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A House Fit for a Bee: Historic Apiary Typologies and Technologies

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A House Fit for a Bee: Historic Apiary Typologies and Technologies

Abstract

This thesis defined historic apiary typologies and technologies including: bee houses and honey houses, bee shelters, stands, and hives. Because of a strong beekeeping tradition in Philadelphia and its influential role in the advancement of apiculture, this paper researched apiary typologies beginning in Philadelphia and its region. The Rev. L.L. Langstroth, a Philadelphian, experimented with beekeeping methods and technologies, inventing the moveable-frame hive in 1851, which would later make the bee house and other forms of protection unnecessary. Bee manual authors provided various structural forms to protect the hives, produce valuable honey, and aid the beekeeping process. These vernacular structures were either decorative and playful as an architectural folly in the landscape, or simply utilitarian and unadorned. A bee house and honey house remain intact in Madison, Indiana and stand as rare tangible evidence of the type. Other regions developed their own typologies, but common themes emerged. The typological defining features are; protecting the beehive from weather and temperature fluctuations, providing ample forage, utilizing trees as wind breaks, and locating the apiary near a frequented dwelling. This thesis reveals a once common but now obscure outbuilding type that has largely disappeared from the American cultural landscape and rescued the bee house form from near total obscurity.

Keywords

bee house, bee culture, skep, Madison, alighting board

Disciplines

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A HOUSE FIT FOR A BEE: HISTORIC APIARY TYPOLOGIES AND TECHNOLOGIES

Sonja Jean Lengel

A THESIS

in

Historic Preservation

Presented to the Faculties of the University of Pennsylvania in
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Introduction

This thesis defines historic apiary typologies including: bee houses, honey houses, bee shelters, stands, and hives in the United States and also relies on historic British and European sources. Because of the strong beekeeping tradition in Philadelphia, Pennsylvania, and the city's influential role in the advancement of apiculture, this thesis researched apiary typologies in Philadelphia and its region. Because no intact historic apiaries are known in the Philadelphia area, beekeeping manuals, manuscripts, diaries, letters, newspapers, photographs, drawings, and journals provided the basis of research. However, two intact historic bee houses which remain in southern Indiana, stand as tangible evidence of the type and largely inspired this investigation. Many widely distributed beekeeping manuals discussed types of apiaries, including bee houses. Immigrants from bee house traditions of Switzerland, Austria, and Germany also brought the bee house form to America.¹ American apiculturists from different parts of the country, communicated with and educated each other bringing some standardization and cross pollination to the practice over time. As apiary typologies become better known, more examples of intact historic apiaries and more typologies may be discovered. This thesis does not attempt to be the exhaustive source for historic apiary typologies, but offers foundational research on the form.

Although few examples of intact apiaries remain, beehives and houses played a significant role in American farming and in the cultural landscape. Many historic architectural inventories did not record structures associated with beekeeping because of their impermanent construction. However historically, bees, known as valuable pollinators

¹ Crane, *The World History of Beekeeping and Honey Hunting*, 320-1.

for crop production, also produced honey and beeswax, useful byproducts. Honey had many uses. It could be converted to mead an alcoholic beverage, used as a sweetener, a wound dressing, and beeswax could be used for candles and provided a finish for furniture and fabrics.² Decorative and unadorned beehives placed within gardens and orchards, capitalized on abundant pollen and served dual functions of production and ornamentation.³

This thesis reviewed scholarly literature devoted to historic apiaries, beekeeping, and rural architecture, informing and framing the topic. Germantown and West Philadelphia's historically rural landscapes provided forage for bees which assisted in the development of the beekeeping practice. Philadelphia apiarists, such as the Rev. L.L. Langstroth whose invention improved the efficiency and production of beehives, experimented with various beekeeping methods. Beekeeping manuals informed and influenced apiarists throughout America and Europe, establishing the forms and typologies of apiaries. Other regions, outside the Philadelphia area, developed their own preferences, methods, and inventions that shaped the practice in America. Finally, these apiary types will be condensed and summarized in the Typologies section.

Beekeeping was a strong tradition in the Philadelphia region.⁴ Early Germantown settlers, to the northwest of the city, experimented with beekeeping, including Germantown's founder, Daniel Pastorius (1651-1719), who wrote a gardening and beekeeping treatise in 1701. He advised, 'stop up your bees only leave breathing vents.'⁵

² Honey is a humectant with natural anti-microbial properties which means it attracts and retains moisture and also has natural anti-microbial properties. <http://www.honey.com/honey-at-home/honeys-natural-benefits/natures-skin-care>.

³ Therese O'Malley, *Keywords in American Landscape Design*, 133-6.

⁴ According to Charlie Thomforde, former staff member at Pennsbury Manor, there is no documentation that William Penn had bees at his Pennsbury estate.

⁵ Francis Daniel Pastorius, "A Monthly Monitor Briefly Showing When Our Works Ought to be Done in Gardens, Orchards, Vineyards, Fields, Meadows, and Woods," vol. no. 7. Quote found in Image Description of Digital Library Version at the Historical Society of Pennsylvania.

<http://digitallibrary.hsp.org/index.php/Detail/Object/Show/idno/8243>.

William Logan (1717-1776) inherited Stenton, the family summer house and working farm from his father, James Logan (1674-1751) in 1751.⁶ In his correspondence between Logan and Anna Blackburne, an English botanist and entomologist, in 1768, she requested, 'Bees, wasps, and common winged flys, I should value...' from America.⁷ His son, George Logan (1754-1821), also kept bees at Stenton. Charles Jones Wister (1781-1865) produced volumes of honey in the 1820s at his Grumblethorpe estate, and Reuben Haines (1786-1831) maintained hives on his property, Wyck. Charles Willson Peale (1741-1827) the American painter, naturalist, and museum entrepreneur kept bees at his Belfield Farm.

Apiaries and notable apiarists called West Philadelphia home. In the village of Hestonville, in West Philadelphia, Frank Parkinson's located his apiary near 53rd Street and Lancaster Avenue in Samuel L. Smedley's 1862 Atlas of the City of Philadelphia (Figure 1). William Bartram (1739-1823) observed bees and noted advancements in beekeeping. The Rev. L.L. Langstroth (1810-1895) invented the movable-frame hive at his West Philadelphia apiary in 1851, which influenced beekeeping worldwide. In Philadelphia, Samuel Wagner of York, Pennsylvania, with contributions by Langstroth, published the *American Bee Journal* in 1861, the first bee journal in America. The United States Agriculture Census of 1860 ranked Pennsylvania second among the Mid-Atlantic States for its production of honey and beeswax.⁸ In 1879, a Montgomery County widow named Sarah Raudenbush Rittenhouse, chose among her husband Henry Renier Rittenhouse's possessions to take two swarms of bees.⁹ That bees were listed on estate inventories indicated their cultural and economic value. Other regions of the country certainly practiced apiculture. However, through his writings, inventions, and correspondence, the Rev. Langstroth influenced other well-known

⁶ Stenton History, accessed April 13, 2016, <http://www.stenton.org/#!william-logan/ckui>.

⁷ Wright, "The Garden at Stenton," *Germantown History*, 3-15.

⁸ Kennedy, *Agriculture of the United States in 1860*, cviii. See Appendix Figures 35-37.

⁹ Love, "Welcome to our Rittenhouse Family History," 305-6.

beekeepers such as the Dadant family of Hamilton, Illinois and the Root family of Medina, Ohio.

Beekeeping manuals offered a wealth of information about historic apiaries, especially historic hives and bee and honey houses. These forms did not survive once Langstroth's moveable-frame hive became standard beekeeping practice around the world, around 1900. Langstroth entered a partnership with the Dadant family, still in business today, who sold and promoted his invention. The engravings offered a picture of what these bee houses may have looked like and explained the theories and ideals of the authors.

Why this topic and why now? The bee houses and honey house in Indiana, initiated the quest for more information and served as a starting point for this research. For the purpose of this thesis, a bee house was defined as an enclosed freestanding building which can accommodate a person inside. Rare treasures, this research did not find other examples in the United States, although a few remain in the United Kingdom on large estates.¹⁰ The high volume of Patents and Manuals from the nineteenth century time period indicated a desire to perfect the form, reinforcing the cultural importance of bee houses. The current decline of the western honeybee added an urgency and relevance to a formerly uncelebrated insect. The literature review confirmed that no other work solely devoted solely to historic apiaries exists and pointed out that architectural historians have not paid attention to this building form and its typologies. As there are few surviving buildings, other artifacts related to beekeeping, such as a skep or straw hive at Wyck in Germantown, historic photos, and, letters and diaries provided the primary source material for this thesis. The following literature review will outline the secondary sources (Figure 2).

¹⁰ Gene Kritsky's book, *The Quest for the Perfect Hive*, noted a brick bee house in Richmond, Kentucky constructed in 1820 (pages 154-5). I chose to leave this building out of my research because I wanted more details to back up the claim that it was a bee house.

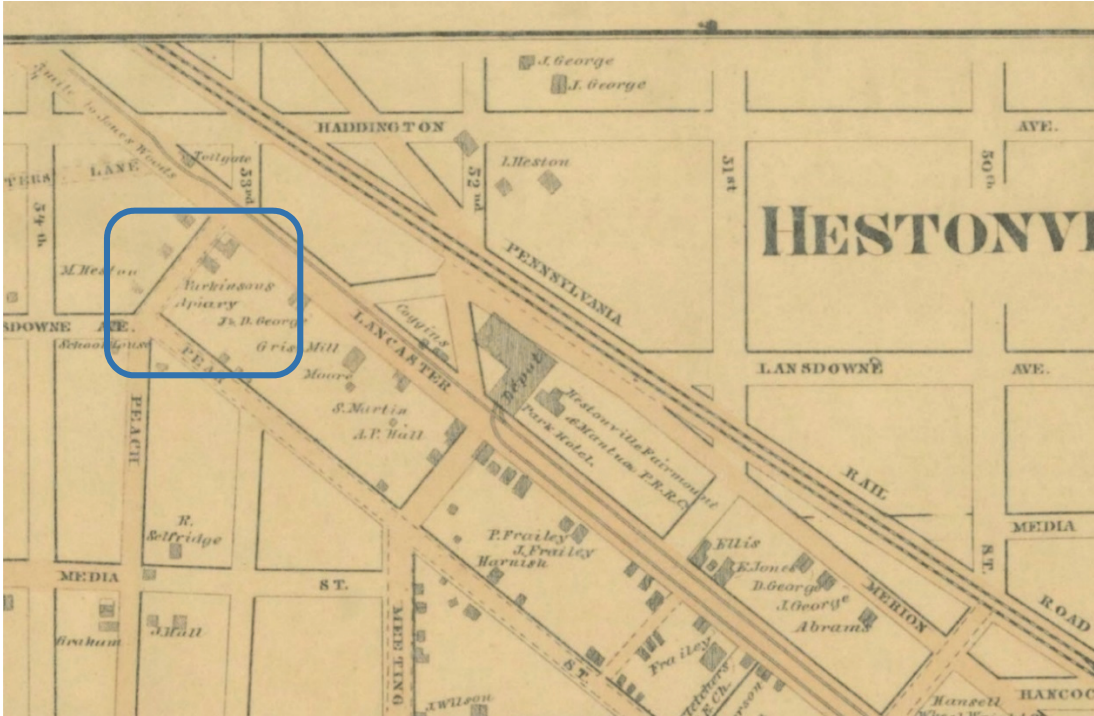


Figure 1 Parkinson's Apiary, Hestonville, West Philadelphia. Samuel L. Smedley, 1862 Atlas of the City of Philadelphia. Courtesy of the Free Library of Philadelphia and Greater Philadelphia Geo History. Accessed 5 May 2016. <https://www.philageohistory.org/rdic-images/view-image.cfm/SMD1860.Phila.013.Section08>.



Figure 2 Honey House (Left) and Bee House (Right), relocated to Pearl Park, Madison, Indiana. Original location at the Vernon Farm. Photo by Author.

Literature Review

Few books are devoted to the topic of historic apiaries in the United States. Authors from the United Kingdom have published works depicting apiary typologies including, bee houses and straw hives or skeps. Many American works focused on the technological development of hives from the perspective of bee entomology. A thesis, biography, and a world beekeeping encyclopedia discussed beekeeping practitioners and practices. The authors of this reference work contributed to the context and terminology of historic apiary typologies.

The most directly relevant work, *Bee Boles and Bee Houses* by A.M. Foster, published in 1991, highlighted British historic apiaries. Foster outlined the bee house form and introduced bee houses, bee boles, bee shelters, bee stands, and bee alcove typologies. Evidence of medieval bee houses made of wood, stone, and brick remains in the United Kingdom. These houses held straw hives or skeps inside protective structures. Foster included sketches of the various apiary typologies. This thesis will define and depict typical historic apiary forms. Beekeepers in the United Kingdom used skeps as standard practice until the introduction of Langstroth's movable-frame hive in 1862. Significantly, Foster did not recount hives themselves but focused on the structures that supported and protected the bees and beehives. A free-standing small house, typically constructed of wood, with interior shelves for skeps or box hives and holes open to the outside is the typical typology of a bee house. A skep situated on a shelf, built within a wall is called a bee bole, common in various regions of the United Kingdom. A structure covered by a roof and open on one or more sides is a bee shelter. A bee alcove is a large opening within a wall that housed skeps on shelves. A skep or box hive sitting on a low bench is known as a skep stand. Although this

thesis does not compare British and American apiary forms, the British form serves as a general reference point.

An American counterpart, Gene Kritsky's, *The Quest for the Perfect Hive*, published in 2010, devoted two chapters to bee boles and bee houses. Kritsky also discussed European and American beehive development with references to other regions of the world. Kritsky wrote amid the Colony Collapse Disorder (CCD) problem, which has affected many beekeepers around the world, since the mid-2000s. He chronicled the progression of hive development and advances in beekeeping that led to the modern hive. He concluded, as beekeepers innovated in the past, they must develop new beekeeping methods to combat the effects of CCD. Kritsky also devoted a chapter to bee boles and bee niches in the United Kingdom. Another chapter discussed American bee houses, which protected straw hives or skeps from the elements. He explained that bee houses became obsolete after the invention of movable-frame hives. According to Kritsky, movable-frame hives survived on their own in the elements without requiring the extra protection of a bee house. He indicated several problems with bee houses including, initial expense, smoke trapped inside the house (unless it had a window), and the potential fire hazard. This resource offered the basics of functioning bee houses, their problems, and described uses of common beekeeping tools including, two important devices, smokers and extractors, equipment developed to calm bees and remove honey, respectively.

