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MASTERS THESIS

DEMER, John Herbert
JEDEDIAH NORTH'S TINNERS TOOL BUSINESS.

University of Delaware (Winterthur Program),
M.A., 1973
History, general

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JEDEDIAH NORTH'S TINNERS TOOL BUSINESS

by

John H. Demor

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Arts in Early American Culture.

May, 1973
JEDEDIAH NORTH'S TINNERS TOOL BUSINESS

by

John H. Demer

Approved: ____________
Professor in charge of thesis on behalf of the Advisory Committee

Approved:  ________________________
Coordinator of the Winterthur Program

Approved:  ________________________
Dean of the College of Graduate Studies
In the first half of the nineteenth century, American tinsmiths fashioned tinplate into a wide variety of objects such as boxes, lanterns, ovens, and footwarmers. The variety of objects was made possible--but only in part--by the skill of the tinsmith. What also helped make possible the wide variety of objects were tools--tools manufactured in Connecticut by tinner's toolmakers such as Jedediah North, of East Berlin.

Jedediah North began his career as a blacksmith in 1810 or 1811. In the decade following 1810, his business records indicate that he made an increasing number of tools in addition to repairing many. In 1817, for instance, North made six sets of tools and seventeen pair of shears. But by 1852, North employed sixteen workers who manufactured forty-four sets of tools, and nearly a thousand pair of shears, which North sold to tinsmiths working in almost every State east of the Mississippi River.

To date, there are two works that discuss Jedediah North's tinner's toolmaking business: Margaret Coffin's American Country Tinware, 1700-1900, and Shirley DeVoe's Tinsmiths of Connecticut. Both studies were published in 1968, and, as one might assume from their titles, treat the broader aspects of tinworking rather than
the more limited aspect of tinner's tools and their manufacture. Accordingly, "Jedediah North's Tinner's Tool Business" discusses a manufacturer of tinworking tools, the composition of a typical set of tools, and the selling and transporting of tools, in hopes of providing more information about one small aspect of American enterprise during the early Republic.

Such a study could not have been possible without the help of several people whom I will attempt to thank here. Several individuals told me where I might, or might not find information about, or tools of Jedediah North. For their help, I thank Robert H. Carlson, Antique Tool Collectors in Connecticut; Eugene S. Ferguson, Hagley Museum; Paul B. Kebabian, Early American Industries Association; Robert W. Oldham, Old Museum Village of Smith's Clove; and Peter C. Welsh and Minor Wine Thomas, New York State Historical Association.

Other individuals aided my search for manuscript material relating to Jedediah North and the tinsmith's tool industry of central Connecticut. For their help, I thank: Doris E. Cook and Thompson R. Harlow, Connecticut Historical Society; Daniel B. Reibel, Editor, The Chronicle of the Early American Industries Association; Judith A. Schiff, Yale University Library; Marcia Smith, Adirondack Museum; and Linda S. Waters, Connecticut State Library.
My special thanks to members of the Winterthur library staff: Frank H. Sommer, Head of Libraries; Helen R. Belknap, Librarian; Elizabeth H. Hill, Librarian, Joseph Downs Manuscript and Microfilm Collection; and Beatrice Taylor, Assistant Librarian, Joseph Downs Manuscript and Microfilm Collection. In all phases of my research these people were generous with their time, and I appreciate their generosity.

Several owners of North tools either photographed, or allowed me to photograph, tools in their collections. For their trouble, I am indebted to: Thomas O. Inman, Tinsmith; John S. Kebabian, Early American Industries Association; William M. "Peddler Bill" Roberts, Early American Industries Association; William Stewart, Tinsmith; and Frank G. White, Old Sturbridge Village.

I am especially grateful to my typist, Mrs. Shirley Anderson, who so accurately transformed a pasted and penciled draft into clear and readable copy. With her help, these final stages of the thesis have been a pleasure.

Finally, there is no one I can thank more than my adviser, Charles F. Hummel, who, though among the most productive and active men I have ever met, has taken the time and energy to read and criticize the proposals and drafts of this thesis, in addition to
discussing and answering many other technical questions I have had in my two years as a Winterthur Fellow. Thank you.
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9. Steps used in making a pair of tinsmith's shears.

10b. Detail of mark.

11b. Detail of mark.

12b. Detail of mark.

13b. Detail of mark.


In 1839, Michael Chevalier, the French observer, wrote:

Tall, slender, and light of figure, the American seems built expressly for labour; he has no equal for despatch of business. Nobody also can conform so easily to new situations and circumstances; he is always ready to adopt new processes and implements, or to change his occupation. He is a mechanic by nature; among us there is not a schoolboy who has not made a vaudeville, a ballad, or a republican or monarchial constitution; in Massachusetts and Connecticut, there is not a labourer who has not invented a machine or tool.¹

Jedediah North was one such Connecticut laborer. Though he did not invent any tools, North made many—indeed, thousands. Jedediah North was a tinners' toolmaker who lived and worked in East Berlin, Connecticut, in the first half of the nineteenth century. North not only made tools for local tanners, but for tanners in other states as well. In his forty-year career, North shipped tools to practically every state east of the Mississippi River. Tanners in every part of the country praised the quality of his tools, and ordered many.

To make tinware, tanners needed tools. The demand for tinware in America in the first half of the nineteenth century cannot be
overemphasized. Americans used more tin-plate, per capita, than any other country in the world. As Philip Flower wrote:

The Dutch or Irish emigrant far away in his tent on the boundless prairies of the West, the boatman barging down his cotton over the bosom of the Mississippi, the Father of the Waters, the rough miners of Nevada fighting nature to extract the virgin silver from the heart of the Rocky Mountains, all require tin-ware in its rudest form, a tea-pot, a kettle, a pannikin, a wash-bowl, and requiring them are well aware that they will find them ready when desired at the nearest country store.2

And as John Banvard, the panoramist, wrote in 1847:

We have seen a large tinner's establishment floating down the Mississippi. It was a respectable manufactory; and the articles were sold wholesale and retail. There were three apartments, and a number of hands. When they had mended all the tin, and vended all that they could sell in one place, they floated on to another.3

In her book, Antique Tin & Tole Ware, Mary Earle Gould illustrates many different implements made of tin, such as roasting and bisquit ovens, fire pans, coffee-bean roasters, foot-warmers, lanterns, tool boxes, graters, sausage guns, butter churns, milk cans, cookie and pudding molds, coffee pots, bedpans, lamps and lanterns, sconces, candlemolds, trays, and hearing trumpets.4 In addition, the catalog of the Dover Stamping Company for 1869 illustrates plates, pie pans, document boxes, coal scuttles, oil cans, dustpans, toys, and tubs.5 Another important use of tinplate was in making tin roofs. As Flower noted: "Tin weighs 1/10 that of
slate, and when painted, will last for years."\(^6\) Uses for tinplate in the nineteenth century seem many, if not endless. Certainly the immense popularity of tinware encouraged many young men to become tinsmiths. And tanners needed tools.

Jedediah North (1789-1855) began his career as a blacksmith, not as a toolmaker. Two factors—North's family, and the central Connecticut area where he lived—probably influenced Jedediah North's decision to become a blacksmith, and later, a manufacturer of tanners' tools. North's grandfather, also named Jedediah (1734-1816), fathered two metalworkers: Simeon (1765-1852), and Levi (1760-1846).\(^7\) The elder Jedediah North was a blacksmith and church elder, but little is known about his career.

Of the North metalworkers, Simeon has deservedly received the most attention. Starting his career as a scythemaker, Simeon experimented with making pistols. In 1799, he received a government contract to make 500 pistols within a year. Simeon delivered according to schedule, probably because he used the system of interchangeable parts. Eli Whitney, also from Connecticut, is given credit for devising the system of interchangeable parts and used the system to manufacture rifles. Simeon North adopted the system to pistol manufacture, and in 1813 recommended that interchangeable parts be a specification of a Federal contract he eventually won.\(^8\)

Simeon's brother, Levi (1760-1846), has received less attention. Though a blacksmith by trade, Levi is known more as a
patriot, because of service during the Revolutionary War. Little else is known about him. He is recorded in the Federal censuses of 1790, 1800, and 1810, and in 1817 he is listed as one of twenty Berliners assessed $100 to help raise money following the War of 1812. In 1822 Levi is listed as a member of the Third Church (Congregational) in Berlin and Giles Curtis lists North as a blacksmith and nailmaker in his account book for the years 1795 to 1805.

The brief genealogical sketches are included to show that perhaps from his grandfather, Jedediah, and his father, Levi, Jedediah North (1789-1855) inherited strong religious convictions, a sense of responsibility to his community, and the interest and skills necessary to work with metals. Indeed, his sixty-three year life centered around church, community, and business.

It is certainly clear that Jedediah North shared the deep religious convictions of his great-grandfather, grandfather, and father. In 1822, he is listed with his wife and family as a member of the Third Church in Berlin. Sometime after 1822, North became a member of the Second Church, also in Berlin, because he is listed as a committeeman of that church from May 5, 1848, to his death in 1855. Two graphics listed in the inventory of his estate are "1 Last Supper," valued at twenty-five cents, and "1 Portrait of Washington," also valued at twenty-five cents.
Entries in North's account books also indicate his interest in religious affairs. On January 4, 1836, a Monday, North took half a day from work to attend a prayer meeting. On February 22, 1838, and May 4, 1838, both weekdays, North took time from work to fast. In September, 1838, North took a half day from work to attend a "Sabbath School Union" meeting in Newington. On April 1, 1839, North bought a family Bible for $1.75. Considering that a toolmaker earned about $1.50 a day, the price of the Bible was equal to more than a day's wages. After stating that paying by day, the English custom, prevailed in America, Chevalier noted why a mechanic, like North, included time taken from work in his account book: "To everything of a private nature, to everything that takes up his time and demands his attention, he applies the mercantile principle, nothing for nothing."

