ROXBURY EIGHT-DAY MOVEMENTS

and the

ENGLISH CONNECTION

1785–1825

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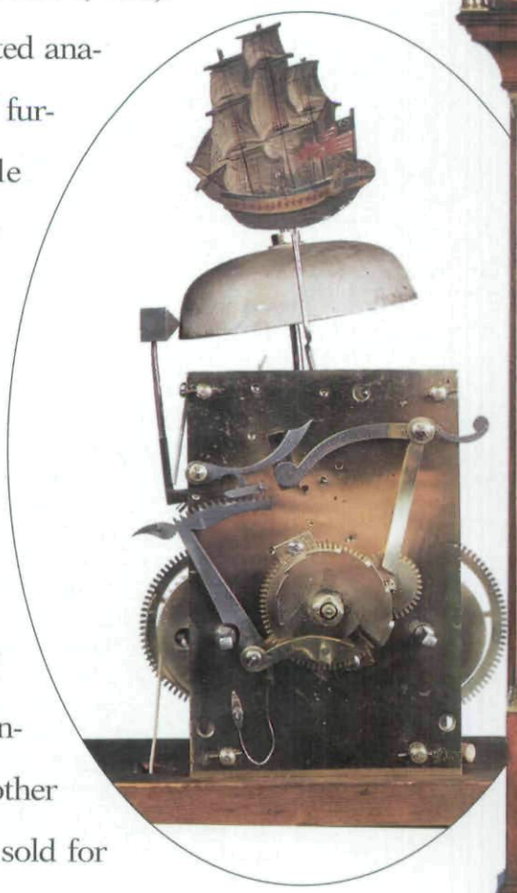
BY ROBERT C. CHENEY

Eight-day clocks with painted dials by the Willard family of Roxbury, Massachusetts, have been extensively studied and documented for nearly a century. However, when attempting to describe the characteristics of a Willard movement, writers have failed to explain the diversity of the design and execution of these movements (see Pls. V, VIII).[1] Although decorative arts scholars have created analytical frameworks for codifying a variety of furniture and silver forms,[2] no comparable framework has been developed for Roxbury painted-dial movements. The present study of the Willards' production methods may provide a road map for future scholars interested in developing an analytical framework for Roxbury eight-day clocks.

The name appearing on the dial of a clock has long been understood to be the maker of the movement, who then acquired the fashionable painted dial and mahogany case from other craftsmen. Once assembled, the clock was sold for fifty to sixty dollars as an elegant and practical addition to the buyer's household. However, the large numbers of known Roxbury



Pl. I. Painted iron dial inscribed "Daniel Knower,/ ROXBURY" from the clock shown in Pl. III. The pristine condition of the dial, gilt spandrels, delicate steel hands, and applied arch with rocking ship (see Pl. II) is a remarkable survival. *Private collection; photograph by Thomas Neill.*

Pl. II. Eight-day movement behind the dial shown in Pl. I. An identical movement is found behind painted dials signed by William Cummens (1768–1834) and Elnathan Taber (1768–1854). Other movements by Cummens and Taber are known that represent a different shop tradition than the one shown here. The ship above the movement rocks with the swing of the pendulum. *Neill photograph.*

Pl. III. Eight-day clock with the dial signed by Daniel Knower, Roxbury, Massachusetts (see Pl. I). Mahogany veneer with line and banded inlay; height 98, width 19 1/4, depth 9 1/2 inches. This is the only known clock by Knower, who is found in Roxbury voting lists between 1802 and 1810. He may represent a number of relatively unknown journeymen whose names rarely appear on a clock dial. *Neill photograph.*

clocks, the great variety in design and execution of the movements, hidden inscriptions, and circumstantial documentary evidence call for a reassessment of the role played by the man whose name appears on the dial.

The Roxbury eight-day movement was, in fact, the product of a vast network of English specialists who made components and finished movements for the trade on both sides of the Atlantic. American specialists cast brass components and painted dials, while unrecorded American journeymen finished the components for the "makers." Initial research indicates that these business practices were not unique to Roxbury, but universal throughout the Republic during this period.

Simon Willard's first biographer, his great-grandson John Ware Willard, erroneously described Willard's working method as what is best termed traditional clockmaking.[3] This is basically a five-step process described in a memorandum book kept by the clockmaker Daniel Burnap (1759–1838) of Coventry and East Windsor, Connecticut, when he was a journeyman in Norwich in 1779.[4] His own shop consisted of a master craftsman assisted by apprentices involved in all aspects of production.

The first step is the preparation of the raw materials. This includes making the wooden patterns for sand-casting the wheels, plate blanks, and other brass parts of a movement; casting the brass parts;[5] forging the steel components; and casting the bell.[6]

The second step is shaping the cast and forged parts. The brass components are rough filed; the wheel and plate blanks are hammered to harden them; the wheel blanks are turned to the correct diameter; and the teeth are cut into them with a complex specialized tool known as an engine (see Pl. VI).[7] The steel rods are turned, slit, and filed to form pinions (see Pl. VII). The other forged parts are filed to correct dimensions using jigs, and the hands are sawn to pattern.

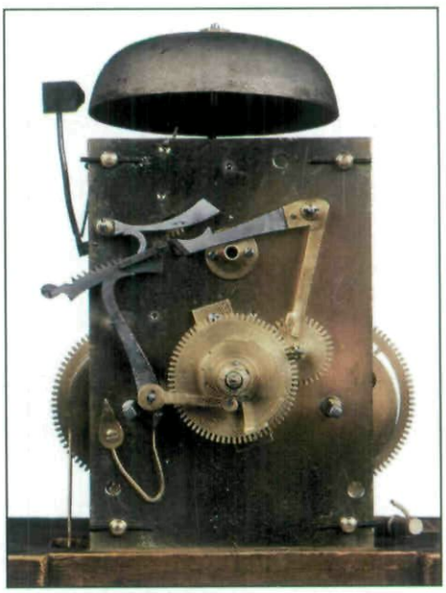
The third step is to mount the wheels on the arbors (axles) and to place these assemblies between the front- and backplates in such a way that the wheels and pinions mesh and turn freely. This step is known as planting the train. The front- and backplates are drilled at the same time, following a template.[8]

The fourth step is to mount the escapement,[9] mount the front-plate components of the striking mechanism (known as the strike work) (see Pl. IX),[10] and assemble and adjust the movement.

