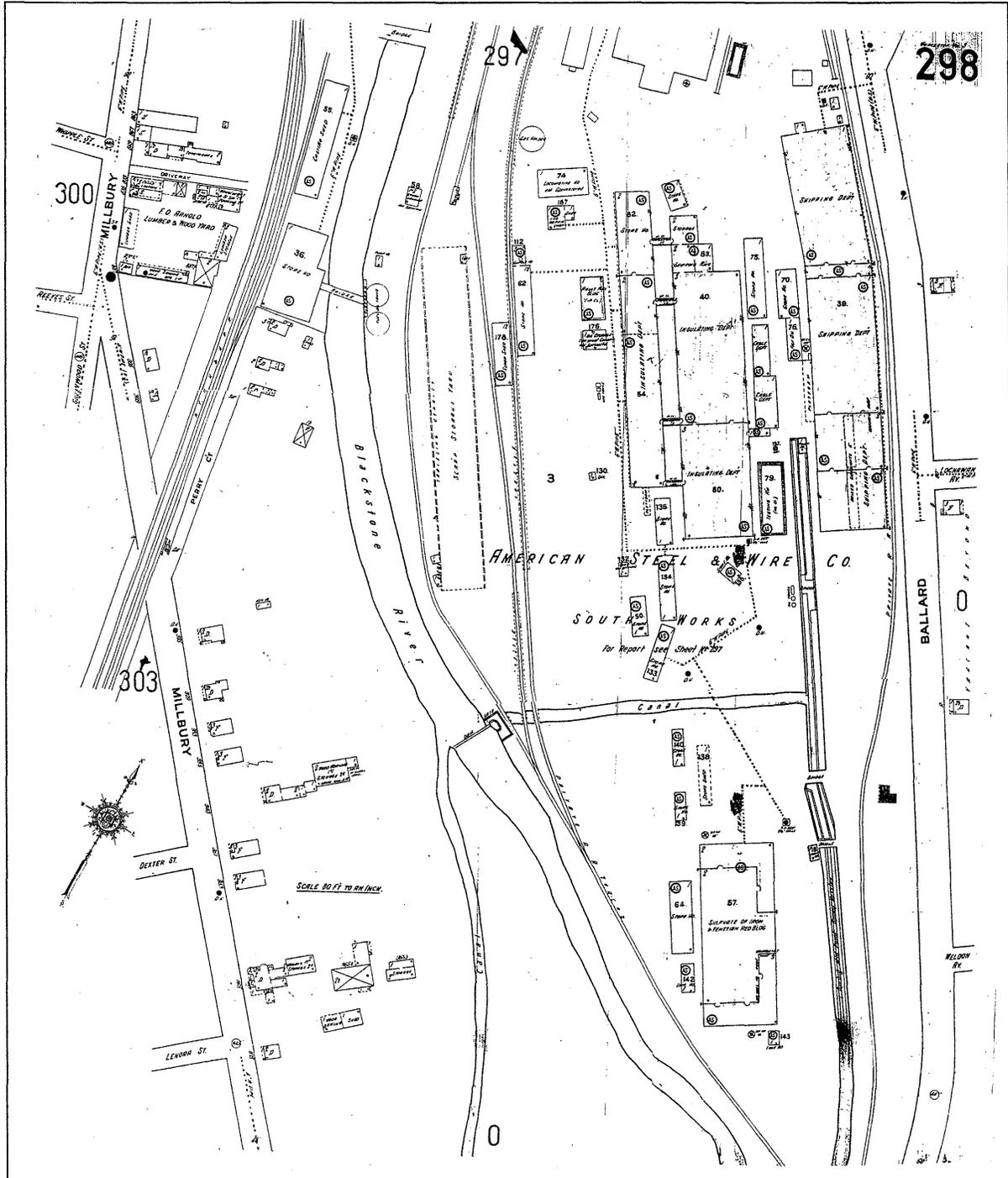


South Works [northern portion], American Steel & Wire Company
Sanborn Map Company, *Insurance Maps of Worcester, Massachusetts*, 1910

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)