Jay Davidson Susnin's 1990 master's thesis, *Grumblethorpe: An Historic Landscape Report*, recounted the Grumblethorpe estate in Germantown including a bee house and box hives. He devoted a chapter to Charles J. Wister's management of Grumblethorpe, his Germantown estate, from 1806-1865. Wister studied science, and along with others founded the Academy of Natural Sciences, gaining membership to the American Philosophical Society. At Grumblethorpe, he experimented with farming and animal

husbandry. Wister also practiced beekeeping, maintaining a bee journal from 1824-1828 entitled *Bees*, located at the American Philosophical Society, which documented his apiaries. Susanin included 1892 apiary photographs of hives and a bee house on the Grumblethorpe property. He suggested these hives and bee house dated from the Wister period based upon the dates of his journal, and as no other beekeeping records have materialized.

Americans were innovative beekeepers, most notably a beekeeper named the Rev. Lorenzo Lorraine Langstroth. The Langstroth Hive, or movable-frame hive, played a pivotal role in American beekeeping and Florence Naile's 1942 biography, *America's Master of Beeculture-The Life of L.L. Langstroth*, provided the story behind the invention and the inventor. Langstroth discovered what would later be called, 'bee space,' a 3/8-inch gap large enough for bees to move through a hive, but not so large that the bees would fill gaps with comb. Because the frame maintained the 3/8-inch space, the beekeeper could remove the frame without destroying the comb, inspect a hive's health, and remove honey and wax easily without harming the bees.¹¹ Langstroth also successfully imported the Italian bee into America, a superior bee to the common black bee because it produced more honey and was less temperamental.¹²

An article from the 1952 *Morris Arboretum Bulletin* sharing news of the Langstroth Bee Garden dedication offered similar information as Naile's book. E.F. Phillips, the late Professor Emeritus of Apiculture at Cornell University, wrote that Langstroth's west Philadelphia apiary was previously located on what would become the University of Pennsylvania's campus. Langstroth's discovery of 'bee space,' the moveable-frame hive, and the successful importation of the Italian bee, transformed beekeeping and would lead to the decline of bee houses.¹³

¹¹ Naile, *America's Master of Beeculture*, 69-72.

¹² Naile, *America's Master of Beeculture*, 119-121.

¹³ "The Langstroth Bee Garden," *Morris Arboretum Bulletin*, 20-4.

Eva Crane's seminal work published in 1999, *The World History of Honey Hunting and Beekeeping* offered a broad context for the technological development of apiaries throughout the world and descriptions of various bee features and uses. Crane chronicled the broad history of European beekeeping and which European methods directly influenced American beekeeping. According to Crane, people intrinsically valued beeswax more than honey because of its use in candle-making. Crane's map demonstrated the historic use of skep beekeeping and log beekeeping in Europe.¹⁴ Nineteenth-century beekeepers utilized bee houses in Germany, Switzerland, Poland, and Western France. As the honeybee was not native to North America, Crane chronicled the importation of the honeybee by English colonists to Virginia as early as 1622, and in Massachusetts, as early as 1639. The bees naturally spread by swarming throughout the northeast and into Pennsylvania by 1630.¹⁵ Although Crane mentioned European bee houses, she did not address bee house typologies or their evolution.

Frank Alston's book, *Skeps: Their History, Making and Use*, published in 1987, provided key vocabulary and practices of common hives in Britain. He defined common hives as a collective term for all reed-based hives. He wrote the history of early hives and explained the transition from wicker to straw. Alston exhibited the traditional materials and craft of skep making. This work informed a foundation and understanding of the common hive, its features and functions.

Other works also informed the greater context of American beekeeping but proved less meaningful to this research. Tammy Horn's 2005 book, *Bees in America- How the Honey Bee Shaped a Nation*, portrayed how the hard working honeybee inspired Americans and offered a source of identity. Horn detailed the skep hive's function as an important Mormon

¹⁴ Crane, *The World History of Beekeeping and Honey Hunting*, 128.

¹⁵ Crane, *The World History of Beekeeping and Honey Hunting*, 359.

symbol. Reese Halter's contemporary book, *The Incomparable Honey Bee & the Economics of Pollination*, published in 2009, detailed the honeybee's role in plant pollination. Halter also discussed contemporary problems affecting bees' health. This book examined the current health problems such as CCD and the Varroa mite for which bees have been receiving so much attention.

Two Frederick Tolles works placed beekeeping within the greater context of late eighteenth and early nineteenth-century agricultural practices. *George Logan of Philadelphia*, a biography of eighteenth-century farmer George Logan (1753-1821) published in 1953, described Logan's belief that every farmer should keep bees to benefit the country by being less dependent on imported sugar. The common practice of killing bees to extract honey and comb concerned Logan. After a collaboration with his Germantown neighbors, George Shoemaker and Isaiah Lukens, he lamented his inability to save his bees. Frederick Tolles also recounted Logan's experiments with agriculture in his article, "George Logan and the Agricultural Revolution," published in 1951 in *Proceedings of the American Philosophical Society*. According to Thomas Jefferson, 'George Logan was the best farmer in Pennsylvania, both in theory and in practice.'¹⁶ Tolles contextualized late eighteenth and early nineteenth-century agricultural advancements including scientific rotation of crops and increased attention to animal husbandry.

The above literature framed this investigation of apiary forms and types. This thesis will focus on historic sources of apiaries including, photographs, drawings, and written descriptions as primary resources. Because this form of agricultural architecture has received little scholarship, this thesis will be useful for understanding, promoting, and preserving historic bee houses.¹⁷

¹⁶ Tolles, "George Logan and the Agricultural Revolution," 589.

¹⁷ Most North American barn and agricultural-outbuildings books did not mention apiaries, but instead described the context of the agricultural landscape. Although Cynthia G. Falk's, *Barns of New York: Rural*

Philadelphia Beekeeping: Germantown Beekeeping

The Germantown landscape developed as large farmland tracts so there was plenty of forage for bees. This rural aspect may be why several early Germantown residents experimented with beehives and were avid beekeepers. Germans, who immigrated from the Rhine Valley in 1683, founded the community. Germantown flourished as a textile producing village northwest of Philadelphia.¹⁸ Francis Daniel Pastorius (1651-1719) an early leader, gardened and kept bees. Germantown historian and antiquarian, the Hon. Samuel Whitaker Pennypacker, quoted Pastorius who said, 'Honey is Money.'¹⁹ Investing in bees; Pastorius purchased two hives from a neighbor on June 2, 1705, showing the early establishment of beekeeping in Pennsylvania. By May 6, 1711, he had doubled his hives.²⁰ Pastorius kept a commonplace book, conforming to the traditional literary form, which he called, "The Beehive," now in the University of Pennsylvania Van Pelt Library. The bee served as a model of industry and for gathering and storing knowledge within its hive. Pastorius referred to himself as a 'two-footed Bee,' travelling from book to book gleaning knowledge that he wanted to remember.²¹ He left the book for his heirs so they could add their own pieces of collected wisdom.²²

Architecture of the Empire State, New York: Cornell University Press, 2012, mentioned New York beekeeping and apiaries. Lucinda Lambton, *Beastly Buildings*, London: Jonathan Cape, 1985, mentioned bee house and bee boles which were also chronicled in A.M. Foster's *Bee Boles*. The following books provided agricultural context: Eric Arthur and Dudley Witney, *The Barn a Vanishing Landmark in North America*, Boston: New York Graphic Society, 1972. Robert F. Ensminger, *Pennsylvania Barn in Origin, Evolution, and Distribution in North America*, Baltimore: The Johns Hopkins University Press, 1992. Joseph W. Glass, *The Pennsylvania Culture Region: A View from the Barn*, Ann Arbor, Michigan: UMI Research Press, 1986. Isaac Phillips Roberts, *The Farmstead*, New York: Macmillan, 1905. Eric Sloane, *An Age of Barns*, New York: Funk and Wagnalls, 1966.

¹⁸ Susanin, "Grumblethorpe," 8.

¹⁹ Pennypacker, *The Settlement of Germantown*, 62.

²⁰ Palmieri, "What the Bees Have Taken Pains For," 40.

²¹ Palmieri, "What the Bees Have Taken Pains For," 39.

²² Palmieri, "What the Bees Have Taken Pains For," 38-9.

Charles Willson Peale (1741-1827), the American painter built a bee shelter at Belfield, a 100-acre farm and garden in Germantown, where he lived from 1810 to 1826. Peale's garden, planted with exotic shrubs, trees and plants, became well known in nineteenth century Philadelphia and beyond. He wrote to his son, Rembrandt Peale, on July 29, 1810:

& beneath rose bushes, [along the stone wall] you may discover a long Roof which has shelves for Bee hives conveniently situated to get their food from the flowers of the Garden.²³

This description painted a lovely picture of beehives, possibly in an ornamental flower garden, confirming that hives not only provided honey and wax but integrated into garden design. The early nineteenth-century date of the letter and the presence of a shelf and roof to protect straw hives from the elements, suggests that Peale probably used skeps. The farm did not at first prove financially successful. His attempts at beekeeping, may have been a method to make the farm viable. He eventually turned to making currant wine and finally received a profit.²⁴

George Logan, son of William, experimented with various forms of agriculture and animal husbandry, including bees. In his address to the Germantown Society for Promoting Domestic Manufacturers, reprinted in *American Museum* in 1792, he responded to the Society's desire for more information about beekeeping. He recommended analyzing the ratio of hives to the available pasture acreage. George stated his preferred hive:

Straw hives are preferable to any other habitations, because the straw is not as liable to be heated by the rays of the sun; and is a better security against the cold, than any kind of wood.²⁵

According to George, an appropriately sized straw hive could hold six gallons of liquid. George recommended the hive not be proportionally too high in relation to the width. A

²³ O'Malley, *Keywords in American Landscape Design*, 135.

²⁴ Lyons, "The House Across the Street," 1-5.

²⁵ Butler, "Observations on Bees," 28. See also Frederick Tolles, *George Logan of Philadelphia*, 93-94.

straw cap protected the hive from rain and extreme temperatures. The hive should be placed on a stool two-feet off the ground, slightly slanted to dispel rain. The cap, sometimes referred to as a hackle, should be wider than the hive. George unsuccessfully attempted to extract honey and comb without killing the bees. He consoled himself and the audience, that bees starved with the removal of their honey and wax. George consulted experienced beekeepers, George Shoemaker and Mr. Lukens, for advice, possibly the same beekeepers he mentioned practicing for forty or fifty years.²⁶

John Wister (1708-1789), a Quaker, immigrated from the Palatinate region of Germany to Germantown, Pennsylvania in 1727. He amassed a large fortune as a wine merchant and purchased property at 3rd and Market Streets in Philadelphia. In 1744, he constructed a substantial two-and-a-half story stone house six miles outside of Philadelphia known as, 'Wister's Big House;' on an eight-acre property purchased from Robert Nevett. The house fronted Germantown Avenue oriented northeast along the narrow but deep farmland tract, as typical of Germantown properties. Wister used this property as his summer residence-farm and respite from the yellow fever epidemics that plagued Philadelphia. John Wister constructed the house using trees from the property, in an area known as Wister's Woods. Years later, the family renamed the property, 'Grumblethorpe' in honor of a favorite nineteenth-century book which resembled their own family's discord.²⁷ Although Wister built Grumblethorpe as summer residence, it also served the family as a working farm until the 1870s.²⁸

Charles Jones Wister (1781-1865), the grandson of John Wister, studied science and agriculture, traveled extensively, and cared for his family estate. His scientific interests included mineralogy, botany, chemistry, and meteorology. C.J. Wister kept daily weather

²⁶ Butler, "Observations on Bees," 27-28.

²⁷ Rubincam, "The Wistar-Wister Family," 153-4.

²⁸ Susanin, "Grumblethorpe," 8.

reports and submitted them to the Surgeon General's Office of the War Department. He gained membership to the Society for the Promotion of Agriculture, among other societies. Employed by his uncle at Wister and Price counting house, Wister collected debts from Pennsylvania to Virginia. Upon their uncle's death C.J. Wister, and his older brother John, founded their own counting house, Wister and Wister. Wister inherited Grumblethorpe from his unmarried uncle William Wister. He continued to work in downtown Philadelphia and maintained a permanent residence at Grumblethorpe from 1811. Charles and others founded the 'Twilight Club' which would later become the Philadelphia Academy of Natural Sciences in 1812. In 1819, Wister retired from business, devoting his full attention to Grumblethorpe.²⁹ Technological advances in agriculture in the early nineteenth century, allowed Wister to experiment with and manipulate the land. The Grumblethorpe garden received local acclaim as a superior example of small farm production well into the twentieth century.³⁰

The Wisters used the garden as recreational and ornamental space in the eighteenth century and the site of the apiary in the early nineteenth century. The estate extended behind the house and consisted of woods, an orchard, three hilly-fields, a meadow, and a quarry.³¹ C. J. Wister wrote about his ancestor John Wister's rectangular garden layout, measured 180 by 450 feet, located between the picket fence at the end of the house-yard to the barns and outbuildings, with the fields beyond the barn. A central path edged with boxwoods created a central access through the garden. The garden contained large fruit trees at the time of C.J. Wister's childhood and an apple orchard which had been cultivated

²⁹ Rubincam, "The Wistar-Wister Family," 157-161.

³⁰ Susanin, "Grumblethorpe," 26.