Few of North's letters remain, and most that do contain references to religious matters. Perhaps none is more poignant than the letter North wrote in 1841, from Coventry, Ohio. Jedediah North traveled from Connecticut to Ohio to visit his daughter, Emily, who was ill. The trip took more than a week. A few days prior to her father's arrival, Emily died at age twenty-four. Stunned, and full of grief, North wrote to his children in Berlin, "...shall we complain, no, we will not. God had made known his will...." Unquestionably, North was a deeply religious man.
Jedediah North also shared his father's and grandfather's sense of responsibility to community. With his father, he is listed among twenty Berliners who helped raise money, in 1817, for victims of the War of 1812. It is not known whether Jedediah North held any civic offices, but he did take time from his business to vote, "visit school," attend a temperance meeting, and to attend an anti-slavery convention. Because so much of North's non-business time was devoted to his church and community, it is necessary to mention his involvement. But the greatest portion of his adult life was devoted to his business.

Members of his family played as important a role in Jedediah North's business life as in his personal life. Most important was Edmund North (1797-1874), a younger brother, who worked as a journeyman blacksmith in New York City in the 1820's. At about the same time, according to correspondence, Jedediah's growing tool business forced him to look for experienced workers. In 1825, Edmund became Jedediah's partner, and the company was simply called: "J. & E. North Manufacturing Company." Jedediah and Edmund remained partners until Jedediah's death in 1855, when Edmund renamed the company: "E. North Manufacturing Company."

Through marriage there were connections between North and other toolmaking families. In 1813, Jedediah North married Betsey Bulkeley (1794-1867) of Wethersfield. William Bulkeley, Betsey's
brother, apprenticed with North, and later started his own
tinners' toolmaking company in East Berlin. William Bulkeley
was one of two competitors, the other being the Roys & Wilcox
Company. Julia North, one of Jedediah's younger sisters, married
Titus Penfield. North employed Penfield, who was among his most
productive workers. North cousins, who settled in Otsego, Delaware,
Broome, and Wayne Counties in New York State, and Cumberland
County, Maine, were other peripheral family members involved in
the tinworking industry. These cousins ordered tools from North,
and apparently were active tinners.

Family influence counted most for North's decision to become
a blacksmith like his father and grandfather. But living in central
Connecticut probably helped with North's decision to specialize
as a tinners toolmaker. Central Connecticut--Berlin in particular--
was the most important tinware producing area in the United States.

In 1738, Edward Pattison, a tinsmith from Ireland, settled in Berlin,
and introduced tinware to his neighbors. Light, inexpensive, and
easy to clean, tinware quickly became popular with housewives, and
demand for it grew. Pattison trained others to fashion tinware,
and by 1760, Berlin tinsmiths supplied tinware to housewives in
other colonies. 19

Tinners needed tools. Local blacksmiths supplied their
needs, probably by copying imported tools such as those Pattison
brought with him. In his History of New Britain, David Camp notes that in the decade following 1770, James North "made augurs, brads, bridle bits, etc., and repaired tools." According to Margaret Coffin, in the decade following 1800 there were "twelve tin shops, six tinner's tool shops, and one shop for stamping tin and copperware in Berlin." By 1850, according to the Federal census, Berlin had four active tinner's tool companies.

There was, of course, a direct relationship between the rise of the Berlin tinner's tool industry and the growth of the town's tinware industry. That Berlin supported four to six tinner's tool shops in the first half of the nineteenth century is more a result of chance--Pattison's settlement--than of design. Berlin was in an adequate, but by no means ideal location to support a tinner's tool industry.

Consider the disadvantages to Berlin's location as a toolmaking center. Coal, charcoal, iron, and steel are needed to make tools. Initially, North could order raw materials from the central Connecticut area. Berlin neighbors supplied coal and charcoal; Hartford merchants supplied ferrous metals. But as his need for raw materials expanded with his business, North was forced to turn to suppliers in New York for his ferrous metals, and at least on one occasion, to suppliers in Pennsylvania for anthracite coal. By 1825, North ordered coal from Vermont, and
experienced the difficulty of distance from source. As Truman Alderman, North's coal supplier in Vermont, wrote: "it is a very hurrying time about business," and when "people gits out of their hurry a little i will do my best to send you some Coal." Importing raw materials was expensive, and Berlin's location was less than ideal for a tool business.

Also, as population beyond the Hudson River increased, North relied more on supplying distant tinners than local ones. A year after Jedediah's death, Edmund wrote that New York was the company's major market. Shipping costs raised tool prices, and made them less competitive. Shipping time became a factor that made Berlin tools less competitive. Boats were inexpensive and reliable, but not always a rapid means of shipping tools. Time was money, and a tinner could ill afford to wait for a shipment of tools. As early as 1824, William Pratt, of Granby, Connecticut, canceled an order for a Mr. Reynolds, of North Carolina, saying: "Mr. Reynolds has bought tools where he resides." In the course of his career, North was to have increasing competition from rural toolmakers. For North and his tool business, the disadvantages of Berlin's location were: distance from raw material sources; and, especially after 1850, distance from the greatest concentration of tinners.
More important were the advantages of Berlin's location as a center for the tinner's tool industry. Berlin is almost ten miles of being halfway between New York and Boston. Joining these two large cities was a road, which Edward Kendall, the English traveller, described as being exceedingly good, carried over an undulating surface, clothed with wood and pasture. In the first half of the nineteenth century, few roads were "exceedingly good," and the apparent good condition of the road cannot be overstressed. North's factory was less than a mile from the Boston-New York road. From Hartford there was another good road to Hudson, New York, and a not-so-good road to Hanover, New Hampshire. Considering the condition of most roads in the early 1800's, Berlin was in a favorable location for overland travel.

Berlin was also in a favorable location for water travel. Middletown, Connecticut, is six miles east of Berlin. In the early 1800's, ocean-going vessels could sail up the Connecticut River as far as Middletown, where, according to Catherine North, two, four, and six-horse teams would haul goods to Berlin. From Middletown and New Haven, coastal packets regularly sailed to New York. In 1830, steamboats sailed from Hartford to New York four times weekly. They also sailed to other ports, but less frequently.
Railroads served Berlin. In 1839, the Hartford & New Haven Railroad was completed, and its Berlin depot was about four miles from North's factory. By 1844, the railroad was completed to Springfield, Massachusetts, and by 1848, to New York City. By 1856, and probably earlier, the Middletown Railroad connected Berlin and Middletown, and passed within a mile of North's factory. Thus, North could choose among different means of regularly scheduled transportation to ship his goods. If a customer needed goods immediately, North could ship by stage, or after 1840, by railroad. If a customer in Ohio, or along the Mississippi River Valley needed tools, North could ship via New York City and New Orleans, using coastal packets and Mississippi riverboats. This he did in 1832 when he shipped tools to Oliver D. Filley in St. Louis. Adequate means of transportation were available to North.

The Mattabessett River runs through Berlin, and provided a small but reliable power source for North's factory. In addition to his tool factory, North operated a mill, probably similar to the one William Imlay built in Hartford (Fig. 1). The location of East Berlin, Connecticut, provided many advantages for the operation of a tinner's tool industry. Not only could North supply the tinner who worked in central Connecticut, but adequate means of transportation enabled him to furnish tinner's living in practically every other State. North seemed to have little trouble attracting and training
workmen, for skilled workers were assured steady employment at decent wages. For North and his tool business, the advantages of Berlin's location were proximity to a high concentration of local tinsmiths, adequate means to ship tools to distant customers, a reliable power source, and the availability of skilled workmen.

Advantages of location apparently outweighed disadvantages, as North's tool business remained active and productive throughout his career. Only after 1850 did North feel the result of serious competition, which came from American makers outside central Connecticut. Prior to 1850, there seemed to be specialization among makers in central Connecticut. Jedediah North specialized in hand tools; William Bulkeley, of East Berlin, specialized in circular shears, a type of machine; Roys & Wilcox, of East Berlin, specialized in a general line of hand tools and machines; and Peck and Stow, of Southington, specialized in tinniers' machines.

Tinsmiths in America used a greater variety of tools than their counterparts in Europe, and American makers best supplied American needs. Though American and European tinsmiths used certain hand tools in common, there were significant differences in the composition of American and European sets which must be discussed.
CHAPTER ONE

FOOTNOTES:


3John Banvard, Banvard's Geographical Panorama of the Mississippi River, With the Adventures of the Artist (Boston: John Putnam, 1847), p. 38. On the same page, Banvard goes on to say: "We have heard of a large floating blacksmith's establishment: and of another, in which it was contemplated to work a trip hammer."


6Flower, p. 181.


9Dexter North, p. 31.

10Margaret Coffin, History and Folklore of American Country Tinware, 1700-1900 (Camden, New Jersey: Nelson, 1968), p. 84.


14. Inventory of Estate of Jedediah North, Joseph Downs Manuscript and Microfilm Collection (hereafter DMMC), MS 54x93, Winterthur Museum.

15. Daybook No. 3 of Jedediah North, 1826-1840, DMMC, MS 54x93, p. 67.


17. Jedediah North to his children, Coventry, Ohio, August 20, 1841, DMMC, MS 54x93.

18. Ibid.


22. Truman Alderman to Jedediah North, Burlington, Vermont, October 17, 1825, DMMC: 54x93.244.


24. Edward A. Kendall, Travels through the Northern Parts of the United States in the Years 1807 and 1808 (New York: I. Riley, 1809), I, p. 121.


