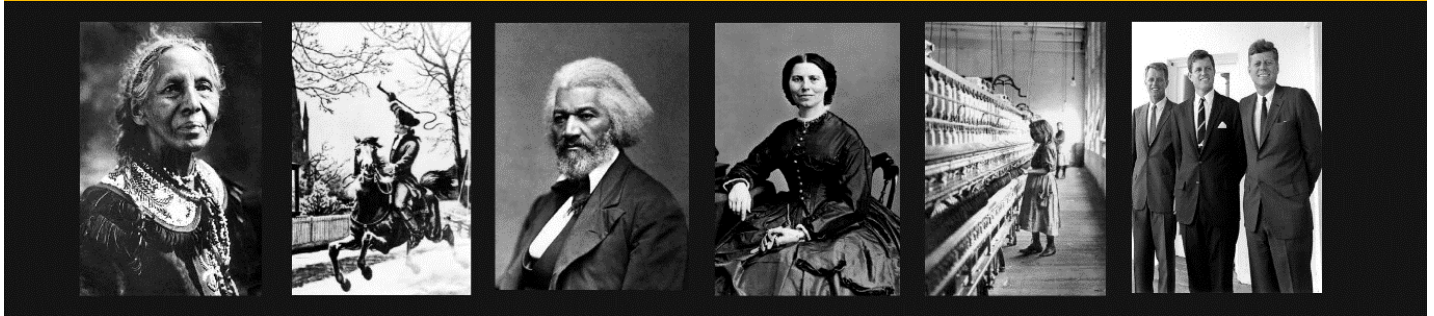


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Created by Craig Thomas, from the Department of Regional Economic and Social Development at the University of Massachusetts, Lowell

PHOTO ESSAY

# The Rise and Demise of the Connecticut River Valley's Industrial Economy

ROBERT FORRANT



**Editor's Introduction:** *In this illuminating photo essay, Dr. Robert Forrant traces the rise and fall of the Connecticut River Valley's precision machine tool and industrial economy. Hundreds of precision machine and metalworking factories once populated the 200-mile industrial corridor between Bridgeport, Connecticut, and central Vermont. The industrial revolution took off, and innovation thrived, in this area. Forrant writes that "[i]t would not be hyperbole to call the collection of towns and cities along . . . [the Connecticut River] the Silicon Valley of its day, one of the most advanced manufacturing regions in the world at that time."*

*Both the physical traces and personal memories of this historical landscape are slowly disappearing. The Springfield Armory National Historic Site (part of the National Park Service) and the American Precision Museum in Windsor, Vermont (115 miles north of Springfield) are two important sites that help preserve the area's rich industrial history. Many smaller museums also dot the region's landscape, such as the Museum of Our Industrial Heritage in Greenfield. Its innovative*

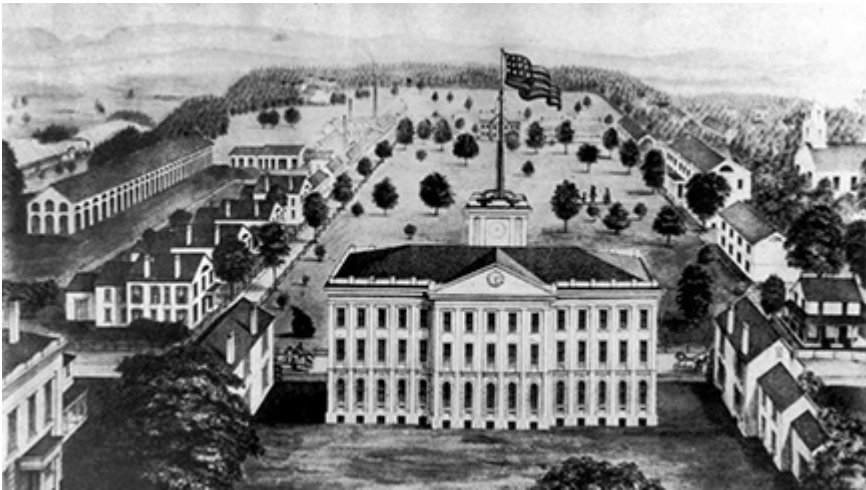
website offers videos and historical records relating to many Franklin County companies. Local historical societies also play a critical role in preserving the records, archives, and artifacts of the region's economic, technological, and industrial histories.<sup>1</sup>