The fifth and last step is to make, engrave, and mount the dial and hands.

In this traditional process, templates, patterns, and drawings guarantee consistency, create an efficient shop, and could be used for generations.[11] However, this process does not allow for production in quantity. Daniel Burnap's daybooks and ledgers record the sale of forty-nine clocks over a twenty-year period.[12] Although he had the skills to transform raw materials into the most complicated mechanical device known in eighteenth-century America, Burnap spent much of his time mending andirons, kettles, skillets, a "steeltrap," and a violin bow.[13] Jedidiah Baldwin (1769–1849) of Hanover, New Hampshire (like Burnap an apprentice of Thomas Harland [1735–1807] of Norwich, Connecticut), made fifty-five eight-day clocks between 1793 and 1811.[14] The accounts of the clockmaking Avery family of Preston, Connecticut, from 1763 to 1825 list only twenty-eight clocks made by three different Averys through two generations.[15]

Pl. IV. Eight-day clock labeled by Simon Willard (1753–1848), Roxbury, c. 1796–1798. Signed "Simon Willard" on the dial. Willard's label, printed by Joseph N. Russell, Quaker Lane, Boston, is pasted inside the door. Mahogany and white pine; height 93, width 21, depth 10½ inches. The case retains an old surface, and the brass hardware shows the original gilt wash. ***Private collection; Neill photograph.***



Pl. V. Weight-powered eight-day brass movement of the clock in Pl. IV. The parts visible in this view, behind the painted dial, enable the clock to strike the hours on the bell at the top. The shapes of the strike-work components provide an easy method of identifying different shop traditions. The moon trip wheel governing the dial showing the phases of the moon has been removed for a better view of the strike work. ***Neill photograph.***

A dramatic comparison is provided by sequential numbers on Willard clocks, which can be used to estimate the family's output. Three Willards numbered some of the dials on their eight-day clocks: the highest documented number on a clock by Benjamin Willard (1743–1803) is 698 and on a clock by his brother Simon Willard it is 1,586.[16] These numbers are corroborated by the large number of surviving examples.

Unlike the Roxbury clocks, the movements made by Daniel Burnap are readily recognizable. They agree in the planting of the train, design of the escapement, shape of the rack and rack hook and strike-lifting piece, and they agree, of course, with the surviving templates. Grouped by maker, Roxbury movements show a wide variety of designs, shapes, and dimensions for the same critical elements.[17] This variety only appears chaotic if we assume that Roxbury makers functioned as traditional clockmakers. In fact, their movements' "signature" is determined by the cast-brass and forged-steel parts or finished movements provided by English craftsmen (see Pl. XIII).

The variations in the Roxbury movements, clearly evident in the shapes of the front-plate strike work, represent equally efficient ways of making and fitting the same components according to a variety of well-designed plans. Although one finds some identical movements in clocks by a given Roxbury maker, one also finds identical movements in clocks by different Roxbury makers.[18] Clearly, traditional clockmaking is not behind the dial of Roxbury clocks (see Pl. II).

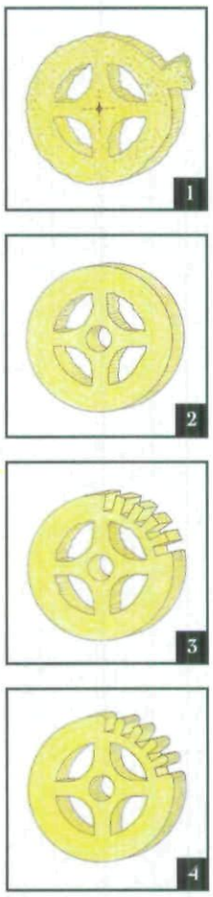
The network of related artisans on Roxbury Neck, which included cabinetmakers, dial and glass painters, carvers, and gilders, has been ably identified.[19] Aaron S. Willard, for example, bought 843 Washington Street on the Roxbury-Boston line in June 1792. The next month the cabinetmakers William (1770–1844) and Samuel Fiske (1769–1842) bought the adjoining property. Willard provided workshop space for the decorative painters John and Charles Bullard and for the cabinetmakers Pratt and Walker as well as Henry Willard (1802–1887), but no journeymen clockmakers are recorded at this address through 1825.[20] The large number of diverse surviving tall clocks bearing Aaron Willard's name suggests the necessity of this sort of collaboration.

Several of the Roxbury makers—Aaron and Simon Willard, William Cummens, William King Lemist (1791–1820), and Elnathan Taber—bought cast clock sets from the brass founder William Cooper Hunneman (1769–1856) in Boston's North End between 1815 and 1821. Buying these castings from an outside specialist was a considerable improvement in efficiency over traditional clockmaking. However, the number of clock sets listed in Hunneman's accounts is rather small: some nineteen and twenty for Aaron Willard in 1816 and 1817, respectively, and sixteen and fourteen for Simon Willard in the same years. Although the Hunneman account books begin in 1801, the first entries for clock sets are in 1815. There is no record of trade in clockwork in the accounts of the Boston brass founder John Andrews or in the Revere foundry records.[21]

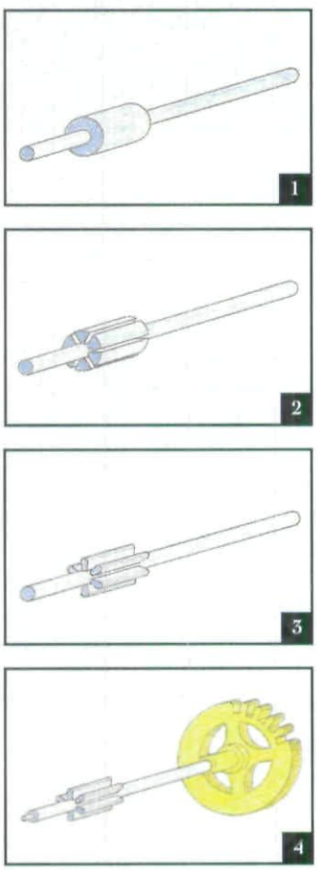
There is ample evidence for the importation of English clocks, watches, and components into America throughout the eighteenth century.[22] In 1760 the Charleston, South Carolina, self-proclaimed "Watchmaker" Joshua Lockwood (w. 1757–1781) advertised for sale the London forerunner of the Roxbury eight-day clock:

8-day clocks with...days of the month and the moon's age...in beautiful mahogany cases...neatly ornamented with flute and frize [sic] work; the capitals and bases of brass, and the pillars inlaid with the same.[23]

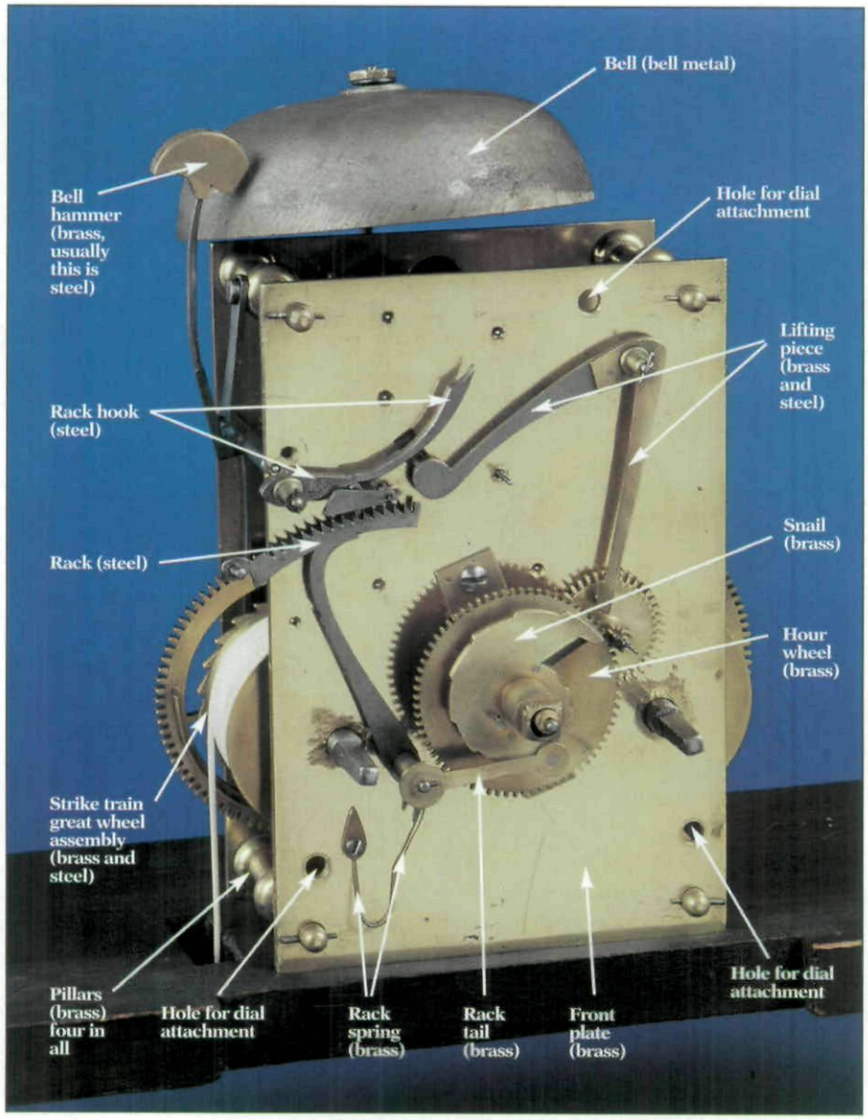
The Philadelphia clock- and watchmaker John Wood in 1771 advertised to the trade a wide array of "just imported" materials and finished goods, "cast and forged clock-work, sheet brass, finished faces, clock pinions, clock hands, clock bells and catgut" (see Pl. XIII). In 1785 he advertised "clock movements [and] slit pinions," and a year later, "Japanned Clock Faces" of English origin.[24] His trade in finished movements continued through 1800. John M. McFarlane of Boston (see Fig. 1) advertised "a number of elegant Eight-Day Clocks" in 1797,[25] and in two Boston papers in 1808 he offered "a great variety of clock and watchmaker's tools, materials...and clock movements."[26]



Pl. VI. Stages in the manufacture of clock wheels. 1. The rough, sand-cast wheel blank as it appears when removed from the sand mold. The projection on the outer edge is the cast of the sprue through which the molten brass was poured into the mold. 2. The center hole is drilled, the blank is turned on a lathe to the correct outside diameter, and the blank is finish filed. 3. The teeth are cut at regular intervals with a specialized tool called an engine. 4. The spokes, known as crossings, are finish filed, and the teeth are "rounded up" with a file to their final shape. ***Drawings by Richard Ketchen.***



Pl. VII. Stages in the manufacture of pinions. 1. Steel rod stock is turned to the prescribed dimension for pinion and arbor. 2. The pinion "leaves" are spaced at regular intervals and slit with a pinion cutter. 3. The pinion leaves are "rounded up" with a file and heat treated for hardness. 4. Pivots are turned at each end of the arbor, and the brass wheel is mounted. ***Ketchen drawings.***



Pl. VIII. The eight-day movement behind a painted dial imported from Osborne of Birmingham that is signed "Simon Willard." Comparing the strike work with that in Pl. V clearly shows that it represents the work of different makers, although both dials are inscribed with Willard's name. ***Collection of the author; photograph by Robert S. Arnold.***

A large and specialized trade supported this extensive English export business to America.[27] A treatise published in 1747 reveals that the English clock trade was organized in much the same way as the watch trade. Numerous specialized subcontractors performed repetitive tasks with precision and dispatch.[28] The Liverpool industry relied on a vast network of "outworkers"[29] to provide the components and services necessary to support thousands of journeymen clockmakers on both sides of the Atlantic. It was a factory-like system under many roofs rather than one. The same structure has been identified in other trades.[30]