CHAPTER TWO

TINNERS' TOOLS AND THEIR MANUFACTURE

Regardless of where or when he worked, the tinner used tools to cut, shape, and solder tinplate into an almost endless variety of objects, such as those mentioned in Chapter One. The composition of a tinsmith's tool set determined what he made. The variety of objects a tinsmith could economically make increased with the variety of his tools.

Though both contained tools in common, American and European sets differed in composition. Between 1771 and 1860, three distinct types of tool sets were in use, which this writer has designated as the European set, the American hand set, and the American machine set. The European set was in use from about 1771 to 1860, the American hand set from 1771 to 1900, and the American machine set from about 1804 to 1900.

In 1837, James Lightbody and James Campbell, appraisers for the estate of New York tinsmith John A. Young, listed "1 Set of Yankee Tools," valued at $17.50, and "1 Set Yankee Machines," valued at $60.00, in Young's inventory. How widespread was the use of...
"Yankee tools" and "Yankee machines" to describe hand tools and machines is not known. Nor is it known whether "Yankee" refers to tools of American or New England origin. It is apparent that the appraisers, neither of whom is listed as a tinsmith in New York directories, distinguished between what were probably hand tools, and machines.

The European set is best illustrated in Diderot's chapter on the ferblantier, or tinsmith\(^2\) (Fig. 2). Tools illustrated by Diderot are those one might expect to find in a tinner's shop, namely: bench and hand shears, several different types of stakes, punches to pierce and decorate, and a soldering iron and flux for fastening pieces of tinplate. Tools in the European set are what a tinner needed to make many different everyday utensils, and are the tools most people associate with the tinner's trade.

The tools that Diderot illustrated apparently were typical of those found in other European tin shops. In 1828, Johann Krünitz, the German encyclopedist, illustrated tools commonly found in shops of klempteners, or tinsmiths. Though Krünitz illustrates fewer tools than Diderot, the similarity between the two sets is apparent, and most important, the types of tools are virtually identical\(^3\) (Fig. 3). There is a pair of shears, a soldering iron and flux; and there are different types of shaping stakes and solid
punches. If any new tool forms were introduced in Europe in the fifty years after Diderot published his chapter on the ferblantier, they are not apparent in Krüütz's chapter on the klempener. One can only assume that no new tool forms gained widespread popularity among European tinners between 1771 and 1828.

Information in Charles Tomlinson's Illustrations of Useful Arts & Manufactures supports this assumption. Tomlinson illustrated a typical English tinner's shop and tools of about 1860 (Fig. 4). The only new forms represented were hollow punches. Otherwise, the tools that Tomlinson illustrated were similar to those found in Diderot and Krüütz. There still was an assortment of stakes, bench and hand shears, a soldering iron, and a hammer.

Non-illustrated sources seem to support pictorial evidence that English tinners used only basic tools. To quote Thomas Martin in 1813:

The tin-plate worker, a trade well known in London, and all large towns, receives tin-plate in sheets, and it is his business to form them into various articles of domestic use which are known to everybody. The principle instruments that he makes use of are a large pair of fixed shears, to cut the tin to the proper size and shape, a polished anvil, and hammers of various kinds, some of which are highly polished on the surface.5

Tomlinson was more explicit in his description of tinners' tools and their uses, but nowhere did he mention new tool forms, or tools
different than those in Martin. And Tomlinson illustrated tools whose forms were almost identical to those in Diderot.

In Europe, then, between 1771 and 1860, a typical set of tinner's tools consisted of bench and hand shears, creasing stakes, shaping stakes, hammers, solid punches, and a soldering iron and flux. The only new form was possibly the hollow punch, illustrated in 1860. But remember that the writer gleaned information about European tinner's tools from encyclopedias, not business records, which were unavailable.

Because of availability, the writer used business records to construct the composition of the typical set of American tinner's tools. Business records provide a more complete source than encyclopedias, and because of that fact, perhaps the comparison to be made between European and American sets is not fully justified. A business record found to be useful was a letter Jedediah North wrote to an agent in New York City, in which North listed what this writer has designated as the typical American hand set of tinner's tools:

<table>
<thead>
<tr>
<th>Prices: Creasing Stake</th>
<th>3.25</th>
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<tbody>
<tr>
<td>Large Stake @ 28¢ per pound</td>
<td>12.00</td>
</tr>
<tr>
<td>Blow Horn + Funnel Stake</td>
<td>3.25</td>
</tr>
<tr>
<td>Square Stake</td>
<td>2.25</td>
</tr>
<tr>
<td>Candle Mould Stake</td>
<td>1.80</td>
</tr>
<tr>
<td>Needle Case Stake</td>
<td>1.80</td>
</tr>
<tr>
<td>5 Hollow Punches one Sett</td>
<td>4.50</td>
</tr>
</tbody>
</table>
As might be expected, North listed tools common to the European set, including creasing and shaping stakes, a hammer, and a pair of shears. But North also listed tools not mentioned in European sources, such as hollow punches, a creasing swedge, and a combination coffee pot and colander swedge. While the differences between European and American hand sets may seem few, they are important. Hollow punches, for instance, enabled the American tinner, whether experienced or not, to quickly cut a circle of uniform diameter, much as a baker uses a cookie cutter to cut dough. Without that tool, the European tinner laboriously cut each circle with shears.

Not only did North list hollow punches, but as optional items, he offered "Large oval Hollow Punches 3 1/2" x 2 1/2" for Teapots 2.75, half oval punch for Teapots 2.75, Tumbler punch 2.25, 3 punches for Molasses cup $4.00, Punch for bread pans 75 cents, Hinge punch 50 cents each," and "2 inch punch $1.75." North made a punch...
for every purpose, which gave his clients leeway and variety in the types of articles they made.

In addition to special purpose punches, North included in his set a variety of swedges. Swedges should not be confused with swages, though their purposes are similar. A swage (Fig. 5) is a two-part tool that fit into the tinner's bench. To use the swage, the tinner placed the tin between top and bottom of the swage, and struck the top half with a hammer, imprinting the design. A swedge (Fig. 6) is a shaping hammer attached to a long pivoting arm, that enables a tinner to quickly and uniformly shape tin. The swedge needed no striking implement, other than the force of the falling hammer.

The swedges North sold in his set were a creasing swedge, and a combination coffeepot and colander swedge. These tools enabled the American tinner to rapidly shape common household forms. North also made a "Wide Swedge for square pans $4.00," that the tinner could buy at option.8

A swage acts as a die, and is used to ornament tinware. English tinners used swages, as is evident in the 1842 edition of Penny Cyclopaedia:
The art of tin-plate working, or of forming sheets of tinned iron into an almost endless variety of useful objects and utensils, depends more, observes the author just cited, on the manual dexterity of the workman than upon any peculiarity in the tools which he requires, which are few and simple, consisting of bench and hand-shears, mallets and hammers, steel heads and wooden blocks, soldering iron and swages.9

More important than mentioning swages, Penny Cyclopaedia credits English manufacture of tin articles with the "manual dexterity of the workman," not "any peculiarity in the tools which he requires." In the English tradition, then, skill was more important than tools. In America, just the opposite occurred. In America, tools were more important than skill, which explains why the American hand set contained a greater variety of tools than did the English set. English tanners used swages to ornament, not fabricate. American tanners used swedges to form basic shapes, and not necessarily to ornament.

Hollow punches and swedges enabled the American tinner to make a greater variety of objects more efficiently than shears and shaping stakes enabled his counterpart in Europe. But by using a third type of tanners' tool set, designated by this writer as the American machine set, the American tinner could surpass anything in efficiency anything the European tinner could do. That two American tanners, Eli Parsons and Calvin Whiting, first developed tanners' machines, supports Richard Shryock's feeling that Americans are most successful with elements of technology applied to specific
limited usage. Consider how specific is the wording of the patent awarded to Parsons and Whiting in 1804, described as:

A pair of rolling shears, for cutting sheet tin, a Sweep Gage, used for holding tin plates, while cut into circular forms, also for holding them while the edge is turned to form the bottom of the vessels; a Machine for turning said edges; a Machine for giving a second turn to the said edges of the bottoms; a Machine for locking the sides and edges together; a Machine for giving the second turn for wiring; a Machine for completing the operation of wiring by closing the edge around the wire; a Machine for turning the edges together after they are turned, and a Machine for burring or turning the lower edges of the vessels to receive the bottom.

In summary, Parsons and Whiting developed circular shears, a burring machine, a setting down machine, and a wiring machine. The importance of their inventions to American tinners cannot be overemphasized. Using machines, according to Parsons and Whiting, a tinner could "save three fourths of the labor necessary in any other mode of working tin plate before practised." Equally important was the fact that a vessel wired by machine was neater and more uniform than one done by hand. By contrast, consider Penny Cyclopaedia's description of the English method of wiring: "tin vessels are strengthened by bending a thick wire and dexterously folding the edge over with a hammer." Compared with the American machine practice, the English hand-method seems hopelessly cumbersome.
To appreciate "dexterity," as implied in *Penny Cyclopaedia*, the reader might try bending a piece of tin around a coat hanger using only a hammer and chisel.

Circular shears was another machine described in the patent. It enabled the American tinner to rapidly cut neat and uniform circles. Circular shears freed the tinner from the time needed to scribe a circle, and cut the circle with hand shears. Using circular shears, the American tinner need only adjust the machine to the circle he wanted, put the tinplate under the round blade, and cut. The operation was similar to the present method of using a wall or electric can opener to open a can, except that circular shears are much larger than an electric can opener.

As stated in the patent, a burring machine shapes the bottom of a vessel to receive sides. As with other machines, uniformity, speed, and neatness were important factors explaining the success of the burring machine. With simple adjustments, the burring machine could be used for other shaping requirements.