*Dr. Robert Forrant has both a personal and an academic connection to this topic. Currently he is a Professor of History at the University of Massachusetts, Lowell, and the author Metal Fatigue: American Bosch and the Demise of Metalworking in the Connecticut River Valley (2009). Before completing his Ph.D. he spent nearly fifteen years working as a machinist in Springfield, MA.*

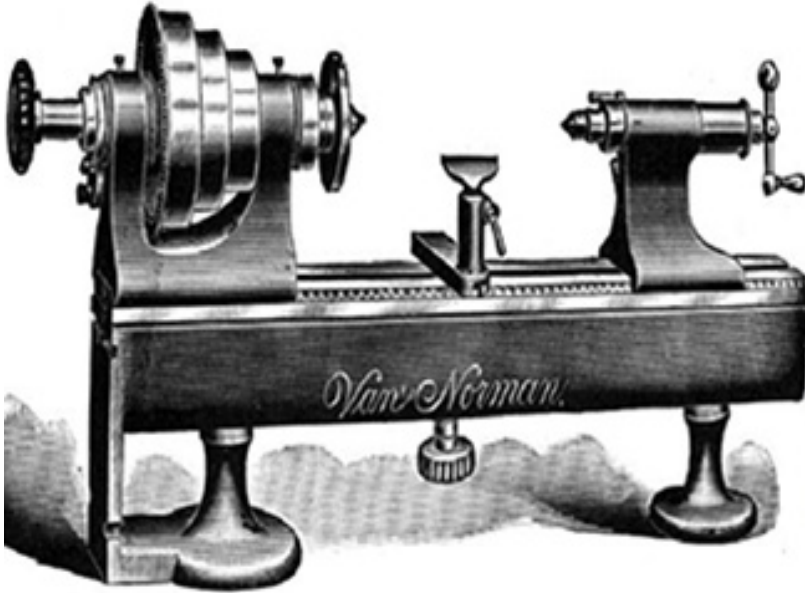
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The genius of this new country is necessarily mechanical. Our greatest thinkers are not in the library, not the capitol, but in the machine shop. . . . Our education is no genial culture of letters, but simply learning the use of tools. — *Putnam's Magazine, 1854*

For much of the nineteenth and twentieth centuries, the Connecticut River Valley's machine tool and metalworking firms constituted a highly innovative region, much akin to today's Silicon Valley. In 1777, patriot colonists had established "The Arsenal at Springfield." The soon-to-be federal armory became one of the nation's primary centers for the manufacture of U.S. military firearms until its closing in 1968. By the 1850s, the federal



**Springfield Armory, 1850**




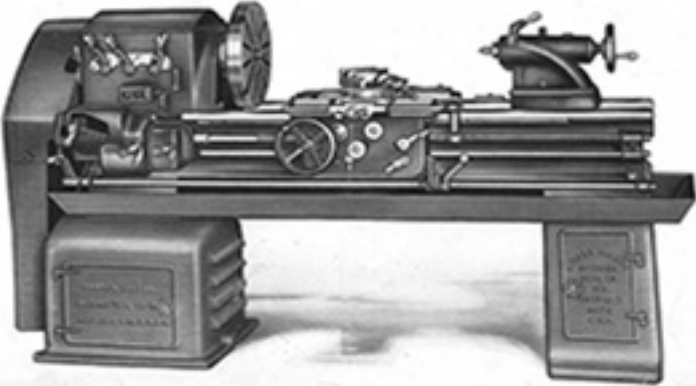
**Bench Miller produced by the Van Norman Company (Springfield)**

Image taken from a company advertisement, 1905

gunmaker had diffused its discoveries about mechanized production. In 1852 this analysis appeared in *Harper's New Monthly Magazine*. “[At the Springfield Armory] we have the very singular and extraordinary operation going on, of manufacturing with the greatest care, and with the highest possible degree of scientific and mechanical skill, a vast system of machinery.” In almost religious terms, one British visitor described the Armory as “beautifully situated on an eminence overlooking the town.”<sup>2</sup>

The machine tool industry consisted of firms, large and small, that made the basic machinery used in manufacturing production. Cars, bicycles, sewing machines, motorcycles, toys and games, and paper all needed to be produced on machines. As a general rule, the goods producer did not build its own production machinery. Companion firms, like Greenfield Tap & Die, made the cutting tools, reamers, drills, and taps that the machinery builders included with their finished machines. The valley did so well in the manufacture of machines, tooling, and finished goods because there existed a symbiotic relationship between the two. When things were going well there was a virtuous circle in the valley; when things went badly, a vicious cycle took over.