³¹ Susanin, "Grumblethorpe," 32.

for over fifteen years.³² Wister continued to cultivate the apple orchard and constructed his apiary in the northeast corner of the garden near the orchard.³³

Wister began experimenting with beekeeping and kept a journal entitled, "Bees" from 1824-28 located in the collections of the American Philosophical Society.³⁴ He purchased some of his bees, while capturing others from his own woods. Considered a local expert, his successes were published in *American Quarterly Review*. But according to a newspaper clipping from 1923:

In time, however, as the region was built up and clover and buckwheat fields became fewer, there was so little nectar for the bees that Mr. Wister eventually abandoned beekeeping.³⁵

Wister's journal abruptly ended in 1828, which may mean that he abandoned beekeeping altogether. However, it is improbable that a wooden bee house and skeps would have survived neglected and unused for 64 years. 1892 photographs, showed Wister's bee house intact and in good condition, suggesting he or his descendants perhaps maintained the hives, along with the bee house³⁶ (Figure 3 and 4).

In his "Bees" journal, Wister recorded purchasing a swarm of bees from William Ruger for \$5 on June 16, 1824. On the second day, the swarm seemed content in their new surroundings, but by the third day, he found the bees outside the hive in large clusters. He raised the hive a half-inch off the ground to help cool it, blaming the hive's temperature as

³² Susanin, Grumblethorpe, 20-1.

³³ Susanin, "Grumblethorpe," 32. After Wister inherited Grumblethorpe, Jay Susanin quoted his garden journal in 1806 which he continued until his death in 1865. In this journal, he summarized his inherited property and detailed farming and garden activities. The seven field farm comprised of; the first field held an apple orchard which had been cultivated for over 15 years. The Wisters cultivated crops at the 'midfield' and one of two 'hillfields,' while cattle grazed on the second 'hilfield.' He mentioned the 'woodfield' which grew vegetables. The Wisters mined soapstone and other building materials from their 'quarryfield.' At Grumblethorpe, Wister experimented with landscaping, botany, animal husbandry, mineralogy, astronomy, and beekeeping. The farm produced potatoes, wheat, buckwheat, Indian corn, rye, 'plaister', harvest pears, and Catharine pears and perhaps the primary source of livelihood for the family. He also had two cows, one calf, twelve pigs, hens, and 140 varieties of flower seeds.

³⁴ Wister, "Bees," 16 June 1824-29.

³⁵ Unknown newspaper clipping from 1923, page 2 of 2. Grumblethorpe folder, Historical Buildings, Box 2. Germantown Historical Society Archives.

³⁶ Susanin, "Grumblethorpe," 32-3.

the problem. The bees quickly returned to the hive which seemed to solve the problem. Unfortunately, because the bees produced little honey, Wister fed them honey in early November, blaming the wet cool summer for the low production.³⁷

Later in Wister's "Bees" journal he wrote, 'On the 10th of November [in 1824] I took a very large hive from an oak tree in my woods.'³⁸ Beginning at sunrise, a group of twelve men plus Wister, retrieved the hive. The group elected John [Knight] to climb the tree and plug the entrance hole. As they sawed the tree branches, at twenty-feet above ground, 'the tree fell with a tremendous crash, this greatly perturbed & injured the Bees, breaking the combs & doing much mischief.'³⁹ They sawed the eight-foot branch, hauled it to the garden in a wagon, and 'planted' it, or inserted into the ground. Wister placed a piece of glass over the hive and watched as the bees repaired the damaged comb.⁴⁰ The story, retold in a local newspaper from 1923, mentioned Charles Saxton, an 'old beekeeper,' and Christian van Laushat, the village pumpmaker, both of whom helped retrieve the hive.⁴¹ In this same article, Charles J. Wister Jr. (1822-1910), fondly recalled during his childhood when the bees swarmed:

Then might John Showaker [Shoemaker] be seen with a ladder and saw, and John Knight with water and brush, and my father with armor [a veil] and squirt, all at the top of their speed, making their way to the scene of action.⁴²

Wister family descendent, Suzanne Wister Eastwick wrote supplemental details in, 'The "Grumblethorpe" Garden: An Historic Sketch' where she identified John Knight as a gardener and former slave.⁴³ In an article dated June 21, 1923, a garden tour was given to

³⁷ Wister, "Bees," 1-2.

³⁸ Wister, "Bees," 2.

³⁹ Wister, "Bees," 3.

⁴⁰ Wister, "Bees," 3-6.

⁴¹ "Some Adventures in Beekeeping." Unknown newspaper clipping from 1923 page 1-2. Grumblethorpe folder, Historical Buildings, Box 2. Germantown Historical Society Archives.

⁴² "Some Adventures in Beekeeping." Unknown newspaper clipping from 1923 page 2. Grumblethorpe folder, Historical Buildings, Box 2. Germantown Historical Society Archives.

⁴³ Eastwick, "The Grumblethorpe Garden: An Historic Sketch."

visitors. The author mentioned, 'one old beehive remains of the apiary that he conducted,' indicating at least one hive remained on site in 1923.⁴⁴

According to Wister's "Bees" journal, he built an apiary, to house twenty colonies of bees to hold his ten hives, during the winter. He purchased two hives and 'a Bees house & apparatus' from Kesler for \$35 on December 3, 1824.⁴⁵ The hives carted, on a 'hand Barrow,' six miles from Northern Liberties without any problems.⁴⁶ He received 'two fine hives' from Ezra Comfort, for \$7 and two hives from Benjamin Woodrow for \$12, on February 3, 1825.⁴⁷ Woodrow's hives traveled three miles by sleigh over rough road causing the death of 2000 bees.⁴⁸ He recorded, 'stuff for 35 boxes which I made myself' for \$6.⁴⁹ In total, including the hive from Ruger for \$5, Wister spent \$85.⁵⁰ Wister invested considerable funds in hives and bees which reflected his willingness to experiment with animal husbandry and enjoyment of the process.

Wister's journal depicted multiple experimental hive types. By March 1825, he moved his bees into his own boxes, suggesting that he previously used an alternative hive. This move confused the bees who flew around for several days until Wister placed different colored boards at each entrance. Wister also mentioned opening a passage between his two hives, suggesting he utilized the depriving method. The depriving method prevented the queen from laying eggs in one compartment of the hive, while the worker bees, allowed to pass into that compartment, built comb to store honey. This method produced excess honey instead of producing more bees. Wister's experiments did not always prove successful. In

⁴⁴ "Viewed Wister Relics at Old Grumblethorpe." Unknown newspaper clipping, June 21 1923, Grumblethorpe folder, Historical Buildings, box. 2 Germantown Historical Society.

⁴⁵ Wister, "Bees," 6.

⁴⁶ Wister, "Bees," 7.

⁴⁷ Wister, "Bees," 6.

⁴⁸ Wister, "Bees," 6.

⁴⁹ Wister, "Bees," 8.

⁵⁰ Wister, "Bees," 1-8.

April 1825, he opened one hive and found all the bees dead from starvation since there was no honey in the combs. He listed further hive type examples on June 10, 1826, he wrote, 'I took from the Column hive a Bell Glass.'⁵¹ This method of stacking two or more modular units, above the main hive was called storifying. This hive could have been a single upright circular wooden hive or tiered straw or wooden hives with a glass vessel on top.⁵² Later he listed more hive types including, 'Large Glass hive,' and 'Long glass.' These glass observation hives allowed Wister to view his hives at all times. The '7inch top box' probably referred to a box hive with inside dimensions of seven inches located above another hive. The 'Straw hive,' was likely a straw hive or skep. The 'Yellowtop' and 'Blue top' probably referred to the colored boards he added in 1825.⁵³ These hives might have come from his own inventions, other beekeepers, or manuals.⁵⁴

Wister had early success when in September 1826, he collected 234 pounds of honey and seven pounds of wax from twenty-five hives.⁵⁵ According to a historic local newspaper the *Germantown Telegraph*, the price of honey per gallon was 52 cents at the Philadelphia market, on Wednesday January 5, 1830.⁵⁶

Jay Susanin's thesis, referenced several historic photographs of the apiary, located at the Society for the Preservation of Landmarks in Philadelphia, Pennsylvania. The 1892 photograph consisted of three stacked box hives with a skep on top, located on a shelf. The hives perched on a log post approximately two feet off the ground (Figure 3). The Nether hive pictured in Henry Taylor's 1860, *The Beekeeper's Manual*, had similar features to the hives in the 1892 photograph, a single box with a skep placed on top (Figure 11). The

⁵¹ Wister, "Bees," 16.

⁵² Crane, *The World History of Beekeeping and Honey Hunting*, 391-392.

⁵³ Wister, "Bees," 17-18.

⁵⁴ Wister, "Bees," 9-15.

⁵⁵ Wister, "Bees," 17-18.

⁵⁶ *Germantown Telegraph*, Wednesday, January 5, 1830, 3.

practice referred to as under-hiving, the opposite of storifying, placed an additional hive underneath the main hive. The lower hive was used as a way to increase bees or honey. By excluding the queen with a queen excluder, the worker bees would store surplus honey in the lower hive, i.e. the depriving method. Allowing the queen into the hive produced more bees and created a larger colony. Another photograph from 1886, depicted a single hive in the middle of a path, with a makeshift structure covered with vines that protected the hive (Figure 4).

From the 1892 photograph (Figure 3), the middle box hive had three stacked box hives with a glass bell jar on top. Two more hives within the garden had three stacked boxes each with a skep on top. A bee house situated along the northeast fence line featured Federal style details. This bee house's gable end had a nine pane glass window separate from the opaque fanlight with muntins below. The cedar-shingled roof framed by a cornice with a return on the gable end continued along the roof line. The perpendicular wall exhibited two hatches which opened outward. Although not visible from the photograph, the skeps or box hives would have been located just inside the hatch on the shelf.

Actively involved in the agricultural and scientific communities, and as a member of the Academy of Natural Sciences with Langstroth, Wister would have known and read Langstroth's book. The photographs from 1892, showed a similar hive to Taylor's combination box and skep Nether Hive⁵⁷ (Figure 11). But the Nether Hives did not appear until Taylor's 1860 edition. It was possible Wister continued experimenting with hives until his death in 1865. Although Taylor's book is not in the Wister Family Library, *Gleanings in Bee-Culture* volume one and two are there. This first volume published by A.I. Root in 1873, suggested Wister's descendants also had an interest in beekeeping.

⁵⁷ Taylor, *The Bee-keeper's Manual*, 92.

Manuscripts from the Wyck Papers on deposit at the American Philosophical Society revealed that Reuben Haines (1786-1831) kept bees at his Germantown estate. He leased his Germantown estate, Wyck for \$400 per year from his mother, Hannah Marshall Haines. In the spring of 1814, he contracted his uncle, Abraham M. Garrigues, to farm the estate for him on shares.⁵⁸ Garrigues purchased beehives for the estate that same year. In a letter found at the American Philosophical Society from James Pemberton Parke to Haines, dated March 23, 1814 he wrote, 'A. M. Garrigues direct me to tell thee... that he could only obtain four bee-hives for Wyck.'⁵⁹ Charles Jones Wister wrote on December 20, 1824 in his "Bees" journal, he received a small swarm of bees as a gift from Reuben Haines, showing that Reuben was still keeping bees ten years later.⁶⁰ A dome-shaped straw hive or a skep, preserved in the collections at Wyck may be the type Garrigues used (Figure 5 and 6).

The skep measured approximately twenty-inches high and twenty-inches in diameter and is made of rye.⁶¹ One oak spleet, or dowel, inserted inside, prevented the weight of the comb and bees from collapsing the skep. A hole in the skep served as a bee hole or the location of a second spleet. In a letter, also at the American Philosophical Society, from Howard F. Stratton to Jane Bowne Haines (1869-1937) dated November 18, 1935, he wrote, 'I thought it might fit in your garret with the straw beehive your aunt told me about.' This letter placed the skep within the Wyck collection at least by 1935. Nineteenth century skeps, rarely survived because of the inherent fragility of the materials. The Wyck skep was likely housed in a bee house or bee shelter for protection, enabling its survival (Figure 5 and 6).

⁵⁸ Haines, *Germantown History Some Account of Wyck and its Owners*, 72.

⁵⁹ James P. Parke to Reuben Haines III, 23 March 1814, Wyck Papers Series.

⁶⁰ Wister, "Bees," 4-6. Both of these men recorded the weather and probably compared notes on scientific pursuits generally.

⁶¹ Agricultural T &E, Skep, 19th-century, 88.2720, Wyck Collection, Germantown, Pennsylvania.

A common hive or skep is an inverted basket made of woven plant stems like wicker and later coiled-straw.⁶² Anglo Saxons imported straw hives to Britain from Europe in the fifth-century which coincided and eventually replaced earlier traditions of wicker hives. Some beekeepers utilized skeps until the early twentieth-century. Beekeepers often learned to make their own skeps, but professional craftsmen were called skep-makers. Durable reed and strong pliable binding cane were the locally available required materials. Dried rye, wheat, barley or oats were the most common choices.⁶³

These skeps fall into two different categories- those without a top aperture, called a single or swarming hive and those with an aperture, called depriving hives. Honeybees reproduce their colonies by swarming. In early summer, the colony's population reaches capacity. When the new queens are almost adult, during the warm part of the day the original queen leads half the worker bees *en masse* out of the hive and clusters on a nearby branch. Scout bees find and inspect a new cavity for a nest and then the entire cluster moves into the new home.⁶⁴ A swarming hive was always small sized to cause the bees to reach population capacity early so they swarmed early in the season. This allowed enough time for the new swarm to build comb and store honey for the winter. By utilizing swarming, the beekeeper could multiply hives. A depriving hive with aperture allowed an additional compartment for honey storage to be placed above. A well-preserved skep could last one hundred years. All skeps had spleets inserted to prevent the weight of virgin comb from collapsing the skep. If not placed under a roof, a hackle made of long rushes of straw tied together to create a tent-like covering placed over the skep, protected the hive from rain.⁶⁵

⁶² Crane, *The World History of Beekeeping and Honey Hunting*, 238.

⁶³ Alston, *Skeps*, 11-8.

⁶⁴ Crane, *The World History of Beekeeping and Honey Hunting*, 19-20.

⁶⁵ Alston, *Skeps*, 26-32.