Other machines American tinners used, and not described in the Parsons and Whiting patent, included formers--devices that shaped flat tin into cylinders for vessels and pipe; double seamers--devices that sealed, or seamed joints; folders--devices that formed
angles in flat tin; and grooving machines--devices that beaded or grooved tinplate to increase its strength (Fig. 7).

It is unfair to deny English inventors credit for devising some tinworking machines. *Penny Cyclopaedia* illustrates a brake, or folder, that earned J. Bassett, of Birmingham, its inventor, a gold medal from the Royal Society in 1831 (Fig. 8). *Penny Cyclopaedia* states that the "most usual way of forming laps is to lay the plate on the edge of the bench and bend with repeated blows of the hammer." Bassett designed his machine to relieve English tinsmiths of this boring task. But the weaknesses of Bassett's machine are apparent: it could accept metal of only a limited thickness; it could bend metal to cylinders of only limited diameters; and the machine was awkward to operate because the tinner had to remove the handle in order to release the shaped tin from the cylinder.

Unlike Bassett's machine, American formers and folders accepted metal of different thicknesses, and with greater ease. Depending on how much tension the worker applied to the tension screw, which was easy to adjust, the American former could shape tinplate into cylinders of almost infinite diameter. To remove his stock, the American tinner merely lifted the upper of three rollers, and slid the stock out. The operation was quickly and easily accomplished. After evaluating surviving evidence, this
writer concludes that the most successful innovations in tinworking machines were made by American, not European, inventors.

In addition to Parsons and Whiting, tin machine inventors included Seth, Orrin, and Noble Peck of Southington, Connecticut, Edward Converse, Peck's partner and Orson and Solomon Stow, of Plantsville, Connecticut. Seth Peck originally sold Parsons and Whiting machines, but quit, and formed his own tinners' tool company in 1819. By 1843, Peck offered a variety of machines--illustrated in a broadside in DeVoe--that constituted what the writer has designated the American machine set:

Prices for O. & N. Peck's Machines

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Set</td>
<td>$90</td>
</tr>
<tr>
<td>Folding Machine</td>
<td>15.50</td>
</tr>
<tr>
<td>Grooving, do.</td>
<td>12.25</td>
</tr>
<tr>
<td>Setting down, do.</td>
<td>9.75</td>
</tr>
<tr>
<td>Wiring, do.</td>
<td>11.50</td>
</tr>
<tr>
<td>Large Turning do.</td>
<td>8.50</td>
</tr>
<tr>
<td>Small do. do.</td>
<td>8.50</td>
</tr>
<tr>
<td>Large Burring do.</td>
<td>8.00</td>
</tr>
<tr>
<td>Small do. do.</td>
<td>8.00</td>
</tr>
<tr>
<td>Extra faces for Machines</td>
<td>8.00</td>
</tr>
</tbody>
</table>

$90.00

Extra faces can be added or not at the option of purchaser; they will be sent however unless otherwise ordered.

Inventor enthusiasm for machines is understandable. As Whitney said of his folder: "Turns a lock 1/16 to 1/4 inch in width; requires but one motion, and is the greatest labor-saving
Folder ever invented." Advertisers also shared the enthusiasm for machines. The Dover Stamping Company was proud to say of Spaulding's Patent Double Seamer: "All ordinary TIN WORK, such as COFFEE-POTS, or other flaring work, MILK-PANS, CANS, PAILS, DIPPERS, WASH-BASINS, & c, can be Double Seamed far MORE RAPIDLY, very much better, and by workmen who have LITTLE OR NO EXPERIENCE." 

Rather than stressing skill, as did English encyclopedists in describing native born tanners, American merchants and toolmakers stressed that workmen needed little skill to operate tinner's machines. The quality of the product made with the aid of these machines and the ease of production was also stressed. As a result, sales and use of machines proliferated in America, but apparently did not in England. The popularity of tanners' machines in America—but not in England—supports Robert Woodbury's contention that the highly specialized machine tool was distinctly American.

Though there are differences in composition between European and American tool sets, the materials and methods European and American toolmakers used to make tools were the same. Raw materials necessary to make tanners tools were iron, steel, coal, and charcoal. The toolmaker could choose among different types of ferrous metals from which to make his tools, and Abraham Rees's Cyclopaedia indicates which metals were best-suited for specific tools:
The cheapest edge tools are usually made of blistered shear, spur, or star steel united with iron.... Clothiers' shears, firmer chisels, plane irons, coopers' adzes, scythes, reaping hooks, and large knives are made with shear steel. Cast steel is used for the best penknives, scissors, and razors; and fine saws, surgical instruments, and all edge tools which require a fine polish, and various other implements employed in cutting iron, are all made with cast steel.19

In his _Mechanic's Companion_, Peter Nicholson described how to make "English Cast Steel":

The _Cast Steel_ of England is made as follows: a crucible about ten inches high, and seven inches in diameter, is filled with ends and fragments of the crude steel of manufactories, and the filings and fragments of steels works; they add a flux...This crucible is placed in a wind furnace, like that of the founders, but smaller, because intended to contain one pot only. It is likewise surmounted by a cover and chimney, to increase the draught of air; the furnace is entirely filled with coke, or charred pit-coal. Five hours are required for the perfect fusion of the steel....It is then forged in the same manner as other steel, but with less heat and more precaution.20

And _Appleton's Cyclopaedia_ described which steel was most suitable for welding:

For the majority of works in which it is necessary to weld steel to iron, or steel to steel, the shear, or double shear, is exceedingly suitable; it is used for welding upon various cutting tools, as most cast-steel will not endure the heat without crumbling under the hammer.20

The previous quotations are included to show that there were many different types of iron and steel, and that some types were better
suited for edge tools than others. Jedediah North ordered several different types of ferrous metals, including Russia iron, Swedish iron, German steel, and English steel. Nicholson further explained the difference between English and Swedish iron:

...our wrought iron English also of late has been much improved in the manufacture, and by many persons is thought not to be decidedly inferior to that of Sweden, which till lately had a decided preference, and is to be attributed to the use of charcoal in the process of smelting, which cannot be procured in sufficient quantity in England, where pit coal has of necessity been substituted.22

Though descriptions of the quality of German steel conflict, the quality of German steel North ordered was probably equal to that of English steel, for both cost the same. A receipt dated January 20, 1825, states that North bought from David Watkinson, a Hartford metal dealer, "1391b. best German Steel @ 14 1/2 Cts $20.16," and "18 1/2 lbs. best English steel @ 14 1/2 cts 2.69"23 Unfortunately, Jedediah North never explained which metal he preferred for specific purposes. Neither did he ever explain the step-by-step process he used to make any of his tools.

For information about how tools were made, it is necessary to look to sources other than North. One source is Denis Diderot, who is his chapter on the taillandier, or toolmaker, explained how French toolmakers in the eighteenth century made tools. Though
Diderot illustrated the making of no tinner's tools per se, some tools illustrated are similar enough that one can assume that the methods used were similar to those used in making tinner's tools.

In Plate III of that section, for example (Fig. 9), Diderot illustrated three important steps needed to make a pair of shears. Diderot explained that the toolmaker first "roughed" the shape of one blade, or arm. After that step, Diderot explained that the toolmaker opened the cutting edge to receive a piece of steel, and finally, Diderot explained that the toolmaker forge-welded the steel cutting edge to the face of the blade. After grinding and polishing, the toolmaker attached both blades of the shears.

In the same plate, Diderot illustrated the steps used in making round and square shaping stakes. The toolmaker started with round and square pieces of iron, to which he welded a steel face, using "teeth" on the steel face to grasp the iron body much as a jeweler today uses the prong on a ring to grasp a diamond. After forging, the stakes were ground and polished. In his first plate, Diderot illustrated the steps used in making an anvil. Essentially, the toolmaker shaped iron stock, then welded a steel face to an iron body. In summary, the toolmaking technique Diderot illustrated is that the toolmaker shaped iron stock, and added steel to the area or edge that would receive the most wear. This he did for the shears, shaping stake, and anvil.
Because blowhorn stakes are similar to anvils, and shaping stakes and shears are identical to those tinner's used, the steps Diderot illustrated for making these tools were probably similar to those Jedediah North used to make tinners's tools. Though evidence of metals that North ordered is limited, existing receipts and entries in his account books suggest that North ordered much more iron, English and German steel, than cast steel. Accordingly, North probably faced iron stock with cast steel rather than making the entire tool of cast steel.

Making tools was more time consuming and difficult than Diderot and this writer implied in preceding paragraphs. The iron or steel had to be repeatedly heated and forged, and the process took more time than possibly is apparent. Forging and welding temperatures were important, as explained in Appelton's Cyclopaedia:

In forging iron or steel, the metal is in almost every case heated to a greater or less degree, to make it softer and more malleable by lessening its cohesion.... Of steel, shears-steel will generally bear the highest temperature, blistered steel the next, and cast steel the least of all; but of all these kinds, especially cast steel, differ very much according to the processes of manufacture, as some cast-steel may be readily welded, but it is then somewhat less certain to harden perfectly. The smith commonly speaks of five degrees of temperature, namely: The black-red heat, just visible by daylight; the low-red heat; the bright-red heat, when the black scales may be seen; the white heat, when the scales are scarcely visible; and the welding heat, when the iron begins to burn with vivid sparks. Steel requires, on
the whole, very much more precaution as to the degree of heat than iron; the temperature of cast-steel should not generally exceed a bright-red heat, and that of blistered and shear-steel, a white moderate heat.24

Repeated heating and working of the iron and steel took time, and just how much time is explained in entries in Jedediah and Edmund North's account books. The Norths paid their workers either by hour, by day, or by piece, according to the task accomplished. In the five years following 1850, the basic hourly rate for journeyman toolmakers was fifteen cents. For routine work, the Norths paid a dollar a day. The piecework rate varied according to the tool forged or finished. The following examples tell the reader approximately how much time was needed to make various tinners' tools. For a more complete list of labor costs involved in making tools, see Appendix A. Because the basic hourly rate was fifteen cents, the time needed to forge and finish each tool was probably the maximum time. It is this writer's opinion that piecework rates provided enough of an incentive for a toolmaker to complete his task in minimum time. Unfortunately, business records are too incomplete to indicate precisely how much time a worker needed to forge or finish a tool when paid according to the piecework rate. The following is a schedule of payments Jedediah and Edmund North paid to Hiram Morgan in 1851 and 1852:
At fifteen cents an hour, a pair of No. 5 shears would take a few minutes more than four hours to forge, as would a pair of No. 4 shears. A pair of No. 3 shears would take almost six hours to forge. Blowhorn stakes took about five hours to forge, but square stakes took only about two hours, and creasing stakes about two-and-a-half hours. And forging was only one operation in making a tool. The forged tool needed to be ground and polished, or finished.