Integral to the river valley's industrial success were two historical continuities: the region's capacity to design and build machine tools and related accessories; and the numbers of skilled machinists and apprentices attracted to it. Firms cultivated and recruited workers through their sponsorship of apprentices and vocational-technical education. According



*The* PORTER-Mc LEOD  
*16 Inch 12 Speed Geared Head*  
*Quick Change Screw Cutting Engine Lathe*  
Porter-McLeod Machine Tool Co. Inc.  
HATFIELD MASS.

### Porter Machine Lathe

Built in Hatfield, Massachusetts (Courtesy of Hatfield Historical Museum)

to historian David Meyer, early nineteenth-century machinists set the stage for “the extraordinary machinery and machine tools of the late nineteenth century, when the United States moved to the forefront in making much of this equipment.”<sup>3</sup> Meyer explains that:

The active engagement of mechanics in advancing the sophistication of machine tools and in incorporating them into firearms manufacturing caused firearms and machine tool networks that concentrated in or near the Connecticut and Blackstone valleys as early as the 1820s.<sup>4</sup>

Without the Armory, Springfield likely would have become a commercial and transportation center. Instead, according to one early observer, it developed an economy with “fewer drawbacks than that of most manufacturing cities. . . . As a consequence, Springfield is neither a sleepy village resting on its past glories, nor is it a coarse factory town, conspicuous for its slums and tired workers.”<sup>5</sup>

By 1860, shops in Franklin County, along the Massachusetts-Vermont border, turned out 49% of the nation’s cutlery. More than simply knives, forks and spoons, cutlery covers a wide range of vital products ranging from basic eating utensils to high-end customized silverware with fancy scrolled patterns, farm equipment, blades, and other tools used for cutting, chopping, and such. In the valley, the several cutlery firms purchased precision tools such as polishing, cutting, and grinding machines from numerous local machinery builders. After the Civil War, the valley’s machinery makers expanded to build specialized equipment for New England’s pulp and paper and shoe industries, textile companies, watchmakers, furniture manufacturers, munitions makers, typewriter and bicycle builders, and jewelry makers.

The commonwealth’s machinery output grew a spectacular 158% between 1885 and 1890, and in 1900 its builders ranked second in the nation in sales (\$2.6 million) behind Ohio (\$6.4 million). Metalworking firms and machinery builders behaved like a transmission agency, spreading their innovations to final goods producers. In 1920, 20% of the country’s machine tool firms with more than 100 workers were located in the Connecticut River Valley. And Massachusetts, Connecticut, and Rhode Island builders collectively shipped 25% of the country’s machine tools.<sup>6</sup>

Holyoke, the second largest city in the river valley, was described thus in 1885: “On a sweeping curve of the Connecticut river . . . is the modern manufacturing city of Holyoke, with a present population of 30,000. It is the most extensive paper-making city in the world.” Holyoke and other towns

benefitted from the cheap and clean water power that powered many of the mills and factories along its banks. The observer continued:

The ceaseless water-power of the great river turns the wheels of numerous industries, which, within the third of a century, have been located here and have transformed a sparsely settled rural parish into a busy and populous city.



### **Robbins & Lawrence Armory, Windsor, Vermont**

The history of the Robbins & Lawrence Company begins about 1838, when Richard Lawrence came to Windsor from the neighborhood of Watertown, New York. Before that, Kendall & Company had been using inmate labor from the Windsor prison to make guns. The company hired Robbins for two years at \$100 a year. In 1843, Kendall & Lawrence leased a small shop in Windsor village and started a custom gun shop. In the winter of 1844, businessman Samuel E. Robbins came to them and said that the federal government was in the market for 10,000 rifles. A partnership formed and a contract for the 10,000 rifles was awarded to Robbins, Kendall & Lawrence. The performance on this and subsequent contracts led to the development of several machine tools. In 1850, Samuel E. Robbins and Richard S. Lawrence formed Robbins & Lawrence Co. in a reorganization of Robbins, Kendall & Lawrence. For more on the company visit the outstanding American Precision Museum, housed in the original Robbins & Lawrence Armory. It holds the largest collection of historically significant machine tools in the nation ([www.AmericanPrecision.org](http://www.AmericanPrecision.org)). Image from Joseph Wickham Roe, *English and American Tool Builders* (New York, NY: McGraw-Hill, 1926).