Letitia Ellicott Carpenter Wright (1861-1933), a descendent of James Logan, and a designer of the Colonial Revival garden at Stenton, practiced beekeeping. Sarah Logan Wister Starr (1873-1956), along with Wright, founded The National League Germantown Branch Demonstration School for high school age girls, during World War I in 1917. This school, born out of the Progressive era, advocated for women's suffrage, safety in food and drugs, a ban on child labor and establishing welfare programs. The two-week boarding school, located on the Fisher Family's Little Wakefield Estate, currently St. Mutien Christian Brothers' Residence of LaSalle University's campus; educated twelve girls each term in domestic arts including, cooking, gardening, canning, flora, and bee culture. Wright, an expert in bee culture, taught the girls beekeeping techniques weekly because of the high demand for honey from England and France. The Germantown Branch National League Demonstration School was the only division in the country that taught bee culture. Wright's mother had lived at Little Wakefield and Wright had lived at Waldheim two years before and likely kept bees on her property.⁶⁶

The small community of Germantown facilitated shared knowledge of beekeeping culture between neighbors and relatives. The bees benefited from a rural landscape with adequate pasture for forage. From Daniel Pastorius, to Letitia Wright, to today, beekeeping has been practiced in Germantown for over 300 years.

⁶⁶ Stieber, "The National League for Women's Service," 48-55. See also Jane Campbell, Scrapbooks, "To Study Bee Culture," vol. 33, 162.



Figure 3 Grumblethorpe Apiary with Federal Style Bee House, northeast view, photographed in 1892. Courtesy of the Society of the Preservation of Landmarks and Allison Ostertag. Also found in Jay Susann's *Grumblethorpe: An Historic Landscape Report*, 149.



Figure 4 Grumblethorpe Single Hive, protected by vine, northwest view, photographed in 1886. Courtesy of the Society of the Preservation of Landmarks and Allison Ostertag. Also found in Jay Susanni's, *Grumblethorpe Historic Landscape Report*, 145.



Figure 5 Straw Hive or Skep. The hole might have been a bee entrance or for a spleet. *Courtesy of the Wyck Association. Agricultural T &E, Skep. 19th-century. 88.2720. Wyck Collection, Germantown, Pennsylvania.*



Figure 6 Inside View of Straw Hive or Skep with Spleet. *Courtesy of the Wyck Association. Agricultural T &E, Skep. 19th-century. 88.2720. Wyck Collection, Germantown, Pennsylvania.*

Philadelphia Beekeeping: West Philadelphia

The Schuylkill River to the east and north, Baltimore Avenue to the south, and City Line Avenue and Cobbs Creek to the west, define the boundaries of West Philadelphia. The City of Philadelphia incorporated Blockley Township, or West Philadelphia in 1854.⁶⁷ West Philadelphia's natural landscape featured rolling hills with trees and wetlands. By the eighteenth century, Philadelphians, like plant collector John Bartram and estate owner William Hamilton, built large gentleman's farms with grand houses. Philadelphians accessed the Schuylkill west bank only by ferries, until a permanent bridge opened at Market Street in 1805. This covered bridge ushered in residential and institutional development increasing the ease of travel between Blockley Township and Philadelphia. Prior to the permanent bridge, the river slowed the development of West Philadelphia, which preserved farms like Bartram's.⁶⁸

John Bartram (1699-1777), a Quaker born near Darby south of Philadelphia, purchased farmland on the west bank of the Schuylkill River near Grey's Ferry in 1728. He built a large hand-hewn stone house and planted the first botanical garden containing native American and imported exotic species in 1731. John Bartram's interest in botany connected him with Peter Collinson, a Quaker merchant and horticulturist in England. They exchanged plants and seeds during their fifty-year correspondence. Through this connection, Bartram obtained the patronage of Lord Petre, who financed his early explorations. Bartram, later joined by his son William (1739-1823), traveled throughout the American wilderness including the Schuylkill River, through Maryland and Virginia to Williamsburg, and over the Blue Ridge mountains. William, aided his father on his travels

⁶⁷ Germantown also incorporated into Philadelphia in 1854.

⁶⁸ Franklin, "West Philadelphia: The Basic History: Chapter 1 Pre-History to 1854," <http://www.archives.upenn.edu/histy/features/wphila/history/history1.html>.

and shared his love of plants and wildlife. William Bartram continued to expand the garden after he inherited the estate in 1777.⁶⁹

The documentation for Bartram's Botanic Garden, known throughout America and Europe, included references to bees. William Bartram referenced bees in his diaries and beekeeping in his Commonplace Book. He wrote about plants, weather, and bees in eight diaries now in the collections of the Academy of Natural Sciences, spanning the years 1802–1823.⁷⁰ On January 15, 1802, he noted, 'Clear & warm as May day,' and '...bees out till evening flying about...'⁷¹ In February of that year he wrote, 'Clear & pleasant. Bees are out of the Hives seeking for flowers.'⁷² He observed the borer bee out visiting tree flowers on May 2, 1802 and on January 27, 1806, Bartram recorded '*apis mellifera*'-- the scientific name for the German honeybee showing Bartram's extensive knowledge of insects.⁷³ Subsequently on May 28, of the same year, he remarked, 'Warm pleasant growing weather Tulip trees in flower Bees swarm'.⁷⁴ An important event like a swarm, allowed a beekeeper to multiply hives. Bartram only took note when bees behaved extra ordinarily; for example; flying in January when they usually wintered in their hive, or swarming.

William Bartram's Commonplace Book, located in the collection of the American Philosophical Society, covered a variety of topics from gardening, to husbandry, quotations, poetry, and philosophical writings, copied from other published works.⁷⁵ The Commonplace Book, represented thirteen or more smaller works bound into one volume by his descendants. Although difficult to date, the collection indicated a date range from the late

⁶⁹ Youmans, "John and William Bartram: A Biographical Sketch," 3-17.

⁷⁰ William Bartram Diaries, Academy of Natural Sciences, Philadelphia.

⁷¹ Diary 1, January 1- April 12 1802, collection 405-407, William Bartram Diaries.

⁷² Diary 1, January 1- April 12 1802, collection 405-407, William Bartram Diaries.

⁷³ In 1802: Diary 2, April 13 1802- January 13 1803, collection 405-407, William Bartram Diaries. In 1806: Diary 3, 1803-May 22 1807, collection 405-407, William Bartram Diaries.

⁷⁴ Diary 3, 1803-May 22 1807, collection 405-407, William Bartram Diaries.

⁷⁵ The manuscripts were probably not bound in William Bartram's lifetime. The title 'Commonplace Book' was given at a later date.

1760s to 1785. Codex 2 contained an illustration of the Cape Henlopan lighthouse at the mouth of the Delaware River, which Bartram likely passed on one of his journeys between 1767-73.⁷⁶ This offers a chronological context for when he wrote about beehives and apiaries.

Bartram sketched, 'New invented Bee-boxes,' in Codex 2 of his *Commonplace Book*.⁷⁷ These eight-inch cubes had a four-inch by half-inch slot on the lower portion of the front which functioned as an entrance for the bees. The roof sloped to dispel rain. At the back, a five-inch glazed window with a shutter allowed the beekeeper to observe when the hive reached capacity. Designed to function as a pair or in threes, the opening permitted the bees to travel between the two hives laterally⁷⁸ (Figure 7).

Further in his *Commonplace Book*, Bartram portrayed the landscape and setting for bee boxes and made apicultural recommendations. The apiary should be located in a valley and not exposed to the noises of people or cattle, which could startle the bees. He advised a situation for hives near plants like fruits, thyme, and clover as well as a nearby water source like a stream. The bee boxes sat on a bench with multiple shelves. The shelf length fit three single or three sets of hives. During hot weather, the shelves should be five or six-inches apart but closer together in winter. According to Bartram, the cold weather did not injure the bees, but high temperatures endangered the bees, especially after a swarm. When exposed to high temperatures, he suggested covering the hive with a linen cloth or evergreen boughs for shade.⁷⁹

⁷⁶ "William Bartram *Commonplace Book*," ca 1760-1800. See also, Fry, "'William Bartram's 'Commonplace Book,'" 245-8.

⁷⁷ "William Bartram *Commonplace Book*," Codex 2, 29. Where he saw or learned of these new bee-boxes is beyond the scope of this thesis.

⁷⁸ "William Bartram *Commonplace Book*," Codex 2, 29-30.

⁷⁹ "William Bartram *Commonplace Book*," Codex 2, 30-31, 36.

Bartram observed land not conducive to the cultivation of corn, wine, or oil, on his travels. The owners made the land profitable by planting an orchard of apple, plum, peach trees, and roses to establish an apiary. Because of the abundant pollen, the bees in turn produced bountiful honey and comb. Bartram commented less on types of hives and more about the environment best suited to bees and the production of honey. He concluded that an apiary should be near low trees or shrubs, beside a flowing stream, with a fence or hedge acting as a wind break to the North. Along the southern end, the hives should be open and along the eastern end lavender, thyme, sage, and other aromatic herbs should be planted. He recommended, 'Bark hives,' or log hives because of their ability to regulate temperature.⁸⁰ This comment may place Codex 6 at an earlier date than the, 'New invented Bee-boxes' in Codex 2 because log hives adhered to earlier practices.

Success in apiculture occurred when the hive type and totality of landscape are in concert. William Bartram's apiary typological descriptions placed box hives on moveable shelves within an orchard. During Summer, evergreen branches temporarily protected against heat. Although not mentioned, the Bartram system could be easily disassembled and moved to another location--unlike a bee house. An improvement over traditional skeps, these box hives allowed the beekeeper to view his hives through the glass window. They also could be expanded to reduce swarming, but swarming would have been common because of its small eight-inch size. One would assume that Bartram experimented with these hives at his family garden. If so, did he find success? Whether he used these hives or another type is unknown, but Bartram observed bees on his property in his later diaries. Since he advocated for swarming, it is likely the hives would have been placed within view of a much used room of the house.

⁸⁰ "William Bartram Commonplace Book," Codex 6, 89.

Langstroth

Because of his fascination with bees and inventive mind, the Rev. Lorenzo Lorraine Langstroth (1810-1895) would eventually be known as the father of American apiculture and influence beekeepers around the world. Born at 106 South Front Street in Philadelphia, he studied at a preparatory school conducted by the University of Pennsylvania. Insects fascinated him from a young age. He observed the cicadas at Center Square (present City Hall Square). His education continued at Yale University, where he entered the Divinity School, ultimately becoming a Congregational Minister. In 1838, while living in Andover, Massachusetts, visiting one of his parishioners, he noticed a glass jar filled with comb honey. This led him to tour his parishioner's attic apiary reawakening his love of insects and bees in particular. Langstroth's debilitating health disabled him for long periods of time, causing him to resign from his church in Massachusetts. In 1848, he moved to Philadelphia to open a school for girls, which proved less trying on his health. While keeping bees in his attic and outdoor apiary, he developed a new type of hive. Receiving a U.S. patent in 1852, he set up his beehive business at his West Philadelphia apiary with his cabinetmaker, Henry Bourquin, who also managed the apiary. Reoccurring illness forced Langstroth to close his apiary prematurely in 1852, he then moved to Greenfield, Massachusetts to live with his brother-in-law. His beehive business failed because of his reoccurring illness and partly because others often infringed upon his patent. In Greenfield, he wrote and published his influential book, *Langstroth on the Hive and the Honey Bee, a Bee-keeper's Manual*, which went on to make him a household name in beekeeping.⁸¹

⁸¹ "The Langstroth Bee Garden," *Morris Arboretum Bulletin*, 20-4.

In the first few pages of the manual, Langstroth publicized his newly patented moveable-frame hive. He claimed the frames could be removed in under five minutes without cutting the comb or injuring or enraging any bees. This revolutionary bold statement certainly caught the attention of established beekeepers, because previous hives made extracting honey, removing comb, and inspecting the bees cumbersome. Many doubters disbelieved his claim which he proved in the manual. He called all 'practical apiarians' to visit his Apiary in Greenfield, Massachusetts. An individual farm right cost five dollars, which allowed the purchaser to build and utilize unlimited movable-frame hives on his or her property. A hive built and shipped with glass on four sides cost ten dollars, shipped anywhere in New England and New York.⁸²

Langstroth ascertained that a newly designed hive was necessary because of the depressed state of beekeeping and the deficient writings of previous beekeepers. In his manual, Langstroth wrote about several vexing problems; a lack of understanding about bees, the damage caused by the bee moth, and the practice of killing bees to extract comb and honey.⁸³ His manual, part sales-pitch and partly educational, claimed to have invented a hive that would solve these age-old problems.

Langstroth began his apiculture research by reading Francois Huber (1750-1831) a blind Swiss beekeeper, who built an observation leaf-hive and published, "*Nouvelles Observations sur les Abeilles*" (Observations on the natural history of bees) in 1792.⁸⁴ Langstroth built Huber's leaf-hive and conducted experiments. He determined the

⁸² Langstroth, *On the Hive and the Honey-bee*, xv-xvi.

⁸³ The bee moth or wax moth infiltrated hives, feeding on nest materials and waste products, like beeswax. The pest was common in Europe but did not reach the United States until 1806 in Boston. By 1831, it had reached the entire state of Ohio decimating beehives and forcing beekeepers to abandon their apiaries. "Bee Moth *Aphomia Sociella*," IAS sheet 7, Natural History Museum, London, accessed April 21, 2016, <http://www.nhm.ac.uk/search.html?q=bee+moth>.

See also, Pellett, *History of American Beekeeping*, 31-33.

⁸⁴ Crane, *The World History of Beekeeping and Honey Hunting*, 381-3.

importance of protecting the hives from hot and cold temperatures. He built his hives of doubled thick materials with an air space in between. His bees survived the winter and consistently swarmed early. Langstroth also experimented with Edward Bevan's movable-bar hive but found cutting the comb time consuming. Too much time spent cutting the hives proved problematic, which led him to create a moveable-frame that suspended the comb without touching the top, bottom or sides. Langstroth discovered that a 3/8-inch gap was large enough for bees to move through a hive, but small enough so that bees would not fill the gap with comb.⁸⁵ This discovery, later known as 'bee space,' led him to invent a revolutionary hive with movable-frames.