The following examples tell the reader approximately how much time was needed to finish tools that had already been forged. An entry in a North account book reads:

1851

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Pairs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 21</td>
<td>By forging 26 pair No 5 shrs</td>
<td>62</td>
<td>16.12</td>
</tr>
<tr>
<td>Aug 23</td>
<td></td>
<td>62</td>
<td>14.88</td>
</tr>
<tr>
<td>Sep 27</td>
<td></td>
<td>88</td>
<td>27.88</td>
</tr>
<tr>
<td>Nov 18</td>
<td></td>
<td>75</td>
<td>23.25</td>
</tr>
<tr>
<td>Decr 8</td>
<td>11 Blowhorn Stakes</td>
<td>75</td>
<td>8.25</td>
</tr>
</tbody>
</table>

1852

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Pairs</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jany 10</td>
<td>29 Square</td>
<td>30</td>
<td>37.50</td>
</tr>
<tr>
<td>Feb 11</td>
<td>71 Do</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot; 24</td>
<td>102 No 1 Raising hmr</td>
<td>27</td>
<td>27.54</td>
</tr>
<tr>
<td>&quot; 406 1/2 hours work from May 1851 to Feb 28 1852 - at 15 cts</td>
<td></td>
<td>60.97 1/2</td>
<td></td>
</tr>
<tr>
<td>Apr 28</td>
<td>forging 86 Blowhorn Stakes</td>
<td>75</td>
<td>64.50</td>
</tr>
<tr>
<td>May 22</td>
<td>55 Creasing Do</td>
<td>37 1/2</td>
<td>25.78</td>
</tr>
<tr>
<td>&quot; 192 1/2 hours work from March 3 to July 3 -</td>
<td></td>
<td>28.87 1/2</td>
<td></td>
</tr>
</tbody>
</table>

334.95
Julius W. Burr
1851

Sep 1  By finishing 2 Pair No 4 Shears  75  1.50
   " " 3 " No 3 "  88  2.64
2 " " 3 " 5 "  62  1.86
   " " 2 " 4 "  75  1.50
   " " 1 " 6 "  .49
" 3 hours work on case hardening box  .45  27

Another entry reads:

William A. Mildrum
1852

July 8 By finishing 3 Square Stakes  15 1/2  .46
   " " 3 Candlemould Do 31 1/4  .94
   " " 2 Blowhorn " 57 1/2  1.15
   " " 2 Needlecase " 20  .40
   " " 25 Sets + headers  6  1.50

At fifteen cents an hour, finishing a pair of No. 6 shears would take a little more than three hours; No. 5 shears, four hours; No. 4 shears, five hours; and No. 3 shears, almost six hours. At fifteen cents an hour, finishing a square stake would take an hour; a candlemold stake, about two hours; a blowhorn stake, about four hours; a needlecase stake, about two-and-a-half hours; and a rivet set and header, about a half-hour.

To finish shears, then, would take about as much time as forging them; while finishing stakes took from one-half to four-fifths the time needed to forge them. The total time needed to make a pair of No. 3 shears was about twelve hours; No. 4 shears, about ten hours; No 5 shears, about eight hours; and No. 6 shears, about
seven hours. The total time needed to make a blowhorn stake was about nine hours; and a square stake, about three hours. Making tools was a time-consuming business. Though there is a pattern in the North account books indicating that toolmakers specialized in either forging or finishing, the same entries indicate that toolmakers could either forge or finish with equal facility. For example, one entry applies the term "making" to a toolmaker's forging and finishing a tool:

James R. Sanford
1852

Aug 12 By making 24 pair No 8 Shears 80 19.20
" " 3 " " 7 " 96 2.88
" Forging 1 " " 7 " 48 .48
" " 1 " " 9 " 34 .34
17 " " 2 " " 7 " 48 .48
27 " " 4 " " 7 " 48 1.92
Nov 12 " Making 1 " " 9 .".68 68 2/3 .69

The Norths paid James Sanford ninety-six cents to make a pair of No. 7 shears, and sixty-nine cents to make a pair of No. 9 shears. To forge these shears, the Norths paid Sanford forty-eight and thirty-four cents, respectively, or half the cost in making them. If shears cost as much to finish as forge, then the cost for making the completed product is consistent with what the Norths paid for different workmen to forge and finish other shears separately.

Considering that the wholesale price of No. 7 shears was $1.98, and the wholesale price of No. 9 shears was $1.30, the Norths had only $1.02 and fifty-nine cents, respectively, to pay for materials, other wages, overhead, and profit. Other tools had
similar low cost margins. There was little money to be earned in the tinner's tool business after the owner paid costs. A summary of the business history of Jedediah and Edmund North's tool factory is presented in the following chapter. The chapter will discuss the modest success of the North tool business.

When he started his tool business, Jedediah North had the choice of making hand or machine tools. North chose hand tools, and apparently never made machine tools on the scale of his competitors in East Berlin, Plantsville, or Southington. North seemed very much to be a toolmaker in the European tradition. Unlike the typical Connecticut laborer described by Chevalier, North never invented a tool or machine. He was content to conduct his toolmaking business in the same manner as the toolmaker in Diderot. In Risk and Technological Innovation: American Manufacturing Methods During the Nineteenth Century, Paul Strassmann states that technological innovation was a safe proposition in the first half of the nineteenth century, and that American manufacturers were eager for new machines. In retrospect, perhaps Jedediah North should have been more daring, and experimented with a new tool, or method. There is no evidence that he did.
CHAPTER TWO

FOOTNOTES

1Inventory of Estate of John A. Young, New York, New York, 1837, Joseph Downs Manuscript and Microfilm Collection (hereafter DMMC), 57 x 12.1. Winterthur Museum.


5Thomas Martin, Circle of the Mechanical Arts: Containing Practical Treatises on the Various Manual Arts, Trades, and Manufactures (London: Rees, 1813), p. 547. The London Encyclopaedia, published in 1829, is of little value as its paragraph on the tin-plate worker quotes Martin verbatim. Either the tools and trade of the tinsmith remained unchanged, or, more likely, London Encyclopaedia pirated Martin's chapters rather than incurring the expenses of researching the tinsmith's trade in 1829.


7Ibid.

8Ibid.                                                                                                                                 marginalized.

9Penny Cyclopaedia of the Society for the Diffusion of Useful Knowledge (London: Charles Knight, 1842) 42, 473.


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*Penny Cyclopaedia*, pp. 42, 473.

Ibid.


Ibid., p. 173.

Hindle, p. 5.


Nicholson, p. 275.


*Diderot, Plates IX, "Tailanderie."

Appleton's *Cyclopaedia*, I, pp. 818-819.

27 Ibid., p. 4.
28 Ibid., p. 91.
29 Ibid., p. 93.

CHAPTER THREE
JEDEDIAH NORTH AND HIS TOOL BUSINESS

In 1839, Michael Chevalier, the French observer already cited, noted that at age fifteen, an American started his business career; at age twenty-one, the American was established; and that at age twenty-two, the American took a wife and started a family.¹ Jedediah North's early life approximated the typical American laborer that Chevalier described.

Though not documented, Jedediah North probably apprenticed with his father, Levi, who was a blacksmith. Assuming that North completed his apprenticeship on his twenty-first birthday, he began work as a journeyman blacksmith in 1810. At age twenty-three, North married Betsey Bulkeley, and Clarissa Amelia, the North's first child, was born fourteen months later, on May 9, 1814.

Little is known about apprenticing in the tinners toolmaking trade. One can find sparse information in William Bulkeley's "Book for Apprentices, being their rules and regulations for taking them with their prices." Actually, the title is misleading, as the book contains no specific rules or regulations, rather entries stating when apprentices arrived, and what Bulkeley paid them. The

39
significance of the book is that pay rates and terms of apprenticeship are probably similar to those North offered, considering William Bulkeley served his apprenticeship with North, and Bulkeley trained young men in the same town as North. The first entry is for December 1, 1825, and reads:

this day Benjamin G. Savage came to live with I. + W. Bulkeley as Apprentice at the rate of thirty eight Dollars per year the first Six Months ending 25th May 1826.