Holyoke . . . does not resemble the smoky cities of the iron regions, nor the languid towns of the South. The swift, powerful current of water does its work without confusion, smoke or waste. Pure breezes sweep along the valley through the mountain rifts, and the mountains serve as barriers to ward off heavy gales and destructive tempests.<sup>7</sup>

The Holyoke Machine Company provides an exemplary case study. It was organized in 1863 as the city's first manufacturer, with capital of \$40,000.

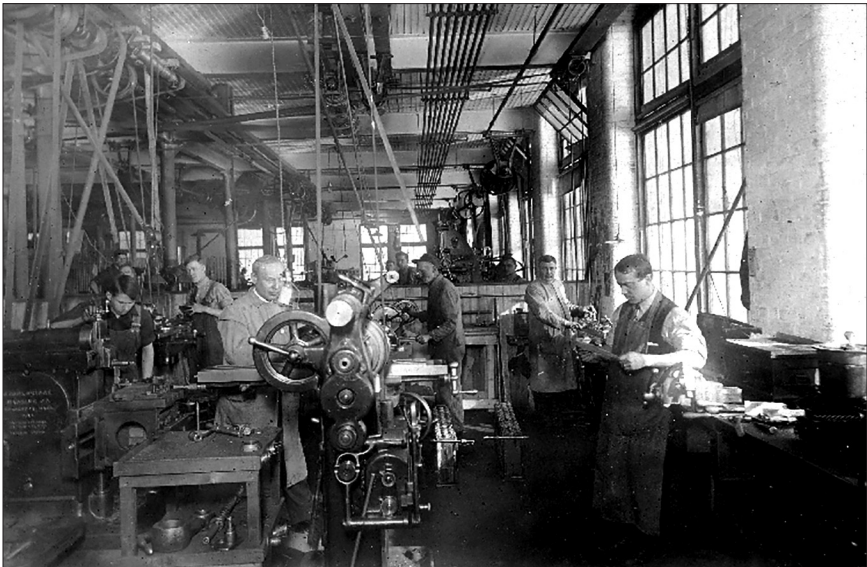


### **Millers Falls Company, 1891**

Created in 1868 as the Millers Falls Manufacturing Company, it produced excellent quality products that today are prized by collectors of antique tools and woodworkers alike. The company also manufactured precision tools, mechanics' tools and power tools. In 1962, it became a division of Ingersoll-Rand. In 1982, the plant closed and its operations were moved to New Jersey following a leveraged buyout. In 1892, the *Greenfield Gazette's* Centennial Edition published a short review of the Millers Falls Company, including rare photographs of its facilities. The paper reported, "The rapid growth of Millers Falls, which has made it one of the prosperous villages of Franklin County, has been due almost entirely to the Millers Falls Company" (February 1, 1892, p. 187).

This was increased in 1871 to \$80,000, and in 1872 to \$180,000. The value of the first year's sales was \$60,000, and fifty men were employed. By 1876 sales reached \$500,000 and the firm employed three hundred men. The Holyoke Machine Company manufactured and exported specialty water wheels and machinery for paper-mills. Machines were shipped to Scotland, France, and Germany. In 1878 and 1879 entirely new machinery was installed, making it one of the most complete machine shops in Massachusetts.<sup>8</sup>

Holyoke became a bustling industrial city of paper and textile mills. In 1879, the largest paper manufactory in the world was in Aberdeen, Scotland. It had the capacity to produce twelve tons of paper daily. The next largest, Holyoke's Whiting Paper Company, had a capacity of eleven tons per day. The expansion of paper manufacturers was accompanied by the growth of firms that made blank books, pads, paper boxes, envelopes, and papermaking machinery. In 1939, local historian Constance McLaughlin Green wrote that paper trade journals:



### **Machinists at the Holyoke Machine Company**

The Holyoke Machine Company, founded in 1863 and the oldest manufacturer in the city, survived for 154 years, finally closing its doors in 2017. Only one company in the country remains that continues to produce its specialized large industrial rollers. Photo courtesy of Wistariahurst Museum Collection.