After his discovery, Langstroth developed his movable-frame hive, receiving patent No. 9,300 from the United States Patent office on October 5, 1852. His invention offered protection against the bee moth and the elements. It enabled the apiarian to rapidly multiply his or her colonies and it produced convenient salable honey. The user-friendly design did not harm bees and was palatable for timid beekeepers. The lid detached so that the movable-frames easily slid in and out of the hive. Unlike previous hives with frames had to be cut in order to remove the honey. Langstroth's pivotal discovery of 'bee space' prevented the bees from fixing the comb to the hive. Because the frames could be removed at any time, early signs of bee moth could be addressed. The bees stored surplus honey in a shallow chamber above the hive with many small apertures allowing bees to enter. Having many small receptacles for surplus honey, gave the beekeeper flexibility in the amount of comb and honey he removed and the ability to sell it directly to a customer. The shallowness of the chamber helped keep the hive warm and retained heat. Small tumblers enabled the bees to build one comb inside which discourages brood (cell with the fertilized

⁸⁵ Naile, *America's Master of Bee Culture*, 69-72.

bee egg) cell from being formed. The double-glass sides allowed the beekeeper to see the hive at all times, despite the moderate increase in cost. The inside box dimensions were: eighteen-and - 1/8-inch long (room for twelve movable-frames) by twelve-1/8-inch width, nine to ten inches deep, which included the platform depth. A cover, gently sloped dispelled rain. The platform had a sunken entrance for the bees about 3/8" deep in front of the hive with a projecting board, called an alighting board, which extended eight-inches in front of the hive, functioning as a landing strip for the bees (Figure 8).

Langstroth maintained two places where he observed bees and conducted experiments with hives. He kept bees in his attic located at his row house at 16th and Chestnut Streets in Philadelphia.⁸⁶ On the second story veranda and in several spare attic rooms of his rowhouse, Langstroth established his city apiary. There is no definitive location for his apiaries in West Philadelphia, other than on the site of the present day University of Pennsylvania's campus. In Langstroth's serial, 'Langstroth's Reminiscences,' published in *Gleanings of Bee Culture*, he wrote they were located two miles from his city home in West Philadelphia.⁸⁷ He likely walked across the Market Street Bridge. He discovered the concept of 'bee space' while walking from his apiary to his house in center city. His two-acre apiary would have been smaller than a city block. He likely rented the land due to his lack of financial resources. Henry Bourquin the apiary manager may have lived on site. Unfortunately, he does not appear in the 1850 census or directories of the same time period.⁸⁸ Samuel Wagner, in an introductory letter to Langstroth's journal, wrote he visited the apiary in the, 'village of West Philadelphia.'⁸⁹ Another West Philadelphia

⁸⁶ McElroy, *McElroy's Philadelphia City Directory*, 236. See also "The Langstroth Bee Garden," 22.

⁸⁷ Naile, *America's Master of Bee Culture*, 42. Naile referenced, "Langstroth Reminiscences," *Gleanings in Bee Culture*, (1892-1893): xxi, 116-118.

⁸⁸ According to the 1861 *McElroy's Philadelphia City Directory*, he lived in the village of Rising Sun near Germantown Avenue and Old York Road.

⁸⁹ Langstroth, *On the Hive and the Honey-bee*, 18. The bridge built at Spring Garden in 1812 quickly spurred development in the Mantua neighborhood. West Philadelphia was also home to institutions like the

Apiary was Frank Parkinson's Apiary, depicted on Samuel L. Smedley, 1862 Atlas of the City of Philadelphia (Figure 1). The landscape surrounding Langstroth's apiary changed from agrarian, with some mills and manufacturing, to institutional, including; cemeteries, hospitals, and suburban residential development between 1850 and 1900.⁹⁰

To mark the 100-year anniversary of Langstroth's discovery, the Morris Arboretum dedicated a garden and bench to Langstroth, in 1951. At this dedication, the Professor Emeritus of Apiculture at Cornell University, E.F. Phillips spoke about Langstroth's life and discoveries. Phillips, the expert Langstroth biographer, authoritatively spoke that Langstroth's apiary was located on what would become the University of Pennsylvania's campus. Langstroth's grandson, William Langstroth Cowan among other descendants also in attendance, perhaps corroborated this assumption.⁹¹

Langstroth strongly opposed the construction of bee houses because they interfered with the even solar heat distribution to the hives. His thinner hives allowed the bees to survive the winter and swarm early, while those in bee houses often did not. He believed bee houses an expensive 'nuisance' because they did not protect against extreme cold and harbored spiders and moths. However, he interestingly recommended sheltering hives with what he called a 'protector', to mitigate extreme temperatures. He recommended digging a trench two-feet deep and building a wall of stone or refuse-brick the length determined by the number of hives, the depth the same as the hive, and the height four-feet above the ground. The top of the wall should be constructed of six-inches of good brick, with the back part two inches higher to allow for a slope for rain run-off. The Langstroth moveable-frame

Pennsylvania Hospital for the Insane, opening in 1841. The Pennsylvania Railroad developed its 30th Street transportation center in 1851. West Philadelphia's population was 13,265 in 1850.

⁹⁰ Franklin and Sullivan, "West Philadelphia: The Basic History: Chapter 1 Pre-History to 1854." <http://www.archives.upenn.edu/histy/features/wphila/history/history1.html#3>.

⁹¹ "The Langstroth Bee Garden," 20-4. The author spent many unsuccessful hours researching historic maps, census records and newspaper articles, trying to discover the location of Langstroth's apiary in West Philadelphia.

hive was placed on top of this brick shelf. Confusingly, he recommended building a 'wooden chimney' at the end of the protector to allow for air flow and exclude rain and snow. The manual artist of the book chose to illustrate the protector without the chimneys.

Langstroth's dislike of bee houses may have led to the decline of the practice since his influence on American beekeeping was so ubiquitous. As a Philadelphia native, Langstroth's influence may explain the lack of intact bee houses within the region (Figure 9).

Langstroth's apiary existed because of the rural agrarian landscape of West Philadelphia, within walking distance of his city house. Langstroth benefited from the scientific knowledge and legacy of the Bartrams and others. His connections with the Academy of Natural Sciences and beekeepers in Europe and across the United States, influenced his work and advanced beekeeping knowledge and technology.

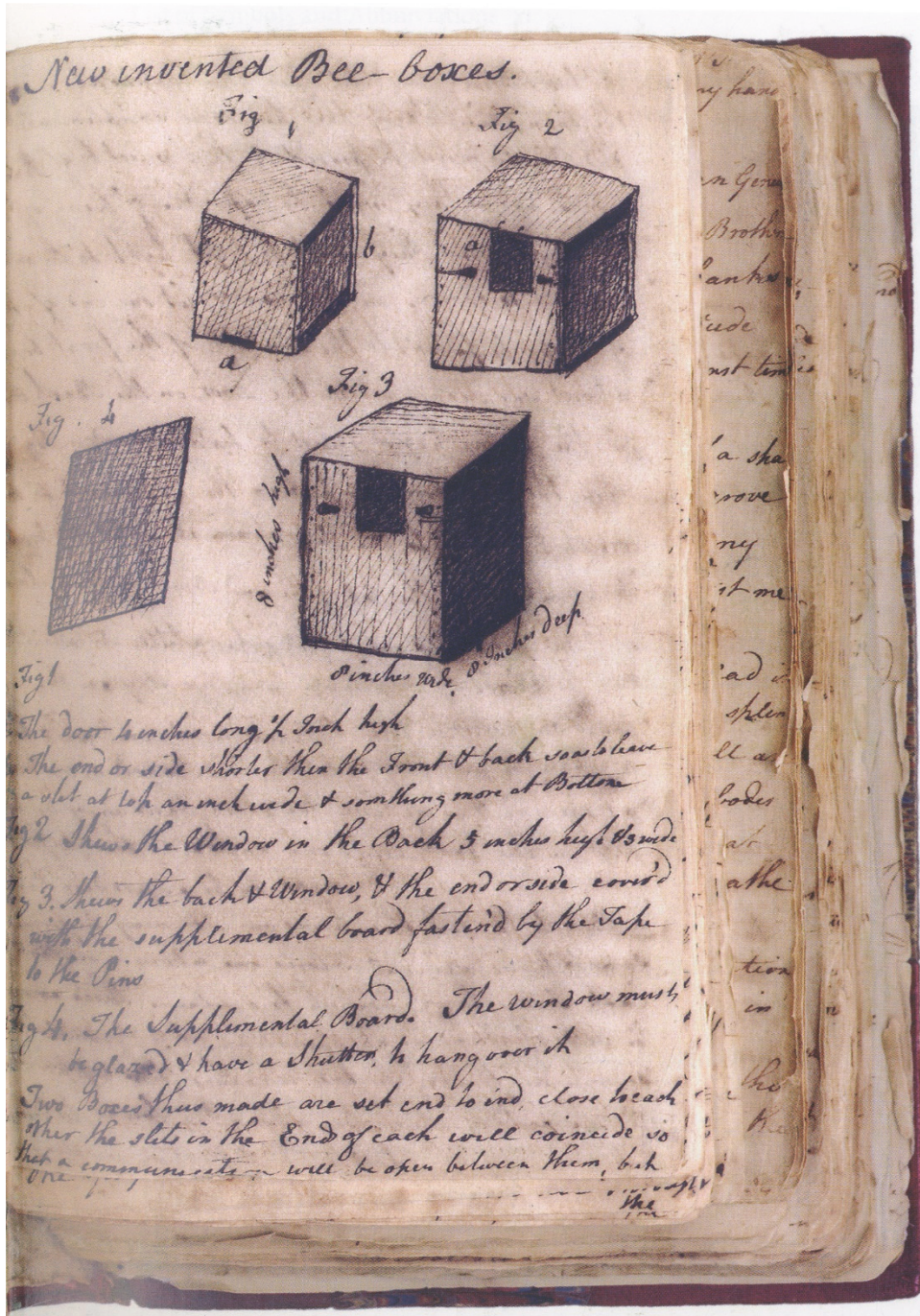


Figure 7 William Bartram's 'New Invented Bee-boxes,' Commonplace Book. Found in Joel T. Fry, "William Bartram Commonplace book," in William Bartram: The Search for Nature's Design, 270.

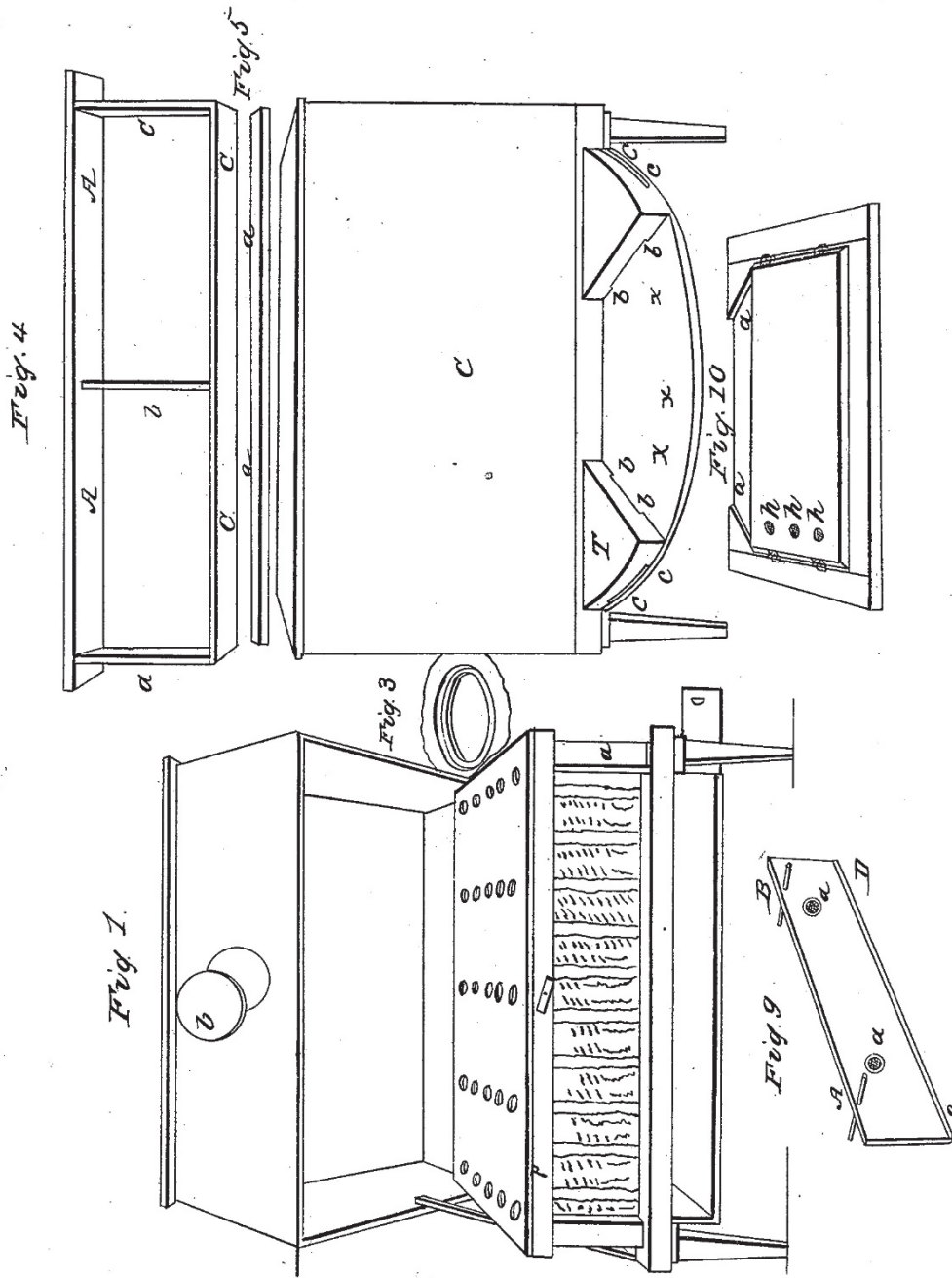


Figure 8 Langstroth Moveable-Frame Patent Number, 9,300. Courtesy of the United States Patent Office. Accessed 5 May 2016
<http://pdfpiw.uspto.gov/piw?DocId=9300&idkey=NONE&homeurl=http%3A%252F%252Fpatft.uspto.gov%252Fmetahtml%252FPTO%252Fpatimg.htm>