In 1819 Abraham Rees described seventeen "departments of the art" of clockmaking based on his understanding of the English industry. Among those responsible for eight-day movements were the "brass founder," who cast the wheels and plates; the "wheel and pinion cutter;" the "movement maker," who mounted the wheels and pinions between the plates; the "clocksmith," who forged the steel parts; the "bell founder," who cast the bell; the "catgut maker;" the "weight, pendulum bob, and hands maker;" the "japanner," who painted the dials; and the "finisher (sometimes called the maker)" who

polishes the teeth and steel parts, finishes the pivots, verifies the engagement, adjusts the escapement, finishes the strike and repeating parts, and puts the whole machine in a state ready for sale.[31]

George Ainsworth at the Lancashire Pinion Manufactory in Warrington, England, kept busy in most "departments" of the trade: pinion maker, brass and bell founder, clocksmith, and clock movement manufacturer (see Pls. XI, XII, and Fig. 3). In 1806 he invoiced Peter Stubs (1756–1806), "Manufacturer of Lancashire Files, Tools and Clock Pinions," also of Warrington, for "clock brass, forge work, pinions, bells and an 8 day movement."[32] And in 1815 he sold Stubs a dozen eight-day clock movements at forty-two shillings each.[33]

The business papers of Peter Stubs fortunately survive and document the transatlantic trade in clock and watch materials, tools, components, and finished movements. The firm's records from 1764 to 1940 also confirm the vast number of outworkers providing this stock in trade.[34] Given the nearly total absence of surviving business papers of the Roxbury makers, this evidence is particularly significant.

Among Stubs's American customers was the firm of Davis and Brown, whose "Wholesale Rooms" were above 33 Marlboro Street at the corner of Milk Street in Boston. According to an undated catalogue, they were "Importers, Manufacturers and Wholesale Dealers in London, Paris, Sheffield, Birmingham and American Goods." Given the Marlboro Street address on the catalogue, it must date from 1810 to 1818.[35]

On May 14, 1817, Davis and Brown ordered from Stubs "24 8 day clock movements" at forty-two shillings each; "12 setts 8 day Brass cast work; 42 doz setts 8 day clock pinions; 6 dozen sets 8 day [clock] forged work; 12 dozen clock bells, common tone; 36 doz for 8 day clock hands assorted patterns, most of 12 & 13 in.," and a page and a half of watch supplies and assorted tools.[36] A year later the firm ordered another "30 sets cast brass clock work; 24 doz sets 8 day clock pinions" as well as clock- and watchmaker's tools.[37]

Once received, all the components of a cast-brass clock set would be worked until they were in a finished condition (see Pls. IX, XIII, XIV). For a typical eight-day clock,

there were seven pinions to a set (see Pl. X). The crucible-cast, high carbon steel pinions provided by Stubs were a high-quality component of American clocks not available locally. Davis and Brown also ordered from Stubs pinion sets for Willard's patent timepiece.[38]

Davis and Brown's 1817 order from Stubs included enough pinion stock to make 504 clocks and enough hands for 432 clocks. Their 1818 order included enough pinions for 288 clocks. The numbers of clocks implied by these orders are more in line with the considerable production of the Roxbury makers than the numbers described in Hunneman's accounts.

Stubs carried on a similar trade with Benjamin Demilt of New York City[39] and John E. Rigden of Baltimore. On June 4, 1818, the latter ordered twenty sets of brass castings and twelve finished movements, specifying: "These goods must be bought very close [cheaply] or I must in future buy them in Birmingham."[40]

Birmingham is better known for japanned clock faces than cast clock work, but it was a source for components (see Fig. 2) as well as of a long-duration movement for a tall clock that was cased in Roxbury and thought to be the work of Simon Willard.[41] It is very likely that the "Cases of Clock-Faces" advertised in 1799 by E. Tuckerman Jr. at his "Warehouse" at 37 Cornhill, Boston[42] and the "imported...Enamelled Clock Faces" offered by Paul Revere (1735–1818) in 1785[43] were both of Birmingham origin.

First advertising in 1772, the partnership of Osborne and Wilson (1772–1777) in Birmingham informed the public that the firm would supply the trade with "clock dials in imitation of enamel."[44] The innovation of the dials introduced by James Wilson (d. 1809) and T. Hadley Osborne (w. 1772–d. 1779) was the backplate, commonly called the false plate, mounted behind the painted dial. It provided a convenient method for "clockmakers to fix them to the movements" regardless of the origin of the movement.[45]

Cast clock work from William Hunneman represents an admirable step toward craft independence, but remains a largely insignificant contribution to the volume of such components imported from England. Given that converting rough castings, forgings, and slit pinions into a finished movement could consume the better part of two weeks,[46] it is unlikely that the Roxbury and Boston makers could have completed the large and diverse number of

Pl. IX. Strike work ready for mounting on the front plate of an eight-day clock. The four parts at the right are the rough forgings and castings of the finished parts at the left. ***American Clock and Watch Museum, Bristol, Connecticut; Arnold photograph.***

Pl. X. Nineteenth-century pinion set for an eight-day clock. Seven were required for each clock. Sets of slit pinions were sold in large numbers to suppliers throughout the United States. ***American Clock and Watch Museum; Arnold photograph.***

Fig. 1. Trade card of John M. McFarlane of Boston on a billhead dated 1812 and engraved by William Barber (possibly the Newport, Rhode Island, printer of that name [1786?–1841]). Inscribed "W. Barber, Sc." at lower left. McFarlane provided clock movements, tools, and other materials to the trade. The imagery suggests either that McFarlane was a Mason or that he sold Masonic regalia. ***American Antiquarian Society, Worcester, Massachusetts.***

Fig. 2. Cover of a trade catalogue, probably Birmingham, England, 1775–1800. Although the catalogue lists "Clock Work," none is illustrated, and it remains the only known trade catalogue to suggest that clock work was distributed by this method. ***Winterthur Library, Winterthur, Delaware, Printed Book and Periodical Collection.***

known clocks, even considering the increased efficiency of working with components.

Marks occasionally found on Willard clocks discredit the notion that the name on the dial was always the maker of the clock. Documented Willard clock movements have stamped or scratched inscriptions that include "ROSKELL, LIVERPOOL," "JB," "Alvin Lawrence," and "Movement Made by Andrew Steele."[47] While the inscriptions rarely state an origin, they do suggest the vast journeyman trade in Lancashire and New England. Further work with the Stubs papers will quantify and document finished English movements coming to Boston and clarify the American contribution to the production of eight-day clocks.