began to abound in advertisements for Holyoke-made machinery and devices used. . . . Three new machinery shops were opened between 1879 and 1882 as well as a brass foundry and one for ordinary castings. The building of new mills and extensions of old made constant demands upon these shops.<sup>9</sup>

Even the tiny rural community of Hatfield (population 1,500 in 1900) developed a thriving industrial base. There, Porter Machine Works built precision lathes for export around the world. When Orra Stone wrote a four-volume comprehensive history of Massachusetts industry in 1930, he referred to Hatfield as “an impressive little town” and had this to say about Porter Machine: “The progressiveness of the company is evidenced by the fact that it maintains a research department for the purpose of making improvements on existing machines.”<sup>10</sup>

Eventually, hundreds of machine-building and metalworking plants populated the 200-mile industrial corridor between Bridgeport, Connecticut, and central Vermont. Fifteen miles north of Springfield,



### **American Writing Paper Company, Holyoke**

Cylinder machine making matchboard. Work Projects Administration National Research Project. National Archives, 1937. Lewis Hine, Photographer.



**Factory workers at Jones & Lamson Col, Springfield, Vermont during World War II**

Image courtesy of American Precision Museum.

Northampton's thriving cutlery and hand tool industries found customers in the nation's burgeoning market for agricultural implements. Thirty miles upriver in Greenfield, firms manufactured cutting tools, machinists' hand tools, and measuring devices. In Shelburne Falls sat Lamson & Goodnow Manufacturing, the largest single producer of cutlery in the United States. The firm produced 500 different styles of cutlery and by 1860 consumed 200 tons of steel annually. It benefitted from being in a region where the machinery needed to produce fine cutlery was built. In Windsor, Vermont, twenty-five factories produced rifles, sewing machines, and machine tools. Final goods producers up and down the valley benefitted from their direct access to the best machine tools in the world, built by their near neighbors.

Machinery output rose a spectacular 158% between 1885 and 1890. In 1920, 25% of the nation's machine tools were shipped from Massachusetts, Connecticut, and Rhode Island. Indeed, 20% of the nation's machine tool firms with more than 100 workers were located along the Connecticut River.<sup>11</sup> Along with the thousands of jobs these firms provided, the companies and



### **American Bosch Corporation, Springfield**

Craftsmen at benches lap the plungers and barrels of fuel injection pumps for diesel engines. The parts had to be accurate to 39 millionths of an inch. Undated photo courtesy of the Connecticut Valley Historical Museum.

their workers played active roles in the region's civic life, something sorely missed today.

As previously noted, during the nineteenth and well into the twentieth century, the Springfield Armory had acted as a clearinghouse for new machines, materials, and manufacturing processes, enhancing the region's reputation for precision and quality work and the clustering of metalworking shops it produced. In a 1948 study, Felicia Deyrup described it as "a model of economic success for 150 years."

Henry Ford too praised the city's metalworkers, noting, "The skill of Springfield's engineers and workers is traditional. . . . [I]n its world-wide



### **Production Workers Leave Greenfield Tap & Die Plant**

*The Greenfield Recorder*, July 2, 1980

In 1872, Northampton resident John Grant moved to Greenfield with plans for a new die that would make a better screw. Patented in 1871, it revolutionized the way that dies were made. By 1900 several large, competing plants made taps and dies for a national market. In 1912 the Greenfield Tap and Die Corporation was organized as a result of a merger of several companies. Peak employment was during World War II; estimates range from 2,500-4,000 workers employed at that time. Unlike most, the company has survived, although it is now owned by Kennametal, a global giant. It continues to manufacture taps and dies, the tools that are used to make nuts and bolts.

# GREENFIELD TAP & DIE CORPORATION



GREENFIELD, MASS., U. S. A.



## Little Giant Wrenches



"Little Giant" Pipe Wrenches are designed to have maximum strength. They are drop-forged, hardened and tempered and will give wonderful service. Owing to their simplicity (they have only three parts) there is nothing to break, no cherry frame, no nuts, pins or springs. "Little Giant" Wrenches are great time and money savers. Made only by the Greenfield Tap and Die Corporation.

## GTD Pipe Wrenches



"GTD" Pipe Wrenches are strongly reinforced where the strains come in using. They are drop-forged, and the jaws carefully hardened and tempered.

A strong, handsomely finished wrench, rugged and powerful.