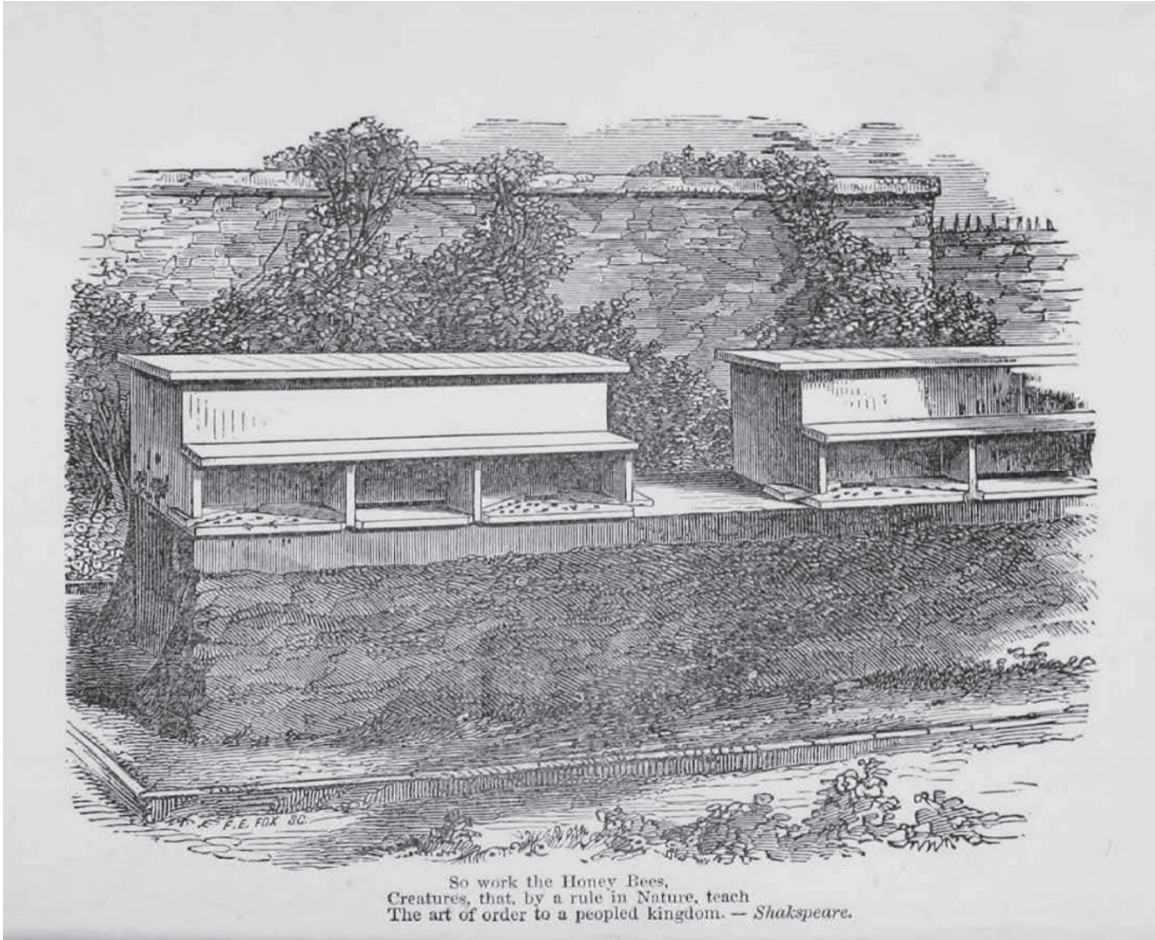


Figure 9 Langstroth Protector, 1853. Found in the Rev. L.L. Langstroth's *On the Hive and the Honey-Bee*, unmarked page in the beginning.

Beekeeping Manuals: Techniques and Typologies

Several manuals written in the mid-to-late nineteenth century shed light on typical practices and architectural forms and styles of historic apiaries. Some hold descriptions and engravings of proposed and actual apiaries within the United States. Edward Bevan's *The Honey Bee, its Natural History, Physiology, and Management*, influenced Langstroth and Taylor, another apiculture author. Henry Taylor's, *The Bee-keeper's Manual* portrayed various hive types. Other manuals intended to educate the new middle-class or rural farmer. A.I. Root's book, *ABC of Beeculture*, devoted entirely to beekeeping, enclosing engravings of American apiaries. These works depicted apiary typologies from the mid-nineteenth century but from different perspectives as beekeeper, farmer, and gardener. Other manuals influenced beekeepers throughout Europe and America, but this research focused on these volumes because they discussed apiary architecture and published in the nineteenth century, during the hey-day of bee houses. These authors also drew influence from the Romantic movement. The influential A.J. Downing wrote, *The Architecture of Country Houses* in 1859, epitomized the cottage style of architecture.⁹² Although Downing did not describe bee houses, his influence was apparent in A.I. Root's whimsical bee houses. These manuals offered beekeepers the opportunity to learn about the latest experiments and beekeeping developments. Beekeeping, considered a gentlemanly agricultural pursuit, was practiced by educated men who kept family libraries like Charles Jones Wister or Ruben Haines, who certainly purchased and consulted manuals to determine best practices. This literature of the period was used as primary sources for this thesis.

⁹² Downing's other work, *A Treatise on the Theory and Practice of Landscape Gardening, adapted to North America*, described how particular trees effected bees.

Edward Bevan

Edward Bevan who wrote, *The Honey Bee its Natural History, Physiology and Management*, in 1838 in Britain, recommended utilizing a bee house if the practitioner could afford it because of the convenience and security. The brick cellar, housed potatoes below the bee house, provided a secondary function for the bee house, and a stable foundation. The wooden bee house was covered with thatch on the walls and roof with an interior dimension of seven-feet by seven-feet. The sides each had a window and the back had a door, providing interior light and giving the beekeeper access to the bee house, respectively. The bee house floor constructed of wood had sawdust insulation. He recommended a bee house placed within a gentleman's garden, could be highly ornamental and useful instead of the typical architectural folly.

Bevan's bee house held seven colonies, three in the front and two on the ends, with a door at the back. The box hives situated on a shelf six to twelve-inches off the floor. The alighting board consisted of one shelf, with brick dividers set back within the wall or with a wooden overhang, offering protection from rain.⁹³

Bevan recommended that the apiary include several features to ensure its success. The apiary should be near a small river or spring since bees required water to make wax. If one was not located near the apiary, setting dishes of water at the base of the bee house would suffice. Like other authors, he recommended the apiary be near the residence of the proprietor. The hives should be protected from excessive heat and cold, but face south, far away from loud noises and strong smells. Each hive, unless in a bee house, should be placed on a stand or pedestal eighteen inches to three feet off the ground and three to

⁹³ Bevan, *The Honey Bee, its Natural History, Physiology and Management*, 54-6.

four-feet apart. According to Bevan, bees needed a clear path in front of the apiary so they could fly off at a 45-degree angle. The landscape of the site should be neat and free of weeds, located in a garden, and near pasturage such as clover, buckwheat, and saintfon⁹⁴ (Figure 10).

J.C. Loudon

In 1838, J.C. Loudon wrote, *The Suburban Gardener, and Villa Companion*, which served as a guide to those looking to live the country life away from congested cities. This book, part of the Romantic movement, applied the aspects of eighteenth-century picturesque landscape design and encouraged readers to pursue gardening for health of the mind and personal satisfaction. Loudon proposed apiculture to the elite as well as the common laborer. Beehives could be placed on a dwelling roof, if no other available place existed in the garden. He considered regional practices the best beekeeping standards, including, the skep or straw hive commonly practiced in England, the log hive in Poland, and the cork hive in Spain. Of all the patent hives Loudon considered, Thomas Nutt's collateral hive, which utilized three boxes with a central box called the pavilion, housing the main hive, as superior.⁹⁵ Stephen White invented this under-utilized collateral hive in 1756, in England. In 1832, Nutt adapted this hive into a large and expensive cost-prohibitive collateral hive.⁹⁶ Loudon believed the hive design regulated the bee's temperature advantageously for breeding and producing honey.

But Nutt's hive required protection in the form of a shelter or a bee house. Loudon proposed a shelter with open access behind the hive, never against a wall or the side of a

⁹⁴ Bevan, *The Honey Bee, its Natural History, Physiology and Management*, 49-53.

⁹⁵ Crane, *The World History of Honey Hunting and Beekeeping*, 413.

⁹⁶ Taylor, *The Bee-keeper's Manual*, 81-83.

house. This free-standing rustic structure was covered with bark. He also proposed a roof covered with thatch, heath, or bark supported by rustic supports open on all four sides.⁹⁷ Loudon's rustic bee shelter featured sticks built into a frame with a decorative diamond pattern. A graceful arch, with sticks arranged like a fan, shielded Nutt's hive. The thatch roof shaded the hive from the sun and protected it from rain. The structure open in the back, gave the beekeeper easy access to manipulate the hive. This temporary rustic structure fit within the picturesque landscape movement advocated by landscape architects. Loudon applied these principles to the new class of suburban gardens.

Henry Taylor

Henry Taylor wrote yet another English bee manual entitled, *The Bee-keeper's Manual; or, Practical Hints on the Management and Complete Preservation of the Honey-bee*, published in 1848. Although beekeeping authors communicated with each other and referenced each other's work, neither Langstroth or Taylor mentioned the other. However, they both referenced Edward Bevan's bee manual.

Taylor mentioned several beehive arrangements practiced by various beekeepers. When the additional honey storage compartment, also called a super, located above the main hive, Taylor referred to this position as 'storifying.' When the super was placed below the hive, the position was known as 'nading.' The super to the side of the hive was termed 'collaterally.' According to Taylor, bees built their comb in whatever method the beekeeper chose.⁹⁸ These methods informed the types of hives beekeepers developed. Langstroth's system used the storifying system with a super above for additional honey storage. Nutt's

⁹⁷ Loudon, *The Suburban Gardener, and Villa Companion*, 713-4.

⁹⁸ Taylor, *The Bee-keeper's Manual*, 22-4.

system utilized the collateral system, placing one additional storage compartment on each side. Taylor recommended the nadiring system which placed the additional storage beneath the main beehive.

The collateral hive system placed two hives side-by-side, allowing the bees to travel horizontally. Once the bees filled one hive with comb, the communication hole opened manually by the beekeeper, allowing the bees to move into the second hive. The bees, theoretically needed more heat for breeding, so that by placing the queen in the central hive or pavilion she would benefit from the warmer temperature, while the comb building and honey storage occurred in the side compartments. Taylor called this practice a fallacy, stating that bees generated heat wherever they made comb. Further disagreeing with Nutt, Taylor believed that bees exerted the same energy moving vertically as they did horizontally, concluding that bees moved easily in all directions.⁹⁹ Langstroth also disagreed with Nutt, stacking his additional compartment or super above the main hive or called the storifying method.

Taylor's Nether hive utilized the nadiring method, with the super placed beneath the main hive. The straw hive or skep placed on top, housed the queen, while the box hive below, stored the honey. A window at the back with a shutter allowed the beekeeper to view the hives, framed with a moveable top and bottom with a one-inch projection. Taylor developed this hive when he observed bees building comb beneath the floor of his hives. The hive should be sized eleven-inches square by six or seven-inches deep. The movable floor board kept the queen from the lower hive but allowed the other bees to build comb and honey. Taylor recommended this type of hive in warmer climates with strong colonies since bees would naturally ascend up the hive due to heat rising¹⁰⁰ (Figure 11).

⁹⁹ Taylor, *The Bee-keeper's Manual*, 78-86.

¹⁰⁰ Taylor, *The Bee-keeper's Manual*, 87-94.

Taylor discouraged the use of bell glasses because their high narrow shape hindered comb building, deforming the comb. Although, according to Taylor, a glass wider than high and straight at the sides worked well. Adding some guide comb to the top of the glass or three or four pieces in the shape of a cross, corralled the bees to make a uniform shape. Cost effective straw or box supers packed and shipped easily, which made them superior to glass supers despite the attractiveness of viewing the comb building process.¹⁰¹

The characteristics of traditional bell-shaped skeps used the single-hive system or swarming system. Taylor claimed hives made in the proper proportion did not need spleets or wood dowels to prop up the hive. The proper inside average dimensions, according to Taylor, were fourteen-inches wide and eight-inches high. Taylor referenced Bevan's beekeeping manual, who suggested a wooden hoop around which the straw can be formed preventing the bottom from decaying, offering greater hive stability, and allowing easy moving. Taylor recommended skeps be covered or placed within a bee house for protection.¹⁰²

Taylor stressed the importance of protecting skeps from the elements, if not protecting skeps with a bee house or shelter. Taylor recommended covering the hive with either of two methods-a dome-shaped straw cover with a three-inch lip which will function well if painted, or a zinc cover, convex-shaped with a projection of a two-inch rim. The zinc cover must have perforations to allow air flow so the zinc does not overheat. The zinc cover works well with the flat straw depriving hive. He discouraged using 'ugly' measures like hackles, a tent-like covering made of straw or earthenware, not only because of aesthetics but the considerable weight they impart on the hive.¹⁰³

¹⁰¹ Taylor, *The Bee-keeper's Manual*, 120-1.

¹⁰² Taylor, *The Bee-keeper's Manual*, 27.

¹⁰³ Taylor, *The Bee-keeper's Manual*, 38-42.

Box and Straw Hives placed on a stand offered protection from the elements. As dictated by Taylor, a hive should be set on wood as opposed to stone or slate which retained hot and cold. The stand or pedestal fixed sturdily fifteen or sixteen-inches above ground, prevented wind damage. Alternatively, a hive set too low to the ground encountered damp conditions, insects, and vermin. A wood plank, known as an alighting board, functioned as the bee entrance and exit.¹⁰⁴

Although Taylor advocated for both wood and traditional skeps, he mentioned new developments in beekeeping, like the movable-frame box hives which resisted vermin and had a more efficient comb arrangement. (Taylor wrote within the context of England where wood cost more than in the United States.) Wooden box hives with wooden moveable bars allowed the beekeeper to extract the combs separately. Taylor referred to this improved system as the bar-system. He recommended the boxes be shaped relatively square with a window. Space along the sides of the comb prevented the bees from attaching the comb to the box, with a lip on top, allowing the comb to be removed without cutting. Taylor recommended all unpainted wooden box hives be placed in a bee house, or under a shed, or with an outer casing cover.¹⁰⁵ Taylor believed bee houses and shelters were necessary, holding on to past traditions. Interestingly, this system described the Langstroth invention but made no mention of him.