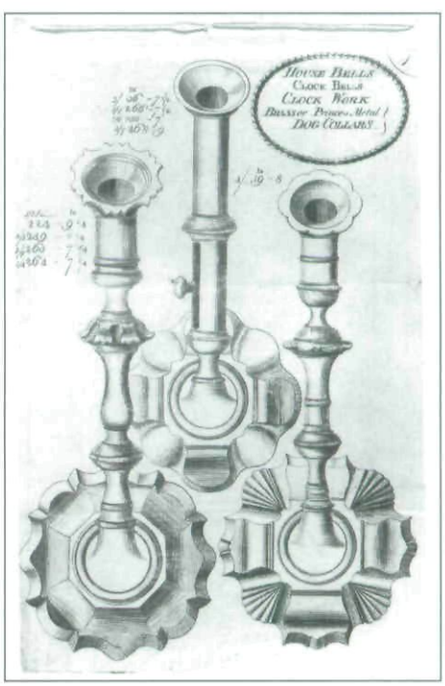
Two early writers noted American clockmakers' use of English movements. The antiquarian and physician Irving Whitall Lyon (1840–1896) wrote in 1891:

About 1790 white enameled dials, both with and without the clock movement, of English manufacture, began to come to New England, and to be sold, wholesale and retail, not only by dealers in clocks and watches, but also in some instances by hardware merchants.[48]

The collector Luke Vincent Lockwood (1872–1951) wrote in 1901: "painted faces in large numbers were sold to clockmakers throughout the country, who added their names and placed the dials on works often not made by themselves."[49]

There are clues, however, that suggest the presence in Federal New England of a number of journeymen clockmakers. Recent research into the assessors' records has documented seven previously unrecorded Boston clockmakers working between 1787 and 1799.[50] However, none is known to have signed a surviving clock dial, suggesting that they worked as anonymous journeymen. Elsewhere in Massachusetts the journeyman Nichols Goddard (1773–1823) of Shrewsbury described in his diary supplying clockmaking and wheel-cutting services for Luther Goddard (1762–1842) of Shrewsbury, Gardner Parker (1772–1816) of Westborough, and Isaac Gere (1771–1812) of Northampton.[51] Joseph Loring (1768–1846) of Sterling charged Benjamin Willard "to make a movement—4 pounds,"[52] and an English journeyman is known to have worked in Concord from about 1812 to 1829.[53]

New Hampshire appears to have been a mecca for a large journeyman population. Abel Hutchins (1763–1853) advertised in 1812 "clock hands, pinions, bells and clock faces chosen by the owner at the Manufactories in England,"[54] much like those in the components trade in Boston. Price books printed as "pocket memorandum for the country trader" facilitated the exchange of clock components for rural journeymen and clockmakers.[55] More significantly, New Hampshire eight-day movements confirm a collaborative effort: fourteen movements by Timothy Chandler (1762–1848) and Levi (1761–1853) and Abel Hutchins all of Concord, New Hampshire, for example, display the same variety in layout and design that is



evident in Roxbury clocks.[56] Correspondence between Simon Johnson Jr. of Sanbornton, New Hampshire, and the Boston retailers William Grant (w. c. 1815), John Sawin (1801–1863), and Edmund Currier (w. c. 1790–1820) confirm that Johnson sold them "striking movements" to be incorporated into clocks signed by the Boston retailers.[57]

The Willards and their contemporaries made use of the finely divided clock-components industry and the journeymen network in England and America to realize the most complex business structure so far documented for that period in the United States. In the absence of shop records, the evidence for this remains for the most part circumstantial. However, as Henry Thoreau reminds us, some circumstantial evidence is very strong, as when you find "a trout in your milk pail, evidence is convincing that someone has watered down your milk!"[58]

This article is based on the cumulative experience of Cheney clockmakers over the course of a century and my own twenty-five years of observing, describing, conserving, and acquiring Roxbury painted-dial clocks. The conclusions drawn here are worthless unless the reader trusts my judgment about the authenticity of the objects discussed. I am indebted to David Wood, the curator of the Concord Museum in Massachusetts, who followed the arguments in this article long before they were successfully articulated while constantly contributing his deep understanding of American decorative arts. His initial editing of this manuscript made it much more readable for non-horologists.

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[1] A usable analytical model does exist for the Willards' patent timepieces. See Philip Zea and Robert C. Cheney, *Clock Making in New England, 1725–1825: An Interpretation of the Old Sturbridge Village Collection* (Old Sturbridge Village, Sturbridge, Massachusetts, 1992), pp. 43–46.

[2] See Benjamin A. Hewett, Patricia E. Kane, and Gerald W. R. Ward, *The Work of Many Hands: Card Tables in Federal America 1790–1820* (Yale University Art Gallery, New Haven, 1982); Nancy Goyne Evans, *American Windsor Chairs* (Hudson Hills Press, New York, with the Henry Francis du Pont Winterthur Museum, Winterthur, Delaware, 1996); and *Paul Revere: Artisan, Businessman, and Patriot—The Man Behind the Myth* (Paul Revere Memorial Association, Boston, 1988), p. 53.

[3] *A History of Simon Willard, Inventor and Clockmaker...* (E. O. Cockayne, Boston, 1911).

[4] I have organized and simplified this material from Burnap's description, written on September 8, 1779 (see Penrose R. Hoopes, *Shop Records of Daniel Burnap Clockmaker* [Connecticut Historical Society, Hartford, 1958], pp. 109–115). Another contemporary account of the trade, by the clockmaker Abiel Chandler of Concord, New Hampshire, is found in Charles S. Parsons, *New Hampshire Clocks and Clockmakers* (Adams Brown, Exeter, New Hampshire, 1976), p. 46. Three generations of Dominy woodworkers and clockmakers who worked in a similar fashion are documented in Charles F. Hummel, *With Hammer in Hand: The Dominy Craftsmen of East Hampton, New York* (University Press of Virginia, Charlottesville, for the Henry Francis du Pont Winterthur Museum, Winterthur, Delaware, 1968). For more about the traditional craft, see Eric John Tyler, *The Craft of the Clockmaker* (Crown Publishers, New York, 1974).