"GTD" Pipe Wrench parts are interchangeable with other makes. Wood handles furnished in sizes from 6 to 14 inches, inclusive. Steel handles in all sizes.



## Little Giant Pipe Stock and Die Sets



Another item of the famous "GTD" "Little Giant" pipe threading line. The two-piece adjustable dies can be easily removed for sharpening. Standard adjustment indicated by marks on the stock and dies. "Little Giant" Stock and "Little Giant" Dies and Bushings for each cutting size, packed in fiber box.

## "OK" Pipe Stock and Die Sets



"OK" Solid Square Pipe Dies are forged with extra large chip spaces. Forging improves the grain of the steel and makes the die cut easier. The "OK" dies and stocks are interchangeable with square dies and stocks of any other manufacturer.

Regularly furnished with one stock, with "OK" solid square pipe dies and bushings for each size.

## GTD Hinged Pipe Vises



Malleable iron with hardened and tempered tool steel jaws. Holes in the base are placed so a pipe wrench can be used to bolt down to bench or post.

Two lugs on base so the frame and hook can be reversed.

## GTD Combination Pipe Cutters



A "vise" and "three" wheel cutter. The feature is the drop-forged frame with continuous slide. There are two threads cut in frame. The handle engages in a hardened steel nut. This avoids stripping.

search for never ending improvements, the Ford Motor Company has found in Springfield dependable sources for a substantial portion of its equipment and parts used in building Ford cars.”<sup>12</sup> Similarly, England’s premier automobile manufacturer, Rolls Royce, praised the metalworking expertise in the region when it decided to site a factory in Springfield immediately after the First World War.<sup>13</sup>

The production of essential machinery helped Springfield weather periodic economic downturns as well as the Great Depression. A 1941 Work Projects Administration study reported that:

Springfield’s products have been for the most part the essentials of other industries, the machines, the tools, and units that turn the wheels of industry the world over. Because of this inter-relationship and the diversification of her industries, Springfield has suffered less from economic upheaval than single-industry cities of New England.<sup>14</sup>

This helped for only so long.

American industry—undamaged by the Second World War—still accounted for close to half of global manufacturing output in the mid-1950s. Workers enjoyed rising standards of living. Yet, despite such general prosperity, in Holyoke, the slowing down of industrial growth had already begun in the early 1900s. According to Green, “merchants and dealers in mill supplies had already begun to complain of a falling off in business, attributing it to the American Writing’s purchase of supplies elsewhere and to the loss of working time in the combined Holyoke mills.”<sup>15</sup>

Textile production also declined dramatically. By the late 1920s, many of New England’s textile mills had already shut down, moving their operations to the South where labor costs were cheaper. Between 1920 and 1941, the commonwealth lost 45% of its textile production jobs. In Western Massachusetts, twenty-five mills closed between 1908 and 1933. In Holyoke, the valley’s major textile-producing city (and fifth largest in the state in terms of the number of workers employed in textile mills), the impact was particularly dramatic. The city had boasted over 10,000 textile jobs in 1920 but only 1,957 in 1940.<sup>16</sup>

After World War II, the nation’s, and by extension the valley’s, industrial prowess, its position as “manufacturer to the world,” was unsustainable as Japan, continental European countries, and, in the 1970s and 1980s, several developing Asian nations challenged the United States’ preeminence in textiles, cars, steel, major household appliances, machine tools, and



consumer electronics. Much of this work went to newly industrialized, cheap-labor areas including Mexico, South Korea, Hong Kong, and Taiwan. Initially, labor-intensive manufacturers relocated production to developing countries with much lower wages. Eventually, more sophisticated sectors like machinery building moved abroad as well.

Another factor had also contributed to the exodus of industry from the valley. In the late 1940s and 1950s investors and conglomerates from outside the region had purchased many of its leading firms. Merger waves in the late 1960s, the mid-1980s, and the late-1990s resulted in acquisition of valley machine tool firms by diversified companies that had not previously been in the machine tool business. Bendix acquired Warner & Swasey Company in 1983 and transferred most of its production to the Japanese company Murata. Springfield firm Van Norman, acquired by Gulf & Western in 1967, changed hands again in the 1970s. Textron acquired the Vermont-based Jones & Lamson and Bryant Grinding along with Connecticut firm Bridgeport Machine in the 1960s.<sup>17</sup>

Intent on securing a rapid and high return, the new owners felt no obligation whatsoever to the valley's workers, managers, and industrial heritage. Once locally-owned firms changed hands, their assets were globalized. As a consequence, the region's ability to shape and reshape its economic future slipped away. Springfield scrambled to save what jobs it could, offering corporations financial inducement to stay or move in.