HAER No. MA-134

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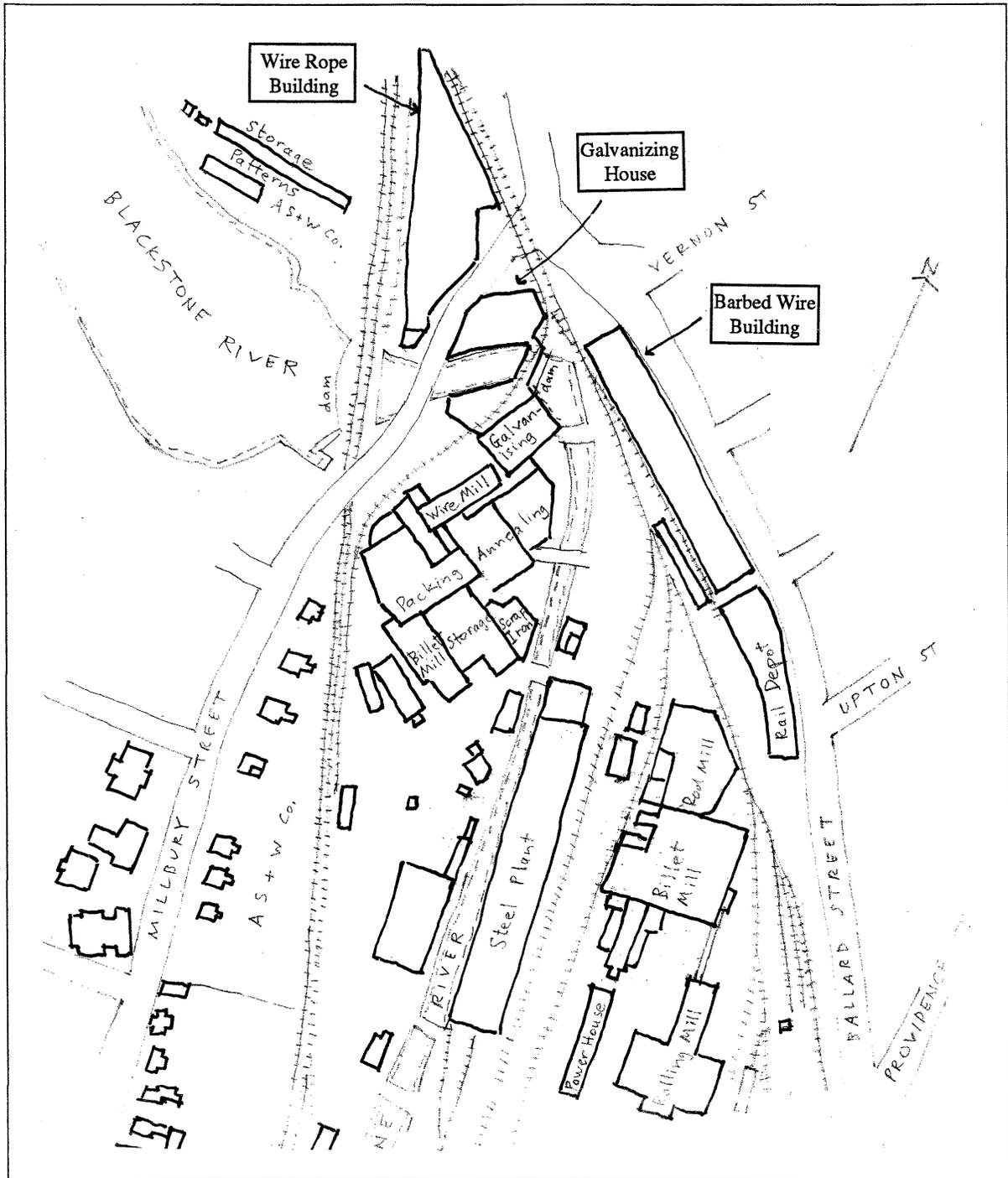


South Works [southern portion], American Steel & Wire Company
Sanborn Map Company, *Insurance Maps of Worcester, Massachusetts*, 1910

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)