[5] Burnap's wooden patterns are illustrated in Hoopes, *Shop Records*, p. 162. For the sand-casting process, see Donald L. Fennimore, *Metalwork in Early America: Copper and Its Alloys from the Winterthur Collection* (Henry Francis du Pont Winterthur Museum, Winterthur, Delaware, 1996), pp. 22–24; and Sven Dan Berg and George Hassell, *The Geddy Foundry* (Colonial Williamsburg Foundation, Williamsburg, Virginia, 1992), pp. 29–45.

[6] Burnap's memorandum book offers directions on how to "make" and to "mix" bell metal, probably for sleigh bells rather than clock bells (see Hoopes, *Shop Records*, pp. 16, 124, 125). Several Connecticut clockmakers cast church bells, but little is known of those specializing in casting clock bells. Fennimore, *Metalwork in Early America*, p. 300, illustrates a clock bell cast by Macok Ward (1702–1783) of Wallingford, Connecticut, whose inventory lists a clock wheel engine for cutting gear teeth and equipment to cast brass clock parts.

[7] Burnap's engine is illustrated in Hoopes, *Shop Records*, pp. 148–149. Zea and Cheney, *Clock Making in New England*, p. 85, illustrate engines reportedly used by the clockmakers John Avery (1732–1794) of Preston, Connecticut, and Joshua Wilder (1786–1860) of Hingham, Massachusetts. For more about engines, the most complex tool used by traditional clockmakers, see Theodore R. Crom, *Horological Wheel Cutting Engines, 1700–1900* (Theodore R. Crom, Gainesville, Florida, 1970).

[8] A template is illustrated (upside down) in Hoopes, *Shop Records*, p. 159. Frank P. Albright, *Johann Ludwig Eberhardt and His Salem Clocks* (University of North Carolina Press, Chapel Hill, for Old Salem, Winston-Salem, North Carolina, 1978), p. 43, discusses a holdfast that held the plates for house clocks during drilling.

[9] Albright, *Johann Ludwig Eberhardt*, p. 70, illustrates twenty-seven varieties of pallet shapes used on Eberhardt's escapements.

[10] The front-plate strike work includes the rack, rack hook, and lifting piece. For an explanation of these parts, see Zea and Cheney, *Clock Making in New England*, pp. 172–173. Albright, *Johann Ludwig Eberhardt*, pp. 44, 149 n. 4, discusses a "Maschien Uhren zusammen zu sezen" in the 1806 inventory of Eberhardt's Salem, North Carolina, shop, which he suggests was probably a jig for holding the clock plates while the maker assembled the clock movement.

[11] Shop drawings and objects survive showing that at least some American clockmakers worked in this manner. See Hoopes, *Shop Records*, pp. 127–132, 158–159, 162–163; and Hummel, *With Hammer in Hand*, pp. 170–171, 189–190. The Pennsylvania clockmaker Jacob Hertz (b. 1773) sketched the plans for a thirty-hour clock in his 1794 account book (Helen B. Newell and Bruce R. Forman, "The Account Book of Jacob Hertz," *National Watch and Clock Collectors Bulletin*, vol. 39 [June 1997], p. 303).

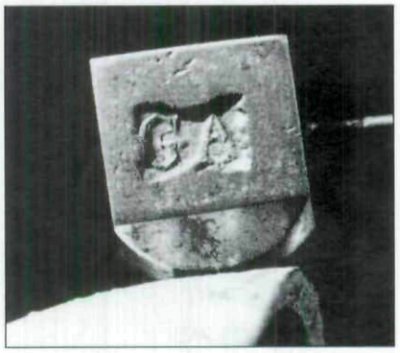
[12] Burnap's papers are in the Connecticut Historical Society, Hartford. Hoopes, *Shop Records* is an excellent analysis of them. Burnap's sales included thirty striking eight-day clocks, nine moon phase clocks, six chime clocks, and four small timepieces, as well as thirteen silvered brass dials sold to others (Hoopes, *Shop Records*, p. 37). Even allowing for clocks paid for in cash or goods and therefore not listed in the accounts, Burnap's total production during his career was probably well under one hundred clocks.

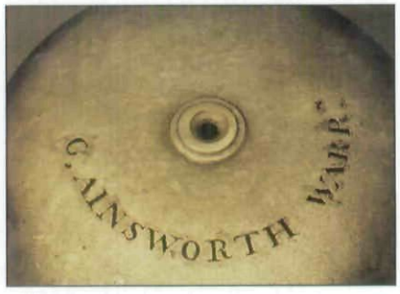
[13] *Ibid.*, pp. 14–27.

[14] Philip Zea, "Clockmaking and Society at the River and the Bay: Jedidiah and Jabez Baldwin, 1790–1820," in *The Bay and the River: 1600–1900*, Dublin Seminar for New England Folklife Annual Proceedings, 1981, ed. Peter and Jane M. Benes (Boston University, Boston, 1982), pp. 46, 48.

[15] Amos G. Avery, *Clockmakers and Craftsmen of the Avery Family in Connecticut* (Connecticut Historical Society, Hartford, 1987), pp. 9, 162. Allowing for those purchased for cash or goods, Avery estimates that a "total of not more than sixty or seventy 'brass wheeled' clocks were made by the Avery clockmakers." The Dominys of Long Island made approximately ninety clocks between 1768 and 1825 (Hummel, *With Hammer in Hand*, p. 222).

[16] Robert C. Cheney research files. A sheet-brass dial by





Pl. XI. George Ainsworth (d. 1815) of the Lancashire Pinion Manufactory, Warrington, England, as a brass founder, cast "GA" under a crown into the front plate of a movement. ***Old Sturbridge Village, Sturbridge, Massachusetts.***

Fig. 3. As a clocksmith Ainsworth struck "GA" on a steel bell hammer. ***Photograph by courtesy of John Robey.***

Pl. XII. As a bell founder, Ainsworth cast "G. AINSWORTH, WARR[N]" into the bell. ***Cheney photograph archive photograph.***

Ephraim Willard (b. 1755) is engraved with the number 251, but no numbered painted-dial tall clocks are recorded for Ephraim or Aaron S. Willard (1757–1844). For additional details about Benjamin Willard's numbered tall clocks, see Zea and Cheney, *Clock Making in New England*, pp. 29 and 56 n. 1. A patent timepiece at the Willard House and Clock Museum in North Grafton, Massachusetts, is inscribed "4561" on the painted dial—a further demonstration of the high-volume production by these makers in a variety of forms (Roger W. Robinson and Herschel B. Burt, *The Willard House and Clock Museum and the Willard Family Clockmakers* [National Association of Watch and Clock Collectors, Columbia, Pennsylvania, with the Willard House and Clock Museum, North Grafton, Massachusetts, 1996], pp. 175–176).