Once outpacing the world, the machine tool industry entered a "deindustrialization death spiral." In an astonishing role reversal, the U.S. became the world's largest importer of machine tools, while goods producers lost their early access to top-notch conventional and state-of-the-art machine tools, and the notable competitive advantages they conveyed, thus hastening further job loss in other manufacturing sectors. Springfield, Holyoke, and other industrial centers were left with aging, empty, multi-story factories and acres of contaminated land.

In Springfield, the wave of industrial closings provoked the near collapse of many of its leading financial institutions, the tax base shriveled, and the city nearly went bankrupt. Between 1980 and 2000, 43% of the region's industrial employment disappeared. The cumulative impact of deindustrialization breached the historical continuity of the valley as a world leader in precision metalworking, a vicious cycle repeated in countless industrial centers in the last three decades of the twentieth century.<sup>18</sup>

To summarize, machinery building and precision metalworking prospered in the Connecticut River Valley from the late nineteenth century through the early 1960s, long after textile and apparel cities like Holyoke, Fall River,

Lawrence, and Lowell ceased their economic growth. But metalworking firms could not escape a similar fate. Half of greater Springfield's manufacturing facilities closed between 1950 and 1987. In 1960, one-third of all laborers in the U.S. outside the agriculture sector had jobs in manufacturing; in 2010, just over one-eighth had such jobs. Economist Christine Walley notes that "The manufacturing jobs lost . . . had better pay, more benefits, and far greater security than those that remain. The jobs that are left are far less likely to serve as a rung up the social ladder to middle-class life for working-class and poor people."<sup>19</sup>

In *Beyond the Ruins: The Meanings of Deindustrialization*, Joseph Heathcott and Jefferson Cowie perceptively point out:



### From Goods to Goodbyes

Former union presidents Ernie Depathy, of Chicopee, left, and Tony Fonseca, of Ludlow, walk in the information picket in front of the United Technologies plant (American Bosch) in Springfield. When this photo was taken in 1986, Depathy had worked at the plant for 43 years and Fonseca for 31. United Technologies had just announced the closure of the factory. Their signs read: "UTC Still Profits While We Lose Out" and "Keep U.S. Government Work in the U.S.A." *Springfield Republican* photo by Dave Roback.

Deindustrialization is not a story of a single emblematic place... or a specific time period, such as the 1980s; it was a much broader, more fundamental, historical transformation. What was labeled deindustrialization in the intense political heat of the late 1970s and early 1980s turned out to be a more socially complicated, historically deep, geographically diverse, and politically perplexing phenomenon than previously thought.<sup>20</sup>

The sudden closure in 1986 of the 76-year-old American Bosch manufacturing plant in Springfield, Massachusetts, epitomized the essence of this history and its deeply personal impacts as 1,200 workers lost their jobs. The mood was poignantly captured in the statement by 36-year employee Donald Staples, who, when he learned of the closing, stated, "It's sad. I didn't



### American Bosch Closes

In this February 1986 photo, union officials discuss the surprise announcement by United Technologies that they will close the Bosch diesel systems plant in Springfield, putting more than 900 employees out of work. Chris Bergeron, seated left, of the International Union of Electrical Workers Local 206, talks with John Domingos, president of Local 112 of the International Federation of Professional and Technical Engineers, while Local 206 business agent Robert Farrant talks on the phone at right. *Springfield Republican* photo by Michael S. Gordon.

realize how much it meant to me, till I think about not going back in there. It's a 36-year habit that's going to be hard to break. I can close my eyes and walk through the building, smelling the cutting oil, hearing the machines."<sup>21</sup>