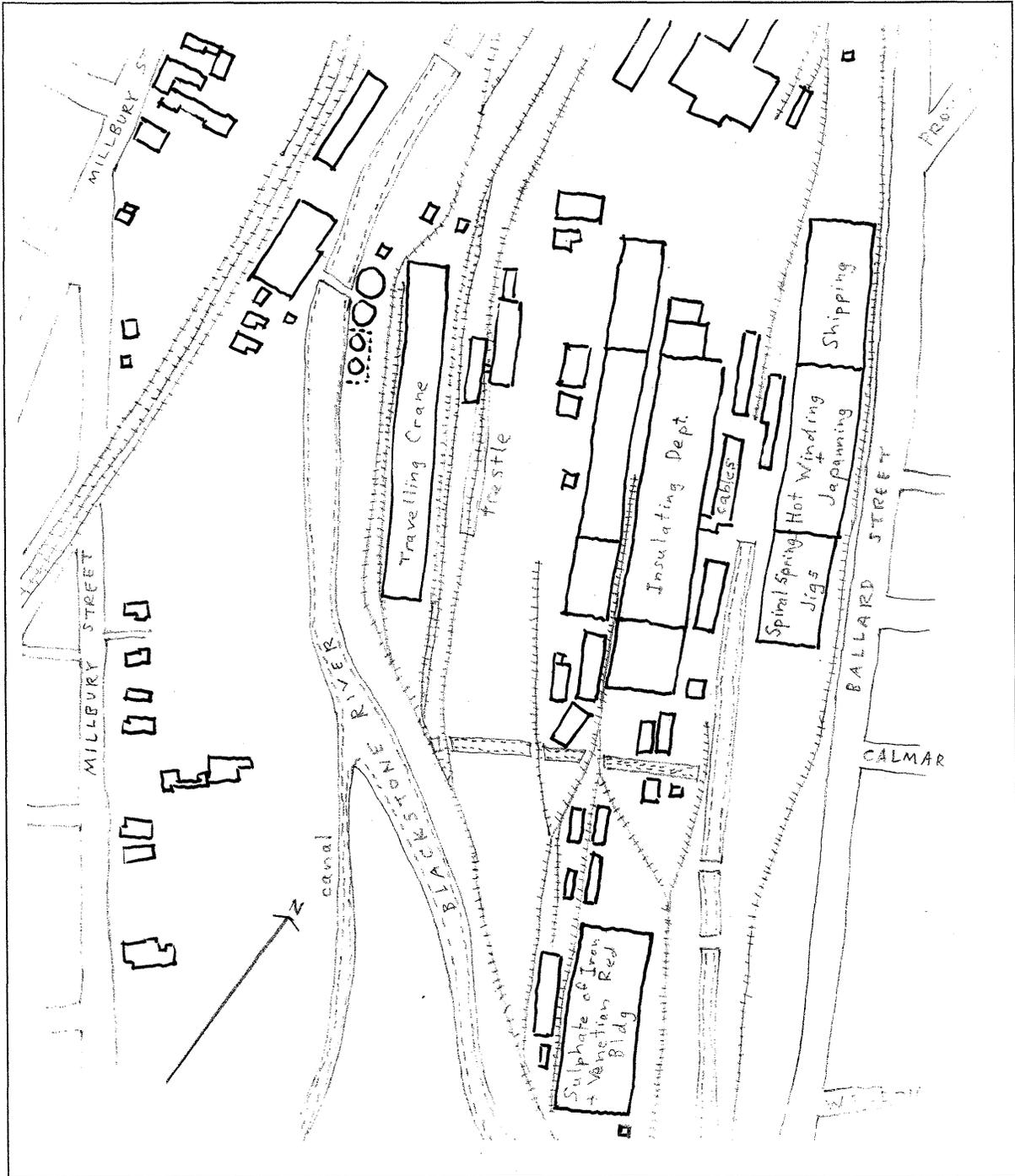
HAER No. MA-134

(page 32)



South Works [northern portion], American Steel & Wire Company
Richards Map Co., *Atlas of the City of Worcester, Mass.*, 1922