17 Cheney research files and photograph archive. This variety is not unique to painted-dial clocks from Roxbury. Initial research suggests that variety within a given maker's work is commonly found on painted-dial clocks throughout the United States during this period.

18 Cheney research files and photograph archive.

19 Zea and Cheney, *Clock Making in New England*, pp. 38 and 57 n. 40.

20 Charles Stimpson, *Stimpson's Boston Directory* (Boston, 1816), provides the best indication of Aaron Willard's whereabouts within a ward; and see Pieter Roos, "Summary of Research on Twelfth Ward Clockmakers and Associated Craftsmen" (unpublished research, 1988–1989, Old Sturbridge Village, Sturbridge, Massachusetts). The first names of the cabinetmakers Pratt and Walker are not recorded.

21 The Hunneman and Andrews account books are in the library of the USS *Constitution* in Charlestown, Massachusetts. The information about Hunneman and Andrews was provided by David Wood. Revere's work in copper is discussed in *Paul Revere*, pp. 94–115.

22 English clocks and watches arrived in Virginia from Liverpool merchants by 1703 (*Virginia Magazine of History and Biography*, vol. 68, no. 4 [October 1960], p. 434). I would like to thank Dennis Moore of the Prescott Museum in Prescott, England, for this citation. A notice in the *Boston News-Letter* for April 9–16, 1716, announced the arrival "from London [of] a Parcel of very fine Clocks, They go a week...in Japan Cases or Wall-Nut" (George Francis Dow, *The Arts and Crafts in New England 1704–1775* [Wayside Press, Topsfield, Massachusetts, 1927], p. 146).

23 Charleston *South Carolina Gazette*, April 7, 1760, cited in Carter Harris, "The Clock and Watch Makers American Advertiser," vol. 2, entries 1241, 1244 (manuscript in American Clock and Watch Museum, Bristol, Connecticut). Lockwood arrived in Charleston in 1757 and advertised an assortment of clocks and watches yearly through 1770.

24 See Harris, "The Clock and Watch Makers American Advertiser," vol. 3, entry 2100 (Philadelphia *Pennsylvania Gazette*, June 27, 1771); entry 2108 (Philadelphia *Pennsylvania Packet*, August 19, 1785); and entry 2109 (Philadelphia *Pennsylvania Evening Herald*, June 17, 1786). Catgut is a cord made from sheep intestines that is used in clockmaking to suspend the weights that power the clock.

25 Boston *Independent Chronicle*, October 19, 1797 (cited in Harris, "The Clock and Watch Makers American Advertiser," vol. 2, entries 1298–1301). See also Fennimore, *Metalwork in Early America*, p. 254; Zea, "Clockmaking and Society," pp. 47, 58; and ANTIQUES, February 1927, p. 133.

26 Boston *New-England Palladium*, August 16, 1808; and Boston *Independent Chronicle*, September 5, 1808. I would like to thank the researcher Paul Foley for calling these advertisements to my attention.

27 Over the last twelve years Dennis Moore of the Prescott Museum has discovered more than twenty thousand clock- and watchmakers working within a twenty-mile radius of Liverpool between 1700 and 1870. Most of these names have never been found on a clock or watch and clearly represent the importance of journeymen in the manufacturing process (conversation with Moore on April 7, 1998).

28 R. Campbell, *The London Tradesman* (1747; David and Charles, Newton Abbot, Devon, 1969), pp. 252–253. The organization of the watchmaking trade is described in Leonard Weiss, *Watch-making in England, 1760–1820* (Robert Hale, London, 1982), particularly pp. 32–33.

29 John Rule, *The Experience of Labour in Eighteenth-Century English Industry* (St. Martin's Press, New York, 1981), pp. 14, 22, 31. Rule describes outworkers as "dependent artisanry." They were subcontractors working in a cottage industry environment performing highly specialized work on materials often owned by others. In the clock trade they worked in brass, iron, and steel. I would like to thank Jay Gaynor for suggesting this book.

30 *Ibid.*, p. 32, Rule cites the silk and hosiery trades, nail making, cutlery, and branches of hardware manufacturing in England as operating with a similar division of labor.

31 Abraham Rees, *Rees's Clocks, Watches, and Chronometers (1819–20): A Selection from the Cyclopaedia, or Universal Dictionary of Arts, Sciences, and Literature* (1819–1820; Charles E. Tuttle Co., Rutland, Vermont, 1970), pp. 90–91. Charles F. Partington, *The Clock and Watchmakers Complete Guide* (London, 1825), pp. 55–56, confirms Rees's division. A more easily available discussion of Rees is found in Parsons, *New Hampshire Clocks and Clockmakers*, pp. 11–12.

32 Alan Treherne, *Nantwich Clockmakers: Catalogue of Clocks and Watches...with Biographies of All Known Nantwich Clock and Watchmakers* (Nantwich Museum, Nantwich, Cheshire, 1986), p. 15. The description of Stubs's business appears on an 1816 billhead (Local Studies Archive of the Manchester Central Library, England, Stubs papers).

[33] Brian Loomes, *Clockmakers of Northern England* (Mayfield Books, Ashbourne, Derbyshire, 1997), p. 79. I am eagerly awaiting the publication this summer of John Robey, *The Longcase Clock Reference Book*, which promises new information about the real makers behind the dials of eight-day clocks.