<table>
<thead>
<tr>
<th>Date</th>
<th>Period</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1826 May 25th</td>
<td>Six Months</td>
<td>$9.00</td>
</tr>
<tr>
<td>May 25th 1827</td>
<td>One Year</td>
<td>33.00</td>
</tr>
<tr>
<td>May 25th 1828</td>
<td>One Year</td>
<td>38.00</td>
</tr>
<tr>
<td>May 25th 1829</td>
<td>One Year</td>
<td>43.00</td>
</tr>
<tr>
<td>May 25th 1830</td>
<td>One Year</td>
<td>48.00</td>
</tr>
</tbody>
</table>

Benjamin's Apprenticeship ends 25th May 1830 171.00

The book lists yearly payments in accordance with the schedule, and notes that Savage completed his apprenticeship May 25, 1830. That a young man completed his apprenticeship on his twenty-first birthday is indicated in Bulkeley's account book: "1836 Sept 24th this day Settled with Horace Galpin and paid him in full for his apprenticeship he being twenty one this day - [signed] I + W Bulkeley/Horace Galpin." His apprenticeship, judging from those who completed theirs with Bulkeley, averaged fifty-four months. Ralph Sage completed his apprenticeship in the least amount of time—forty-six months. Oliver Ellsworth and Horace Galpin completed theirs in the longest time—sixty months.
In the eighteenth century, apprenticeships lasted seven years, or eighty-four months. That the longest toolmaking apprenticeship under William Bulkeley lasted only sixty months is an indication of the breakdown of the apprenticeship system, which occurred in the first half of the nineteenth century.

Considering Oliver Filley completed his apprenticeship in tinsmithing in three years, three months, and Joseph Brown completed his apprenticeship in tinware japanning in twelve months, an apprenticeship in tinners' toolmaking—by comparison—was a long one. And not all those who started as apprentice toolmakers completed their apprenticeships. If one were to judge from information in William Bulkeley's apprentice book, only eight of twelve, or 67 per cent, completed their apprenticeships. Of the four apprentices who left, William Sullivan stayed the longest amount of time—three years—and Stephen Stedman stayed the least amount of time—three months, two weeks.

Disregarding Sullivan, who stayed an unusually long time without completing his apprenticeship, the average time an uncompleted apprenticeship lasted was about four months, one week. Probably a young man quickly decided whether a toolmaker's career was suited for him, and either stayed or left. When a young man was unable to work, Bulkeley entered the fact in his book. William Macull went "home for 3 weeks," in 1837, and finally "left for good."
Bulkeley deducted wages for time not worked, but also apparently rewarded excellent work. When Merrell Roberts completed two years of his apprenticeship, Bulkeley "gave him $8=00 gratis," probably as a token for work well done.6

As stated, information from William Bulkeley's "Book for Apprentices" is included as an indication of the type of apprenticeship Jedediah North served. Other than occasional entries for payment of doctor or raw material bills, Jedediah North's account books contain no information about apprentices, or what North expected of them. Probably an apprentice's training included the practical aspects of running a business, as well as the art of toolmaking. A document in the Winterthur Library, Jedediah North's "Business Practise Book," helps explain this assumption.

As noted, there is little evidence of formal education for Jedediah North. By age twenty-one, he was literate, as evidenced by his account and daybook entries. North's "Business Practice Book," states principles of managing a business. Judging from a comparison of handwriting style and paper composition, North probably wrote the book between 1812 and 1825; and most likely nearer the earlier date.

Included in the "Business Practice Book" are chapters on "Practise, Tare and Trett, Interest, Discount, Fellowship, Barter,
Loss and gain, Double Rule of three, and Alligation. The "Business Practice Book" indicates formal preparation for the toolmaking trade in addition to learning the art of toolmaking. To be a successful businessman, a toolmaker needed to know how to figure interest, how to barter, and how to keep his books. The source for North's "Business Practice Book" was, in part, Nathan Daboll's Schoolmaster's Assistant. Not only does Daboll contain rules of simple arithmetic, but also chapters on "Practice, Tare and Trett, Simple Interest, Commission, Brokerage, Discount, Barter, Loss and Gain, and Double Rule of Three." Compare Daboll's and North's descriptions of "Discount." First, Daboll:

Discount is an allowance made for the payment of a sum of money before it comes due...What remains after the discount is deducted, is the present worth, or such as, if put to interest, would at the given time and rate, amount to the given sum debt.

Next, North in his Business Practise Book:

Discount is an allowance made for the payment of a sum of money before it comes due. What remains after the discount is deducted is the present worth or that sum which being put to Interest would at the given rate and time amount to the given sum or debt.

Accounting was a popular subject in Berlin, Connecticut. In 1836, Worthington Academy offered two courses of study: English; or, Classical and Mathematical. The Classical and Mathematical Department

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taught "Bookkeeping by Single and Double Entry," and charged five dollars tuition per term, compared with the four dollar tuition per term charged by the English Department. The accounting text used was Hitchcock's *Book-Keeping*, not Daboll's *Schoolmaster's Assistant*.

There is no evidence that Jedediah North attended school, but with practical training in the art of metal-working, and with some training in how to manage a business, North began his career as a blacksmith. Among his skills was the ability to make and repair tools, and entries in his day book for June, 1817, indicate the nature of his work during the first decade of his business career:

<table>
<thead>
<tr>
<th>June</th>
<th>Item</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ebenezer Dudley to setting a shoe</td>
<td>0 = 12 1/2</td>
</tr>
<tr>
<td></td>
<td>Capt Benjamin Wilcox work</td>
<td>0 = 25</td>
</tr>
<tr>
<td>3</td>
<td>Joseph Graves pointing shears</td>
<td>0 = 42</td>
</tr>
<tr>
<td></td>
<td>Blakesley Barnes tumbler punch</td>
<td>2 = 50</td>
</tr>
<tr>
<td>4</td>
<td>Joseph Wilcox setting 4 shoes</td>
<td>0 = 40</td>
</tr>
<tr>
<td></td>
<td>Reuben North horse shoeing</td>
<td>1 = 67</td>
</tr>
<tr>
<td></td>
<td>James Lamb 2 pr shears</td>
<td>9 = 00</td>
</tr>
<tr>
<td></td>
<td>set of swedges</td>
<td>9 = 50</td>
</tr>
<tr>
<td></td>
<td>one blowhorn Stake</td>
<td>3 = 50</td>
</tr>
<tr>
<td></td>
<td>large &quot; &quot;</td>
<td>6 = 00</td>
</tr>
<tr>
<td></td>
<td>creasing &quot; &quot;</td>
<td>3 = 50</td>
</tr>
<tr>
<td></td>
<td>square &quot; &quot;</td>
<td>2 = 50</td>
</tr>
<tr>
<td>4</td>
<td>set hammers</td>
<td>1 = 67</td>
</tr>
<tr>
<td>2</td>
<td>Turning Stakes</td>
<td>1 = 00</td>
</tr>
<tr>
<td>2</td>
<td>groovers</td>
<td>0 = 50</td>
</tr>
<tr>
<td>6</td>
<td>dozen saucepan handles</td>
<td>3 = 75</td>
</tr>
<tr>
<td>100</td>
<td>securers</td>
<td>1 = 25</td>
</tr>
<tr>
<td>a box</td>
<td></td>
<td>1 = 50</td>
</tr>
</tbody>
</table>

42 = 67
Among other tasks, Jedediah North set shoes for a horse, repaired a kettle, and made a set of tinners tools. Most of North's clients lived in Berlin, because there are frequent references to Captain Benjamin Wilcox, Jabish Dickenson, and James Lamb, all of whom are listed in the Federal census of 1820 as living in Berlin. Except for those items sold to James Lamb, a hardware merchant, North used no agents or middlemen, and sold goods directly to the customer. For his services, North received payment in goods and services, as well as drafts. In the first decade of his business career--1810 to 1820--North established his position as a competent blacksmith and toolmaker. In 1817, for instance, North's income was $866.83, of which $229.30, or thirty-three per cent was derived from general blacksmith work. But in subsequent years, as North gained prominence as a toolmaker, he did less blacksmith work, and by 1850, only $584.08, or four per cent of his business's income was derived from general blacksmith work.
Toolmakers of the early nineteenth century faced more limited means of advertising and shipping than toolmakers do today. Considering the large geographic area supplied by Connecticut toolmakers, they seemed to overcome difficulties with some ease. One marketing problem Connecticut toolmakers did not face was serious competition from English or European suppliers. As explained, American toolmakers made a variety of tools not made in Europe. American toolmakers could more easily supply American tinniers with tools best suited for their needs.

There is little evidence of tinner's tools in English trade catalogs, other than occasional illustrations of pliers, or shears. There are no illustrations of sets that compare with those American makers sold. Also, the writer could find no references to English or European tinner's tools in nineteenth-century newspaper advertisements, though advertisements exist for other English tools.

Perhaps too much credit is given English makers for supplying tools for the American market. Prior to 1830, they did, but in 1846, that American toolmakers influenced English manufacturers is evident in this paragraph from Scientific American:

Some time since, a Mr. Ash, an extensive manufacturer of Mechanic's Tools at Suffield, England, sent
to this country for patterns of the latest improvements, and amongst the rest, ordered a variety from Mssrs. Barton & Belden of Rochester, which were promptly forwarded. On their arrival there, it seems that their make gave such universal satisfaction, that they were immediately copied, and the fact that they came from this country made prominent, by stamping upon them "Rochester Pattern."12

North's advertising was limited. The writer found no references in Connecticut Courant for North tools. Neither could the writer find references to any North catalog, or printed price list. None is listed in Lawrence Romaine's Guide to American Trade Catalogs, though Romaine lists an 1869 catalog of the Roys & Wilcox Company, North's competitor from East Berlin. But the fact remains that Jedediah North sold tools to clients working in all parts of the eastern United States, and probably the best description of North's advertising is personal referral, or "word-of-mouth."