HJM

## Notes

1. At Turner's Falls, the Great Falls Discovery Center is also housed within a complex of old mill buildings. It showcases the natural, cultural, and industrial history of the Connecticut River watershed.
2. Jacob Abbott, "The Armory at Springfield," *Harper's New Monthly Magazine* (July 1852), 146; David Meyer, *Networked Machinists: High Technology Industries in Antebellum America* (Baltimore, MD: The Johns Hopkins University Press, 2006), 260. The British observer's comments are reported in Nathan Rosenberg, ed., *The American System of Manufactures: The Report of the Committee on Machinery of the United States in 1855 and the Special Reports of George Wallis and Joseph Whitworth* (Edinburgh, Scotland: Edinburgh University Press, 1969), 364.
3. Meyer, 3.
4. *Ibid.*, 260.
5. Derwent Whittlesey, "The Springfield Armory: A Study in Institutional Development" (Ph.D. diss., University of Chicago, 1920), 265.
6. Robert Forrant, "Too Many Bends in the River: The Post-World War II Decline of the Connecticut River Valley Machine Tool Industry," *Journal of Industrial History* 5 (2002): 71-91; M. King, *King's Handbook of Springfield, Massachusetts: A Series of Monographs Historical and Descriptive* (Springfield, MA: James D. Gill, 1884).
7. Fanny M. Johnson, "A Model Industrial City," *The Bay State Monthly* 3, no. 5 (October 1885).
8. Holyoke Water Supply Company, *The City of Holyoke: Its Water Power and Its Industries* (Holyoke, MA: Clark W. Bryan & Co., 1879), [https://www.digitalcommonwealth.org/book\\_viewer/commonwealth:sq87dw463#1/1](https://www.digitalcommonwealth.org/book_viewer/commonwealth:sq87dw463#1/1).
9. Constance McLaughlin Green, *Holyoke, Massachusetts: A Case History of the Industrial Revolution* (New Haven, CT: Yale University Press, 1939), 163. The Holyoke Machine Company survived for 154 years, finally closing in 2017. See "Holyoke Machine Co., Oldest Manufacturer in Paper City, Shuts Down and Plans to Auction Off Equipment," *MassLive*, July 24, 2017, at [http://www.masslive.com/business-news/index.ssf/2017/07/holyoke\\_machine\\_co\\_once\\_oldest\\_manufactu.html](http://www.masslive.com/business-news/index.ssf/2017/07/holyoke_machine_co_once_oldest_manufactu.html). The article notes that "[t]he end of Holyoke Machine leaves just one company [in the U.S.], Badger Roll and Machine in Green Bay, Wisconsin, working on the same large industrial rollers that Holyoke Machine worked on."
10. Orra Stone, *History of Massachusetts Industries*, vol. 2 (Boston, MA: The S. J. Clarke Publishing Co., 1930), 718.

11. J. Alexander Bishop, *A History of American Manufacturers, 1608-1860*, vol. 3 (Philadelphia, PA: Edward Young & Co., 1868), 338-343; Robert Farrant, "Hatfield's Forgotten Industrial Past: The Porter McLeod Machine Works and the Rise and Fall of the Connecticut Valley Machine Tool Industry," forthcoming in this journal.
12. *Springfield Republican*, November 21, 1936, 13
13. For details on the role of the Armory in disseminating technical and manufacturing information see Felicia Deyrup, *Arms Makers of the Connecticut Valley* (Northampton, MA: Smith College Studies in History Series, 1948); Robert Farrant, *Metal Fatigue: American Bosch and the Demise of Metalworking in the Connecticut River Valley* (Amityville, NY: Baywood Publishing Company, 2009), 17. See also "The Rolls Royce in Springfield," *Vanity Fair* (June 1926): "The artisans of Springfield—from long experience in fine precision work—were found to possess the same pride in workmanship as the craftsmen of England."
14. Writers' Program of the Work Projects Administration, Springfield, Massachusetts, (Springfield, MA: City of Springfield), 57.
15. Green, 195.
16. L. Mara Dodge, "Anna B. Sullivan, 1903-83: The Formative Years of a Textile Mill Union Organizer (Holyoke, MA)," *Historical Journal of Massachusetts* 44 (Summer 2008): 203.
17. Farrant, "Too Many Bends in the River."
18. Robert Farrant, "Springfield, Massachusetts After the Finance Control Board: Is the Way Clear to A Sustainable Recovery?" *New England Journal of Public Policy* 24 (2013): 67-92.
19. Christine Walley, *Exit Zero: Family and Class in Postwar Chicago* (Chicago, IL: University of Chicago Press, 2013).
20. Joseph Heathcott and Jefferson Cowie, eds., *Beyond the Ruins: The Meanings of Deindustrialization* (Ithaca, NY: Cornell University Press, 2003), 2.
21. Farrant, *Metal Fatigue*, 1.