[34] I am indebted to Alan Treherne of Keele University in Staffordshire for generously sharing his research on the Stubs export business to Boston. His ongoing research into the significance of the Lancashire trade has added substantial documentary evidence to this article. A Stubs tool catalogue dated 1801 is reproduced in Crom, *Horological Shop Tools*, pp. 119–161, 172–213. Other sources of information about Stubs are Thomas Southcliffe Ashton, *An Eighteenth-Century Industrialist: Peter Stubs of Warrington, 1756–1806* (Manchester University Press, Manchester, Lancashire, 1939); and Eric Surrey Dane, *Peter Stubs and the Lancashire Hand Tool Industry* (John Sherratt and Sons, Altrincham, Cheshire, 1973).

[35] The *Catalogue of the Principal Articles Sold by Davis, Brown and Co.* is in the Stubs papers (L24/1). (Although it is called a catalogue, this is a two-page broadside.) Samuel Davis is listed in the 1807 Boston directory as a jeweler at 53 Marlboro Street, and in 1810 Samuel Davis and R. Johnson Brown are listed at 33 Marlboro Street. The firm continued at that address until the 1818 directory listing. The firm was intact until 1825, although Davis left in 1820. (The Boston directory information was kindly provided by Donald Wing.)

[36] The order is in the Stubs papers (L24/1, box 114). The reference to twelve and thirteen inches denotes the width of the clock dials.

[37] Order dated July 12, 1818 (*ibid*).

[38] The order of May 14, 1817, referred to in n. 36 included "3 dozen sets of pinions for *timepieces* as enclosed pattern, 3 in a set, and 3 dozen timepiece hands for dials 8 inch in diameter." On July 12, 1818, Davis and Brown ordered from Stubs another "12 dozen sets of timepiece pinions" (*ibid*).

[39] Demilt's orders to Peter Stubs, 1816–1818 (Stubs papers, L24/1). Demilt offered "movements" for sale in the *Rhode Island Republican*, November 22, 1809. I would like to thank Paul Foley for providing this advertisement.

[40] John E. Rigden order to Peter Stubs, June 4, 1818 (Stubs papers, L24/1). John Rigden is listed at 200 ½ Market Street, Baltimore, among the "dealers in hardware" in Charles P. Forbes, *The Merchant's Memorandum and Price Book* (Boston, 1827). Davis and Brown similarly advised Stubs in their order of May 14, 1817, that "we want them [clock hands] lower [cheaper] than the last or we will have them from Birmingham."

[41] Paul Oglesby and Richard J. Wolf, "A Mystery Unwound," *National Watch and Clock Collectors Bulletin*, June 1995, pp. 339–341. For a discussion of the same long-duration clock associated with Willard, see Richard W. Husher and Walter W. Welch, *A Study of Simon Willard's Clocks* (Husher and Welch, Nahant, Massachusetts, 1980), pp. 229–236.

[42] Boston *Columbian Centinel*, June 8, 1799. I would like to thank the furniture conservator Robert Mussey for this citation.

[43] Boston *American Herald*, May 23, 1785, cited in Harris, "The Clock and Watchmaker's American Advertiser," vol. 3, entry 2166.

[44] Brian Loomes, *Painted Dial Clocks, 1770–1870* (Antique Collectors' Club, Woodbridge, Suffolk, 1994), p. 19.

[45] *Ibid.* The supply of Birmingham dials was supplemented by dials painted locally and attributed to John Ritto Penniman (1782–1841), Aaron Willard Jr. (1783–1864), and Spencer Nolen (1784–1849), and others (see ANTIQUES, July 1981, pp. 147–170, and November 1975, pp. 998–1000; and Robinson and Burt, *Willard House and Clock Museum*, pp. 94–96).

[46] Chapter 3 in Robey, *Longcase Clock Reference Book* (forthcoming).

[47] Cheney research files and photograph archive. "ROSKELL/LIVERPOOL" appears on an Aaron Willard movement (see Zea and Cheney, *Clock Making in New England*, p. 39). "Movement Made by Andrew Steele" is also on an Aaron Willard movement (Worcester Art Museum, Massachusetts). "Alvin Lawrence" is on a Simon Willard movement (private collection), and "JB" is on an Ephraim Willard movement (private collection).

[48] *The Colonial Furniture of New England* (Houghton Mifflin, Boston, 1891), pp. 261–262.

[49] *Colonial Furniture in America* (Charles Scribner's Sons, New York, 1901), p. 338.

[50] ANTIQUES, May 1996, pp. 760–765.

[51] Zea and Cheney, *Clock Making in New England*, p. 107.

[52] Joseph Loring account book 1791–1812 (American Antiquarian Society, Worcester, Massachusetts). This ledger was used as a scrapbook in the late nineteenth century, and, although now restored, has many illegible areas.

[53] Edward Jarvis, "Houses and People in Concord 1810–1820," typescript 1882, annotated by Adams Tolman in 1915, pp. 359–361 (Special Collections, Concord Free Public Library, Concord, Massachusetts).

[54] Quoted in Parsons, *New Hampshire Clocks*, p. 276.

[55] For example, Forbes, *The Merchant's Memorandum and Price Book*.

[56] Parsons, *New Hampshire Clocks*, pp. 80–83.

[57] The striking movements were probably for wall clocks, as no eight-day clocks are known from these retailers. The correspondence between Johnson and Grant and between Johnson and Sawin and Currier is in the Sanbornton Historical Society in Sanbornton, New Hampshire. I am grateful to Stephen Sanborn for this interesting material.

[58] Henry David Thoreau, *Journal*, ed. John C. Broderick (Princeton University Press, Princeton, New Jersey, 1990), vol. 3, p. 139.

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Facing page:

Pl. XIII. Nineteenth-century cast and forged set of clock work. It includes just under six pounds of brass castings: plates, pillars, wheel blanks, great wheel assembly, hour wheel bridge, pallet cock, key, and other components. The forged-steel components include a leaf spring, great wheel arbors, bell stand, bell hammer, clicks, studs, pallet blank, rack, rack hook, and lifting piece. Also shown is a small assortment of pinions. ***American Clock and Watch Museum; Arnold photograph.***

This page:

Pl. XIV. Steel forgings and brass castings of a great-wheel assembly, shown with the finished components. Although forgings and castings saved a good deal of time in the production of an eight-day clock, it is clear from the photograph that considerable finishing was required. ***American Clock and Watch Museum; Arnold photograph.***