In order to protect these new box hives, Taylor recommended a wood casing with decorative wood trim, making the hive more aesthetically appealing. The cover had a hipped roof with an acorn finial and a suspended two-inch cornice, trimming the edge.¹⁰⁶

¹⁰⁴ Taylor, *The Bee-keeper's Manual*, 42-51.

¹⁰⁵ Taylor, *The Bee-keeper's Manual*, 51-67.

¹⁰⁶ Harris, *Dictionary of Architecture and Construction*, 400.

Lateral openings, cut under the cornice of the projecting roof edge, provided ventilation.¹⁰⁷

The additional decorations would have appeared superfluous to Langstroth and Allen.

Larger apiaries required permanent shelters, like a bee house, covered shed or veranda in a well-screened spot, to protect the investment and health of the bees. Taylor did not recommend the 'oven' style bee shelter, open in the front but closed in the back, which trapped heat from the sun. These shelters attracted insects and vermin and its' enclosed back made it difficult for the beekeeper to maneuver. He recommended a deeper bee shelter, with a front hatch on hinges, recessing the hives behind, protecting them from heat. Taylor believed folding doors opening from top to bottom allowed easy access to the hives, and when open, allowed the sun to penetrate inside during the cool winter months. According to Taylor, bee houses enclosed with four walls, with oblong bee openings, allowing the bees to enter their own hive, functioned well. The slanted alighting board facilitated the bees docking. The hives located directly behind the openings on a shelf far enough from each other, prevented the bees from going into the wrong hive. He recommended installing a lock to prevent theft. Taylor's engraving of a bee house depicted skeps on a shelf, with opening hatches and lattice underneath providing ventilation (Figure 12). A cupola also provided air flow, resting on a hipped roof supported by Ionic columns. Set within a wooded garden, the functional building, was also a whimsical, decorative architectural folly. The presence of people indicated this garden offered leisure to the lay person. If a beekeeper did not want to incur the expense of building a bee house, Taylor suggested retrofitting an outhouse or a spare room in a house for an apiary, which he did in his own house. Langstroth also kept hives in his attic, and it appeared to be a relatively common practice, at least among enthusiastic apiculturists.¹⁰⁸

¹⁰⁷ Taylor, *The Bee-keeper's Manual*, 51-67.

¹⁰⁸ Taylor, *The Bee-keeper's Manual*, 94-7.

The preferred apiary location provided ample forage for bees, near a frequented dwelling, or near a churchyard. The apiary located next to a house, prevented the beekeeper from losing bees during swarming season. Other livestock should not be located in close proximity to hives. Laurel and Laurustinus evergreens, a bee favorite, made good wind breaks. Low shrubs, planted near hives, provided a low place for swarms to land, instead of high in a tree, and offered a resting place when they returned from long flights. Bees produced the most honey when located near a variety of plants with varying flowering seasons. Beekeepers avoided moving hives because the bees could become confused and might attempt to return to their former location. Taylor's engraving showed two types of apiaries within a churchyard garden (Figure 13). Three variously shaped skeps rested on a long stand in the open air while a bee shelter housed box hives. An arbor and roof with decorative trim, protected box hives, set on decorative iron stands. The vegetation provided protection, forage for bees, and gave the shelter a picturesque aesthetic also admired by onlookers.¹⁰⁹

Unlike other authors, Taylor did not strongly recommend one type of hive. He saw the benefits of the moveable-frame hive but also knew beekeepers preferred the cost-effective traditional skep. He was the only author who recommended the nading system but he realized the problems with it in cooler climates. He valued hive aesthetics and proposed decorative classical style elements as opposed to the rustic style of Loudon.

¹⁰⁹ Taylor, *The Bee-keeper's Manual*, 97-103.

Lewis Allen

Lewis Allen from Black Rock, New York, a small town outside of Buffalo, advanced the farming and beekeeping profession in, *Rural Architecture*, published in 1852. He wrote about barns, outbuildings, and houses, claiming no expertise in architecture or construction. However, as a farmer, he observed and used rural buildings. He wrote his book because of the 'absence of any cheap and popular book on the subject of Rural Architecture.'¹¹⁰ He lamented the stereotypical uncouth farmer who lived and worked in rough, unsophisticated buildings. He believed the environment affected the character and manners of its inhabitants, therefore, these circumstances necessitated elegant, neat, and refined buildings especially within the house interiors. Even so, according to Allen, these farm buildings must not be too extravagant because plain farmers, although useful and worthy, should inhabit 'plain...yet substantial' buildings.¹¹¹ Downing's work, *The Architecture of Country Houses*, published seven years after Allen's, stated a person's house should represent his or her station in life, Downing and Allen would have agreed.

Allen exhorted farmers to keep bees, using the shed apiary, if adequate pasture was available. Bees' natural habitat is in the forest, and they cannot be coaxed into any bee house or hive against their will. Allen rejected the bee house 'palace,' built to look like a temple or a pagoda, because these ostentatious dwellings 'frightens the simple bee.'¹¹² Bees, by nature wild and untamable, rejected such pretentious dwellings and preferred simple rustic houses. The apiary structure should not be expensive and only cost between \$10-15 for labor and materials. Allen would have agreed with Langstroth and Loudon that Root's decorative enclosed bee houses were unnecessary and impractical.

¹¹⁰ Allen, *Rural Architecture*, viiii.

¹¹¹ Allen, *Rural Architecture*, XIII, III-XV.

¹¹² Allen, *Rural Architecture*, 248.

Allen recommended that farmers carefully consider the apiary site. Apiaries sheltered from the elements benefited from the front facing the sun, with hives set low to the ground, in a quiet and clean location, keeping out other animals and bad smells. Plantings like low trees and shrubs offer the apiary a clean appearance. Farmers observed an apiary easily if located near a frequented dwelling.¹¹³ These standard apiary typologies aligned with other manuals of the time period.

Allen proposed a bee shelter to protect box hives. The structure remained open in the front and enclosed in the back and sides with an overall dimension of six-feet deep and twenty-eight feet long. The front opening, tall enough for a man and his hat, constructed approximately nine-feet high in the front and seven-feet high at the rear. Four front corner posts and three back posts, with chamfered corners formed a six-sided structure. A forty-two-inch high swing door at the level of the hives, allowed ventilation. A simple shingled shed roof with an overhang of twelve to eighteen-inches completed the rustic bee shelter. This shelter took advantage of the warmth from the sun by remaining open in the front and utilized the rear hatches to provide ventilation and easy access for bees. The rear hatches addressed the issue with previous shelters that did not allow the beekeeper to access the back of the hives. This simple post structure inherently temporary, explaining why none have been found, if any were built (Figure 14).

The shed apiary interior held sixteen box hives. The hives sat on a stand constructed twenty-four-inches off the ground and eighteen-inches deep. Allen preferred simple box hives since patented hives did not bring him success. The box hives with inside dimensions of a twelve-inch cube, made of 1-1/4-inch thick plank pine boards. A four-inch wide 3/8-inch high bee entrance prevented the bee moth from entering the hive. A hole in the hive lid

¹¹³ Allen, *Rural Architecture*, 246-8, 255.

allowed bees to store surplus honey in the super. Allen recommended using a ten to twelve-quart pail placed on top, which could hold twenty pounds of honey and beeswax. The hives painted with white lead paint or another light color, protected against insects and weathering. The hive inside was whitewashed every spring, and the outside painted a 'soft agreeable color' matching other nearby structures.¹¹⁴ These careful steps allowed Allen to successfully and profitably keep bees for twenty years.

Immensely practical, Allen's bee shelter protected his hives while providing access to the beekeeper without any additional ornamental details. In the engraving, Allen's shelter utilized unplanned log posts, giving it a rustic quality similar to Loudon's suggestion. The engraving by Orange Judd & Company Agricultural book publishers illustrated a curved arch over the front of the apiary, adding elegance to the otherwise utilitarian structure described by Allen.

A.I. Root

A.I. Root (1839-1923) beekeeper, publisher, and apiculture manufacturer, published *ABC of Beeculture* in 1877. Root constantly edited and added to the work in response to beekeepers from across the country. He organized the book alphabetically with topics from A to Z, and wrote in a down-to-earth folksy style, providing various styles of apiaries.¹¹⁵ His apiary engravings showed the typologies of apiaries in the late nineteenth-century across the United States, not necessarily invented by him.

In the manual, Root illustrated the *Vineyard Apiary* which consisted of box hives, grape vines, and trellises surrounded by a fence with an attached honey house. Honey

¹¹⁴ Allen, *Rural Architecture*, 256.

¹¹⁵ Root, *The ABC of Bee Culture*, introduction.

houses functioned as work-shops and places to store honey and combs. An older building could be adapted into a honey house.¹¹⁶ Since only Root utilized the term 'honey house,' he may have coined the term, while others simply referred to the structure as a shed. Inside the apiary yard, wooden trellises made of posts and wire provided shade to each box hive. These trellises, placed four feet apart, formed a small vineyard within the nineteen-hive apiary. A picket fence surrounded the apiary, laid out like an octagon, reminiscent of honey comb. Situated at the end of the apiary yard, the wooden honey house with decorative trim and clapboards stored honey and beekeeping materials. The front-facing gable-end roof of the honey house featured picket fence pattern clapboards. The eave had cross bracing in the form of a decorative king's post truss.¹¹⁷ A triangular pediment roof protected the door.¹¹⁸ This apiary setting appeared idyllic in Root's engraving, portraying apiaries as lovely and serene.

The *Lawn or Chaff-Hive Apiary*, best suited for honey, contained insulated box hives, enclosed by a fence yard, and situated next to a honey house. Chaff or sawdust inside the box hive walls insulated the hive from the sun, albeit adding a significant expense. Like the *Vineyard Apiary*, the fence laid out in an octagon shape, a play on the shape of honey comb, enclosed the apiary. The octagon layout appeared in many apiaries across the country, suggesting a standard feature. A decorative fountain, situated in the middle of the apiary, provided water for the bees. According to Root, because the chaff or sawdust insulated against the cold, the hives could survive the winter outdoors without extra covering, resting on their stands. But according to the illustration, additional trees planted along the fence either functioned as additional foliage for the bees or as a wind break. Keeping the beehives outside, significantly reduced the amount of prep work for the beekeeper each winter. The

¹¹⁶ Root, *The ABC of Bee Culture*, 151.

¹¹⁷ McAlester, *A Field Guide to American Houses*, 335.

¹¹⁸ Root, *The ABC of Bee Culture*, 12-5. See also Harris, *Dictionary of Architecture and Construction*, 1015.

decorative *Chaff-Hive Honey House* faced the apiary and stored honey and materials. The gable-end roof had raking cresting. The window, capped by a triangular pediment, was centered within the vertical siding gable. A hipped triangular pediment capped the door.¹¹⁹

A.I. Root promoted the *Modern House Apiary* or bee house as a successful way for a beekeeper to manage multiple hives. The equipment and tools located within reach, and honey stored in the middle of the room, made the house apiary convenient and efficient. Interior lighting allowed the beekeeper to work at night. Locked at all times, the bee house ensured the safety of the bees and honey from thieves. Additional benefits of the bee house included that the bees could be handled in all kinds of weather, and that an additional room upstairs furnished a playroom for children, unafraid of bee stings. Interestingly, nineteenth-century apiarists did not share the modern fear of exposing children to bees. The exterior octagon-shape, with three hives to a side, prevented bees from entrapment in the corners, while the exterior battens, painted a slightly darker drab color helped the bees find the entrances. The octagon-shaped building resembled a tent, adding a romantic element to the garden. Each bee entrance location varied, a feature which aided bees in finding their correct hive. The bees entered the hive through a two-inch hole directly below the batten in the center hive. The bees entered the bee hole to the left of the batten in the left hive, etc. The alighting boards or landing strips fixed outside each bee entrance. Battens also functioned as decorative ornamentation and covered the seams of the boards. Two sets of doors, the inner glass door and the outer wooden door sat directly across from each other each for ventilation. The well-painted tin roof protected the hives long term, but added additional cost. The peak of the roof had an apparent decorative box hive and weather vane. The cresting trim completed the cornice of the roof. To prevent dampness, a small twelve-

¹¹⁹ Root, *The ABC of Bee Culture*, 15 and 19.

inch square hole served as a ventilator in the center of the ceiling, and a trap door in the floor allowed cool air to flow from the basement. A shelf three-and-a-half-feet above the floor and eighteen-inches deep held thirty-six hives. A second shelf added additional hives several inches off the floor or directly on the floor. The combs and glass panels hung on metal rabbets. The hives could be covered with glass in the summer for easy viewing, and with a chaff cushion or cloth on top for insulation in winter. The triangular pedimented roof with a dentil band below capped the door. A fence, low bushes and grape vines enclosed the bee house¹²⁰ (Figure 15). The *Modern House Apiary* combined function and form, allowing comfort for the bees and beekeeper and adding a beautiful architectural building to the garden.

The drawbacks of the *Modern House Apiary* were the initial expense- especially when a beekeeper could use outdoor hives without a house and make a yearly profit. Most apiarists liked to work outside instead of inside a bee house. Another drawback to a bee house was that all the bees must be driven out to inspect one hive. According to Root, the bee house suited locations where the theft of bees and honey was a threat.¹²¹ This seems an unlikely problem, since other farm animals, often housed outside were not in locked quarters.

Root's book published multiple engravings of apiaries located across the country, including California. Regional differences emerged, but unsurprisingly many apiaries contained the same elements. The Californian apiaries appeared in the middle of wilderness often without other farm buildings or houses in view. Like other apiaries across the country, they contained box hives, often in rows, a honey house for storage, and trees or low bushes surrounding the apiary. Root unlikely visited these apiaries personally but based them upon

¹²⁰ Root, *The ABC of Bee Culture*, 15-9.