Documentary evidence helps support this assumption. On March 5, 1825, Lyman Adams, a tinsmith from Baltimore, Maryland, wrote to North asking for prices, and added: "I understand from the Tinplate-workers in this City, that you are a Manufacturer of Tinner's Tools...I further understand that those of your manufacture, are the most approved."13 In a letter dated March 19, 1825, Edward Drew, a tool agent of New York City, wrote: "I am becoming so well known for Selling your tools that I can sell much more than ever," and Drew asked North to supply him before North supplied "Strangers."14 In a letter dated March 28, 1825, Abijah Dunnell, of Springfield,
New Jersey, told North that he "saw a pair of shears that the workman said were good," and asked North's prices for tools.¹⁵

Two reasons help explain the success of North's "word-of-mouth" advertising. The first is emigration of families who were familiar with the tinsmithing trade from Connecticut to other states and territories. Members of the North family moved to the Cherry Valley Section of New York State, and later to Palmyra, New York. One of North's sisters married Oliver Buckley, a tinner of Westbrook, Maine. Edmund, one of Jedediah North's brothers, worked as a toolmaker in New York City, prior to joining his brother. Other Connecticut families moved to the Western Reserve in Ohio, Illinois, and Indiana. Oliver Dwight Filley moved to St. Louis, Missouri, and referred customers to North; Bulkeley, the Pecks, and probably other Connecticut toolmakers.

The second reason that helps to explain the success of North's "word-of-mouth" advertising was the agent-pedler system. Connecticut pedlers and agents, familiar with toolmakers' wares, recommended Connecticut toolmakers to local tinsmiths. In 1825, for instance, Jedediah North told Charles Yale, a Connecticut pedler-agent living in Richmond, Virginia, that he planned to "send a Set of Tools" to A. H. Brooks, of Taunton, Virginia.¹⁶ Other pedler-agents for North included William Austin, of Albany, New York, and Augustus Filley, of Lansingburg, New York.
Jedediah North's reputation as a first-rate toolmaker accounted for the wide range of his market. Jedediah North shipped tools to clients living in Alabama, Connecticut, Louisiana, Maine, Massachusetts, Maryland, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, and Vermont. William Bulkeley, North's neighbor and competitor, shipped tools to clients in Georgia, Kentucky, Wisconsin Territory, and Ontario, Canada, as well as to those states that North supplied. Jedediah North's and William Bulkeley's clients were so widespread that one can say they were important suppliers of tools to American tinners. An indication of the numbers of tools manufactured by North's factory is included in Appendix B.

As distance between North and his customers increased, methods of shipping tools became more of a problem. Jedediah North rarely specified precisely how he shipped tools, but his East Berlin competitor, William Bulkeley, did. One can assume that North used similar means. In September, 1837, William Bulkeley used a wagon to carry tools to Hartford, which were to be "put on Boat of John Cooley" for shipment to L. & W. Belden, of Springfield, Massachusetts.17 Bulkeley "Sent by Stage Nov 12th, 1838," tools for Wilcox & Prior, of New Haven, Connecticut, and on "August 1st, [1838], sent this day 3 Setts tools by Steam Boat, Middletown," for transshipment from New York to New Orleans, in order to reach a customer, Oliver Dwight
Filley, in St. Louis, Missouri. In 1857, Bulkeley "Sent to Depot April 2d 1857 + marked as follows E Ketcham Pearl St NYC" tools for a New York client, indicating he used railroads to ship tools.

Because the customer paid shipping costs, it is difficult to reconstruct shipping rates from the sparse information in North's and Bulkeley's account books. One clue regarding shipping costs is found in the traveler Gideon Davison's outline of stage schedules from Hartford. In 1830, Davison stated that stages left Hartford daily, except Sunday, for New Haven (40 miles, fare $2.00), New York City (123 miles, fare, $5.50), Boston (136 miles, fare, $5.50), Hanover, New Hampshire (152 miles, fare, $7.25), and Albany, New York (96 miles, fare, $5.00). On one occasion, Rice and Miller, clients of Jedediah North who lived in Worcester, Massachusetts, paid 33 cents to ship a set of tools from Berlin to Hartford, and $4.25 to ship the set from Hartford to Worcester. Thus, in 1822, shipping a set of tools by stage would cost about the equivalent of passenger fare, which was high.

Wagon prices to Hartford and Middletown were no less expensive. To loan his horse and wagon for a trip to Haddam, Connecticut, North charged Nathaniel Parmalee "6 cents a mile," on April 21, 1826. North's standard charge for loaning his wagon and horse to go to
Middletown was $1.00, and to go to Hartford, $1.50. When dealing with customers from central Connecticut, transporting tools was only a minor concern for North, as roads were adequate. But when selling tools to customers in many parts of the eastern United States, transporting tools became more of a problem. Shipping costs were high, and shipping time was long.

When dealing with tanners in central Connecticut, North charged a certain price for a tool, and allowed a discount for cash payment on delivery. As Jedediah North increased the amount of business with clients outside central Connecticut, he followed the common pricing practice of other toolmakers, which was to advertise their tools at retail price, and allow discounts. The percentage of discounts varied. In 1832, O. D. Filley complained to his father that William Bulkeley only allowed a 4 per cent discount on tools. In the cover of his 1834 Book of Orders, William Bulkeley wrote: "Agents for Tinners tools are to have made to them 8 p cent Discount provided they pay for them in 6 Months. Customers who pay for tools at the Shop are to have 3 p cent made to them." By 1854, North offered a 25 per cent discount, with six months credit, and an additional 5 per cent if the customer paid cash. In the same year, North asked O.D. Filley "not to be induced by those who give a greater discount than 25%."
In the second decade of his business career, Jedediah North expanded his business. As noted, North increased the amount of his business outside central Connecticut, and made an increasing number of tools. As the number of orders increased, North was unable to meet the demand and looked for other experienced toolmakers to work with him. Jedediah's first choice for help was Edmund, one of his younger brothers. Edmund had apprenticed with Jedediah, and Jedediah was familiar with the quality of his work.

After completing his apprenticeship, Edmund went to New York City where he worked as a journeyman toolmaker. At first, he was pleased that he earned $1.37 for ten hours work, and at one point had earned seven dollars a week for the previous five weeks. But in one letter, Edmund noted that he was "tired" of being a journeyman, and told Jedediah that working with him would be the "best thing I could do." Edmund's only concern was that Jedediah wanted him to pay more money to become a partner than Edmund was willing to pay. To return, Edmund asked for a guarantee of twenty-six dollars a month for five months. Apparently all problems and money matters were resolved, as Edmund joined his brother early in 1825, and remained with the business after his brother's death.
Another indication of Jedediah North's expanding business was the increasing number of agents to whom he sold tools. No longer did he have direct contact with many of his customers as he did during the first decade of his business career. But North's business expansion did not come at the expense of central Connecticut tinners. As North noted in his day book on May 8, 1822: "Wrote to Andrew Seger New York, gave him offer of Selling tools by paying me $43.50 a Sett on condition I can make more tools than to supply the market at home." At least early in the second decade of his career, North felt a mercantile responsibility to those tinners who had bought tools from him, his father, and his grandfather.

Little is known about North's third decade in business, which lasted from 1830 to 1840. A daybook that exists gives, at best, sketchy information. What can be determined is that North continued to do general blacksmith work for neighbors, but less frequently than in previous years. By 1830, and in the decade following, North's most important product was his tools, which he produced in quantity.

Perhaps only next to the first decade of his career, was the final period of his career, lasting from 1840 to his death in 1855, most interesting. From every indication in his business
records, North was more a businessman than toolmaker. Indeed, the Federal census of 1850 lists Jedediah North's occupation as "manufacturer," a title reserved for only six other Berlin citizens in the same year. In 1850, of four tinner's tools companies in Berlin, the North company produced the second largest value of tools--$9,500--compared with the Roys & Wilcox Company's $25,250.

North employed sixteen men, including a bookkeeper whose entries date from 1848. North's average monthly payroll was $375, which meant the average monthly salary for each employee was about $23.50. Though the figure may seem low, one must remember that North employed at least two apprentices, whose salaries averaged about $42 per year. On the other hand, the average monthly payroll of the 35 men who worked for Roys & Wilcox was about $31, causing this writer to speculate about whether Roys & Wilcox paid higher wages, or if the task of making tinner's machines, which comprised more than half of Roys & Wilcox's business, commanded higher wages. Unfortunately, there seem to be no known records of the Roys & Wilcox Company available for comparison.

From 1850 to 1855, sales were consistent for the North Company. During that period, it appears to have had no financial problems. If, as a latter-day laborer once said, "A great man's greatest good luck is to die at the right time," then Jedediah North had good luck and died in 1855. A year after his death, the
central Connecticut tool market apparently foundered. Edmund North wrote to Lyman Wilcox on July 28, 1856:

> Do you sell Tools in N York and at what price—Our sales are amazingly dull in N York + elsewhere—we think more of N York as that was our principal Market—we were rather hard up a year ago when we made only 20 pr ct off from list prices, but we about that time offerd them at 25 pr ct off + found a material change in our sales + had a good run untill some time this spring when Hough & Co. went to our agents and offerd their tools at 30 pr ct less than list prices on 6 mos (or about that rate)—we think we can make tools as cheap as Hough has, but we cannot, as we live, afford them at that price. now what shall we do—will you tell what you are doing in NY—

> Roys & Wilcox + Co have recently had some large orders— they say + we believe with truth that they discount only 25— on tools and 33 1/3 on Machines 6 mos

Peck, Smith Mfg Co are supposed to sell just as they can. 29

Toolmakers in central Connecticut, who for forty years enjoyed a virtual monopoly on manufacture and sales of tinners' tools, were hard put to match competition from toolmakers in other locales. Edmund North suggested a possible solution to the crisis in a letter to Bruce & Cook, dated October 23, 1856:

> We are all practical workmen, having grown up in the business + ever endeavored not to put into Market an inferior article. We think our experience should give us some advantage over those who depend wholly in such hired help as they can pick up.