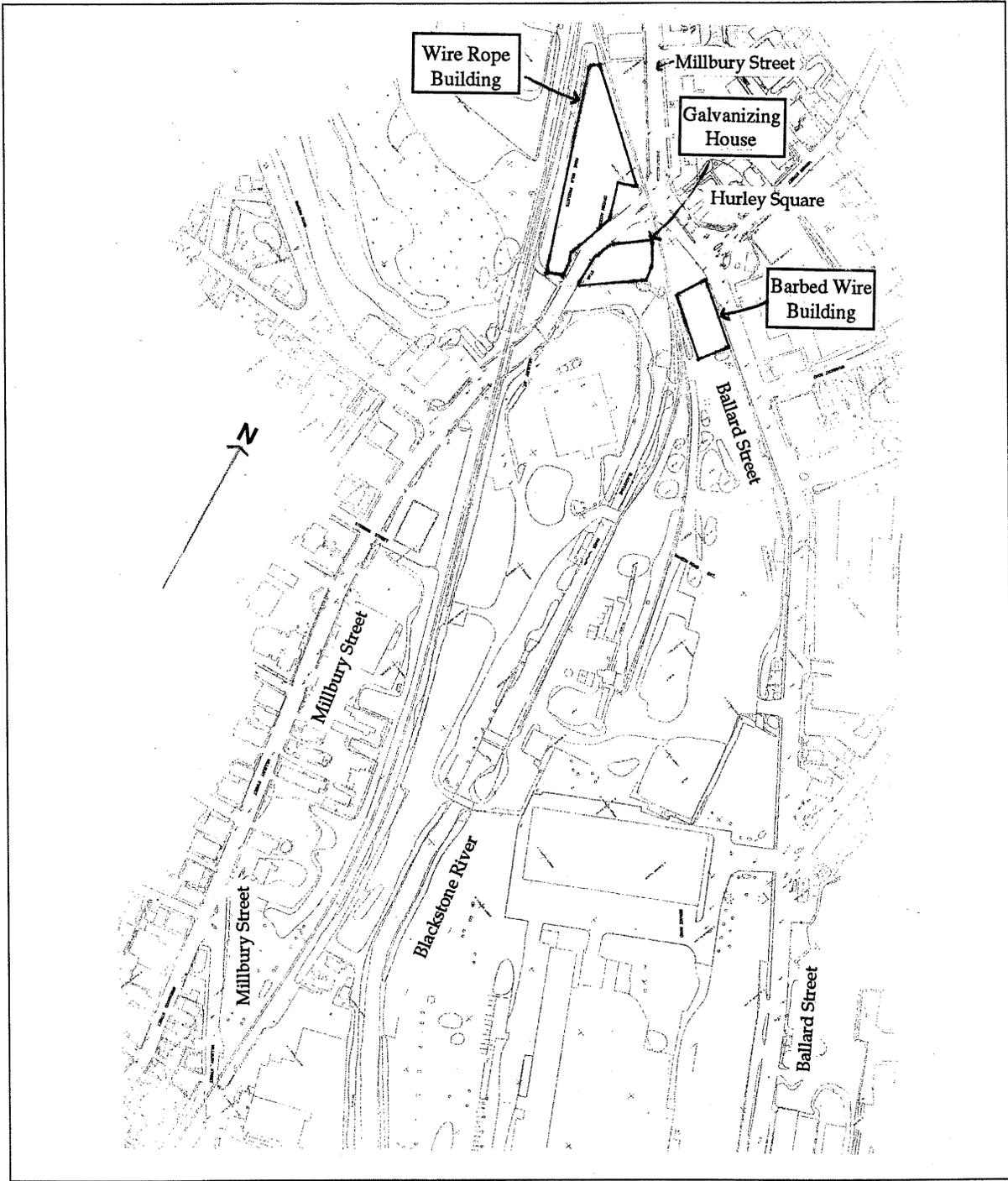
WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)
HAER No. MA-134
(page 33)



South Works [southern portion], American Steel & Wire Company
Richards Map Co., *Atlas of the City of Worcester, Mass*, 1922

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
(Washburn & Moen Manufacturing Company, South Works)
HAER No. MA-134