> The Tool Manufacturers have had several Meetings to talk over matters connected with the Tool + Machine business, our meetings have been pretty fully represented, + all agreed that it is a killing business to mark off from list prices on Tools even 30 per ct.

> We propose selling through one house in New York, or at one invariable price. 30
But even the threat of a consortium of central Connecticut toolmakers could not spark sales enough to save Edmund North's tool business. On December 26, 1856, Edmund North wrote to William A. Crowell that he had bought stock in the Roys & Wilcox Company to the sum of $2650. Competition from makers outside central Connecticut had taken its toll; the Jedediah and Edmund North Tool Company was no more.
FOOTNOTES


2Account Book of J. + W. Bulkeley's for Apprentices being their rules and regulations for taking them with their prices." Connecticut Historical Society.

3Ibid.


5"Account Book of J. + W. Bulkeley's for Apprentices being their rules and regulations for taking them with their prices," Connecticut Historical Society.

6Ibid.

7"Business Practise Book of Jedediah North," Joseph Downs Manuscript and Microfilm Collection (hereafter DMMC), MS 54x93, Winterthur Museum.


9"Business Practise Book of Jedediah North," DMMC, 54 x 93.

10Catalogue of Trustees, Instructors and Students of the Worthington Academy, Berlin, Connecticut (Hartford: P. Canfield, 1836), p. 7.


13 Lyman Adams to Jedediah North, Baltimore, Maryland, March 5, 1825, DMMC 54 x 93.223.

14 Edward Drew to Jedediah North, New York City, March 19, 1825, DMMC 54 x 93.226.

15 Abijah Dunnell to Jedediah North, Springfield, New Jersey, March 28, 1825, DMMC 54 x 93.230.

16 Jedediah North to Charles Yale, East Berlin, Connecticut, June, 1825, DMMC 54 x 93.236.


18 Ibid., entry for July 6, 1838.


21 Rice and Miller to Jedediah North, Worcester, Massachusetts, November 11, 1822, North Family Correspondence, photostat copy, Photostat no. 1292.8, DMMC; original at Connecticut State Library.

22 Daybook No. 3 of Jedediah North, 1826-1840, DMMC 54 x 93.3, p. 7.

23 Coffin, pp. 65-66.


26 Edmund North to Jedediah North, New York City, December, 1824, DMMC 54 x 93.216.

27 Edmund North to Jedediah North, New York City, January 26, 1825, DMMC 54 x 93.221.


CHAPTER FOUR

SUMMARY AND EPILOG

Jedediah North, of East Berlin, Connecticut, was the son and grandson of a blacksmith who started a career as a smith after apprenticing with his father. Early in his career he earned a reputation as a maker of quality tinners' tools. The reputation stayed with him throughout his life.

Jedediah North worked in central Connecticut, where, until about 1820, lived the greatest concentration of American tinners. After 1820, smiths in other rural and urban areas produced tinware in sufficient quantities to lessen central Connecticut's prominence as a tinware producing center. But no matter where tinners lived, chances were that North supplied their needs, as he shipped tools to every State east of the Mississippi River except Florida, Georgia, and Tennessee.

Jedediah North made what this writer has designated the American set of tinners' tools. The American hand set included shears, shaping stakes, hollow and solid punches, a hammer, and swedges. The European hand set contained the tools named above except for hollow punches or swedges; but hollow punches and swedges enabled
the American tinner to make a greater variety of objects than his counterpart in Europe. The European tinmaking tradition stressed the importance of manual skill while the American tinmaking tradition stressed the importance of machinery which allowed for neater and more economically produced objects.

Early in his career, Jedediah North supplied tools to tinners in central Connecticut. Later, he supplied tools to tinners in many other areas, with New York City being his most important market. As his market expanded, North felt increasing competition from tool-makers outside central Connecticut. Two years after Jedediah North's death, Edmund North, Jedediah's partner and successor, merged the business with that of his competitor, the Roys & Wilcox Company. The demand for hand tools had lessened as the demand for tin machines increased. Also, stamping machines produced quality tinware in sufficient quantities to compete with hand-made tinware. In 1854, for instance, Rehn & Everett, manufacturers of tin boxes in Philadelphia, proudly advertised that they made "Tin Ware in Every Variety, By Machinery." The age of hand-crafted tinware had passed, and the greatest demand for tinner's skills was in making tin containers, and tin roofing.

Throughout his career, Jedediah North made hand tools. Had he manufactured machines, perhaps his sales would have increased, and his brother would not have needed to merge with Roys & Wilcox.
Jedediah North's Tool Factory no longer stands. In 1879, his family sold the building to Carroll Dudley, who renamed it "Dudley's Mill." In the early part of the twentieth century, operations in the mill ceased. After years of neglect, the building became a safety hazard, and in the late 1960's, the Town of Berlin burned it. Regrettably, there are no known pictures of what is one of the best documented factories of the early nineteenth-century American toolmaking era.
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## APPENDIX A: TOOLS AND THEIR COSTS

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<th>TOOL FORM</th>
<th>SIZE</th>
<th>RETAIL PRICE</th>
<th>WHOLESALE PRICE</th>
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<th>COST OF FINISHING</th>
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## Appendix A: Tools and Their Costs (Continued)

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## APPENDIX B:

Tool Sales of Jedediah North's Business Representing Selected Years and Tool Forms.

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Appendix B: Tools Sales of Jedediah North's Business Representing Selected Years and Tool Forms. (Continued)

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Sources:

1. Daybook of Jedediah North, 1816-1818, MS, Connecticut Historical Society. Figures for 1816 include only the months of September through December.

2. Daybook of Jedediah North, 1818-1820, MS, Connecticut Historical Society. Information for the years 1818 and 1820 is partly gleaned from the preceding and following daybooks.

3. Daybook of Jedediah North, 1820-1822, MS, Connecticut Historical Society. Figures for 1822 include only the months of January through May. Nonetheless, there is an indication that North would sell more tools in 1822 than he did in 1821. There are no consistent business records in the latter half of 1820, and none for the decade following 1830. Not until 1845 are there consistent records.


Fig. 1. Sketch of a Hartford, Connecticut flour mill owned by William Imlay. Though there are no known pictures of Jedediah North's mill and factory on the Mattabessett River, the North mill was probably similar to this. Both existed in the same region at the same time. From: Sherman W. Adams, "The Hartford Park System," Connecticut Quarterly, 1. (1895), p. 68.
Fig. 2. The French tinsmith, or ferblantier. From: Denis Diderot, *Receuil de Planches...* (1771; rpt. New York: Readex Microprint Corporation, 1969), IV, p. 313.
Fig. 3. The German tinsmith, or klempener. From: Johann Krüützt, Encyclopädie, Oder allemeines... (Berlin: J. Pauli, 1828), XL, figures 2186-2198.
Fig. 4. The English tinsmith. From: Charles Tomlinson, Illustrations of Useful Arts & Manufactures (London: Society for Promoting Christian Knowledge, 1859), II, p. 57.
Fig. 5. A swage. From: Webster's Seventh New Collegiate Dictionary (7th ed. 1963).

Fig. 7a. A former.
From: DSC, p. 168.

Fig. 7b. A double seamer.
From: DSC, p. 173.

Fig. 7c. A folder.
From: DSC, p. 169.

Fig. 7d. A grooving machine.
From: DSC, p. 162.
Fig. 9. Steps used in making a pair of tinsmith's shears.
From: Denis Diderot, Receuil de Planches... (1771: rpt.
New York: Readex Microprint Corporation, 1969), IV,
pp. 844-845.
Fig. 10a. Creasing swedge.
Overall length: 15 7/8 inches.
Collection of John S. Kebabian.

Fig. 10b. Detail of mark. JED\textsuperscript{H} NORTH/ BERLIN/CONN. This is probably one of Jedediah North's earliest marks; the swedge was made prior to 1824 because Edmund North joined his brother in that year, and no doubt ordered a new mark reading "J & E NORTH."
Fig. 11a. Creasing stake.
Overall length: 15-3/4 inches.
Overall height: 9-3/4 inches.
Collection of Old Sturbridge Village.

Fig. 11b. Detail of mark. J. NORTH
This also is probably one of Jedediah North's earliest marks and indicates that the tool was made prior to 1824, the year that Edmund North became his brother's partner.
Fig. 12a. Bench shears.
Overall length: 30-1/2 inches.
Overall height: 6-7/8 inches.
Blade: 7-1/2 inches.
Collection of William M. Roberts.

Fig. 12b. Detail of mark. J & E NORTH/BERLIN/CONN. The bench shears were probably made after 1824, when Edmund North became his brother's partner.
Fig. 13a. Bench shears.
Overall length: 34-1/8 inches.
Overall height: 6-7/8 inches.
Blade: 8-1/2 inches.
Collection of William Stewart.

Fig. 13b. Detail of mark. J & E NORTH/
BERLIN CT. A variation of Fig. 12b, this
mark also indicates the tool was made after
1824, but not later than 1856, when the
business was dissolved.
Fig. 14. Blowhorn stake.
Overall length: 21-1/8 inches.
Overall height: 10-1/8 inches.
Collection of William Stewart.

Mark: see Fig. 12b.

Fig. 15. Bench shears.
Overall length: 34-0
Height of tang: 4-1/2 inches.
Blade: 7-1/2 inches.
Collection of Old Sturbridge Village.

Mark: see Fig. 12b.
Fig. 16. Candlemold Stake.
Overall length: 24-7/8 inches.
Overall height: 9-5/8 inches.
Collection of Old Sturbridge Village.

Mark: see Fig. 13b.