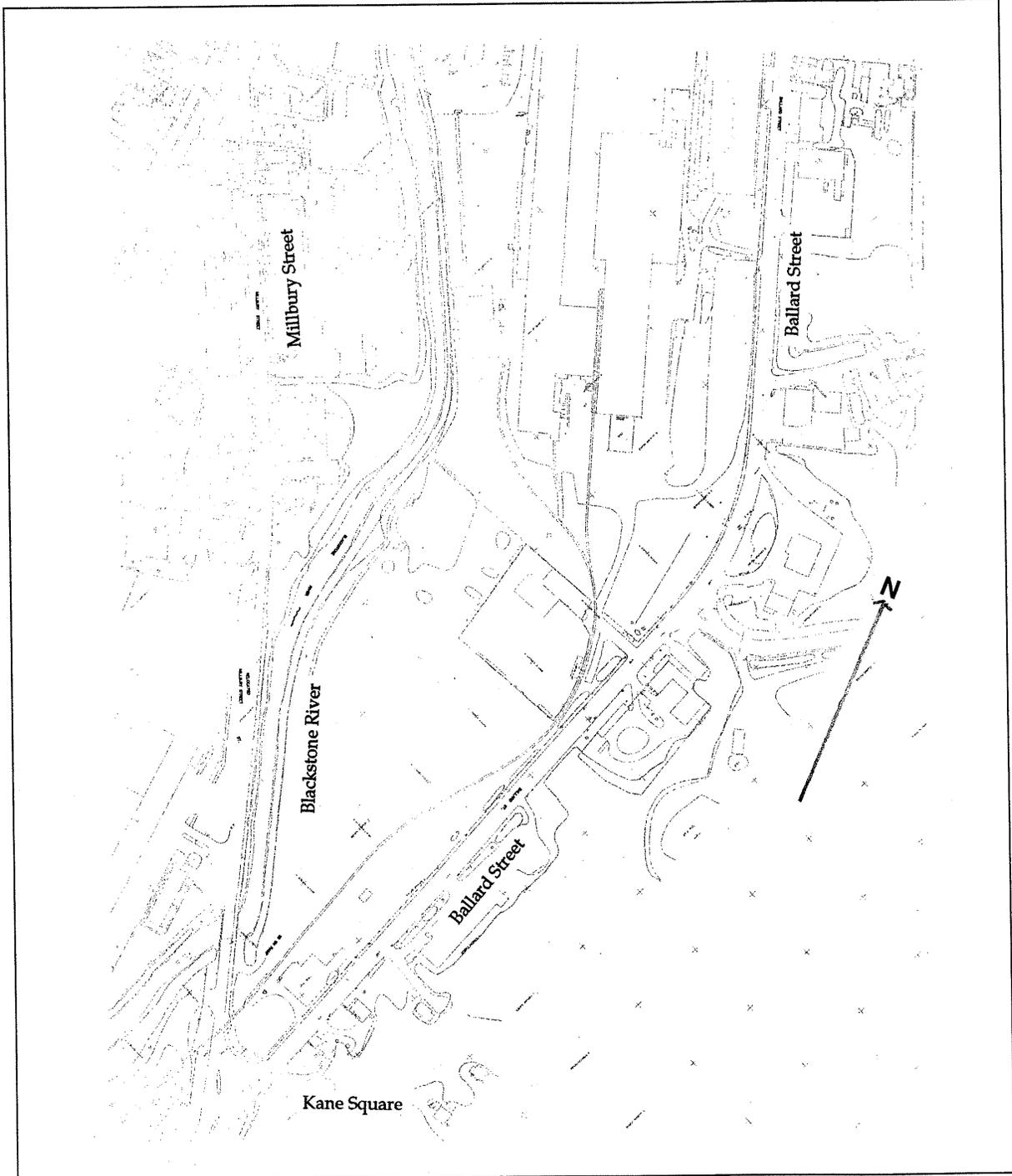
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Site of Quinsigamond Iron & Wire Works (South Works), 1998
Base Map, Sverdrup/Parsons Brinckerhoff, Boston [northern portion]

WASHBURN & MOEN MANUFACTURING COMPANY,
QUINSIGAMOND IRON & WIRE WORKS
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Site of Quinsigamond Iron & Wire Works (South Works), 1998
Base Map, Sverdrup/Parsons Brinckerhoff, Boston [southern portion]