¹²¹ Root, *The ABC of Bee Culture*, 15-9.

written descriptions from corresponding apiarists. Root's *Gleanings of Bee Culture* journal published these apiary descriptions from local beekeepers across the country. An apiary near San Diego, California featured box hives in clusters with a wooden clapboard front-gabled honey house, enclosed by a Virginia rail fence, low bushes, and trees¹²² (Figure 16). R. Wilkin's Hexagonal apiary in Buenaventura, California had diagonal rows of stacked box hives and a honey house in the center. The beekeeper planted young trees or bushes within the rows, while he planted larger trees outside the apiary.¹²³ J. Archer's apiary in Santa Barbara, California had scattered stacks of box hives within a clearing next to a lean-to style honey house with overhanging porch.¹²⁴ The apiary specifications utilized the landscape, offering protection and food for the bees. The proximity of the honey house to the apiary made storage of honey and materials convenient. In California, honey houses built of simple unadorned materials, reflected the frontier aesthetic. Bee houses and shelters were absent within these apiaries possibly because of the temperate climate and the lack of resources to front the initial expense of these structures.

Apiary typologies in Florida were quite different from the rest of the country. Florida beekeepers placed their apiaries beneath extensive vegetation, to keep the hives cool from the excessive Florida heat. Tropical vegetation and climate-specific ways of transporting and accessing apiaries defined Florida forms. W. S. Hart's apiary in New Smyrna, Florida consisted of two-story box hives set on a short wooden stands underneath palm trees.¹²⁵ A. Leyvraz located his Francis, Florida apiary underneath a grapevine arbor with two-story box hives on short stands organized in a long row. The engraving included a hammock for relaxing and a woman seated with her sewing machine beneath the arbor.¹²⁶

¹²² Root, *The ABC of Bee Culture*, 80.

¹²³ Root, *The ABC of Bee Culture*, 180.

¹²⁴ Root, *The ABC of Bee Culture*, 176.

¹²⁵ Root, *The ABC of Bee Culture*, 181.

¹²⁶ Root, *The ABC of Bee Culture*, 171.

This apiary must have functioned as an outdoor living room for the beekeeper's family (Figure 17). In Root's *Gleanings in Bee Culture* journal, E. G. Baldwin wrote about a Florida beekeeper named, Isaac T. Shumard of Osprey in 1911.¹²⁷ Although twenty years later than the previously mentioned apiaries, his extensive apiary on Cassey's Key on the western coast of Florida south of Tampa, contained 200 colonies in five apiaries located on inlets, streams, and bays on the mainland. This large industrial apiary showed that beekeeping had evolved from a part-time hobby in the early nineteenth century, to a full time operation for some practitioners by the early twentieth century. Baldwin noted, Shumard accessed the apiaries with his gasoline powered boat, carrying his extractor, harvesting 1000 pounds of white honey in just a few hours. Shumard's apiary consisted of one and two-story box hives scattered haphazardly beneath low bushes and trees. He located his honey house on the water, accessed by a wooden dock to prevent ant infiltration. These beekeepers adapted and responded to the environment. The typologies of Florida apiaries offered protection against heat by providing extensive shade. Apiaries situated along the coast, allowed the beekeeper to move large amounts of honey easily by boat. Different trees like palm trees set Florida apiaries apart from other temperate regions, while some Florida apiaries provided unique outdoor living spaces.

In the Northeast and Midwest regions, apiaries located within the barnyard and in view of the farmhouse, appeared refined compared with their Florida and California frontier counterparts. M.A. Williams & Co.'s, *Railroad Apiary* located in Berkshire, New York, included railroad tracks, which led directly into the honey house.¹²⁸ The beekeeper organized box hives in neat rows on both sides of the honey house while a post and rail fence enclosed the apiary, with one large tree planted in the middle. The farmhouse and

¹²⁷ Baldwin, "Bee-keeping in Florida," 426-7.

¹²⁸ Root, *The ABC of Bee Culture*, 166.

several barns sat in the background of the apiary. The clipped grass surrounding the box hives lent a clean and neat appearance to the apiary. A.A. Rice from Seville, Ohio constructed a hexagon-shaped bee house, similarly formed, but less ornamental than the *Modern House Apiary*, surrounded by single-story box hives in neat rows.¹²⁹ The simple gable clapboard honey house was located next to the bee house. A Virginia rail fence surrounded the apiary with large and small trees scattered throughout. The farmer could view the apiary at all times from his house next door. Mrs. Jennie Culp's apiary in Hillard, Ohio comprised straight rows of box hives next to rows of fruit trees and bushes, surrounded by a picket fence. Deciduous trees planted at the far end probably functioned as a wind break.¹³⁰ J.H. Townley's Chaff-Hive Apiary located in Tompkins, Jackson County, Michigan, had chaff hives organized diagonally and with straight rows.¹³¹ Enclosed by a fence, two small sheds or honey houses sat beside the box hives and short trees. Although advocated by Root, only one farm within the region included a bee house. Belonging to established farms, these apiaries coexisted with other farming types. These apiaries appeared more mature and did not have the 'carved out of the wilderness' appearance of the California apiaries, but instead had purposely planted trees and orchards. Northern hives required more sun exposure than the apiaries in Florida or California because bees in the northern regions needed warmth from the sun to survive the winter.

Root included in his manual several bee house examples, including his own. His Medina, Ohio apiary had single and two-story box hives situated on stands with grape vine trellises behind.¹³² The plain detailed house contrasted with his *Vineyard Apiary*. Similarly, unadorned, a wooden clapboard honey house had a small hatch above the larger door and a

¹²⁹ Root, *The ABC of Bee Culture*, 21.

¹³⁰ Root, *The ABC of Bee Culture*, 46.

¹³¹ Root, *The ABC of Bee Culture*, 21.

¹³² Root, *The ABC of Bee Culture*, 20.

vent in the roof. A picket fence enclosed the yard with short trees planted inside the apiary. Olive Foster's bee house, in an undisclosed location, built on a brick foundation, supported a front gabled clapboard house with batten door, holding eleven hives. Operable hatches located under the eaves opened outward exposing interior shelves. Unlike any other bee houses, fanciful dormered bee entrances distinguished the ground level, providing the bees a sheltered entrance. Another bee house, constructed on a brick foundation, of batten-board wooden clapboard construction forming arches featured an alighting board and bee entrance located under the batten-boards providing a finding aid for the bees. Decorative scrollwork added visual interest beneath the eave and above the door's cornice. A cupola with weathervane on the roof, provided ventilation. The panel door had two glass or wired glass panes.¹³³ These whimsical but functional bee house types displayed the possibility of embellished bee houses. Brick foundations offered permanence and possibly cellar storage that many other bee house structures lacked. Root valued these decorative gothic bee houses, but for his own purposes he preferred the simple clapboard bee house (Figure 18).

Root's apiary designs provided a range of decoration and detail. Farmers needed these vernacular buildings to be functional as well as cost effective. Most of the actual apiary engravings in various sources were unadorned compared with Root's suggested decorative hive designs. Through ornamentation, he may have wanted to elevate the form thereby raising the beekeeping profession. A neat, well-appointed, ornamented bee or honey house promoted beekeeping from a farmer's livelihood to a gentleman's pastime. How many of these decorative bee houses were actually built is difficult to determine since few structures remain. Apiaries, across the country, enclosed by a fence set within an orchard or vineyard with surrounding trees as foliage and weather protection. The honey comb appeared to

¹³³ Root, *The ABC of Bee Culture*, 20.

inspire the shapes of structures and apiaries by the repeated use of the octagon form. The ubiquitous honey house and box hives reflect a standardization to the beekeeping practices brought by bee manuals like A.I. Root's.

These five works depicted the wide range of apiary typologies within the United States and England, offering an overview of the architectural fashions, aesthetics, and practices of mid-nineteenth century apiarists. A spirit of experimentation was evident in these works as the authors tried new methods of producing honey and promoting the health of the bees. Finally, the fundamental pattern for success as advocated by all these authors was, box hives with shelter and shade or a bee house, enclosed by a fence, and proximity to an orchard, a house, and water.



Figure 10 Edward Bevan's Thatched Bee House, 1838, surrounded by hollyhocks, lilies, and roses. *Found in Edward Bevan's The Honey Bee, its Natural History, Physiology and Management, i.*

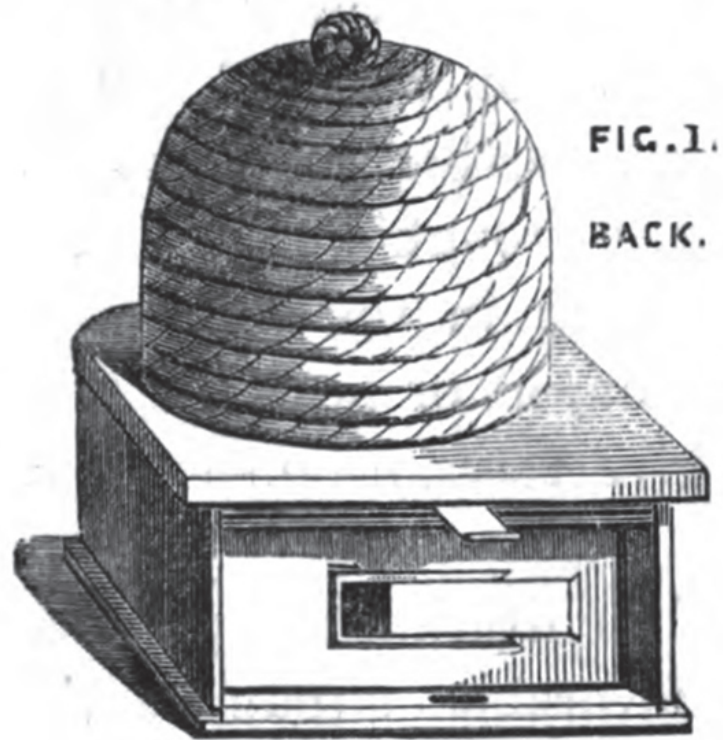
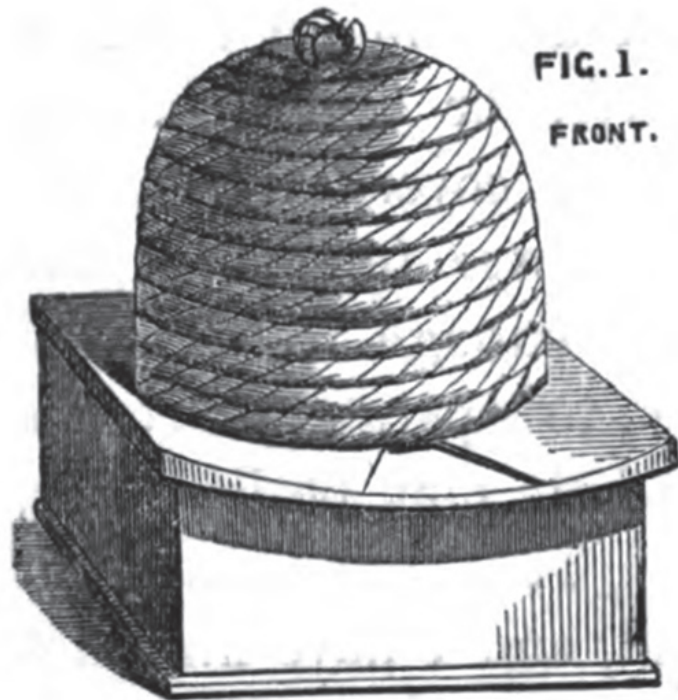


Figure 11 Henry Taylor's Nether Hive, 1860. Found in *Henry Taylor's Bee-Keeper's Manual*, 92.



Figure 12 A Large Well-Ventilated Bee House, 1860. *Found in Henry Taylor's Beekeeper's Manual, iv.*

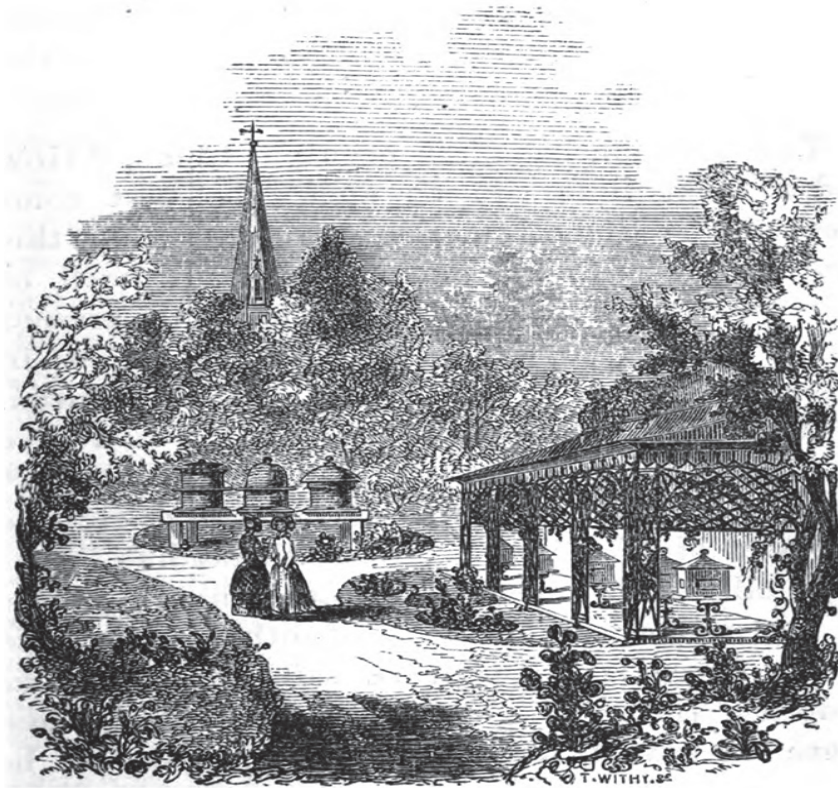


Figure 13 A Whimsical Bee Shelter and Bee Stand, with various decorative box hives. Found in Henry Taylor's *Beekeeper's Manual*, 105.

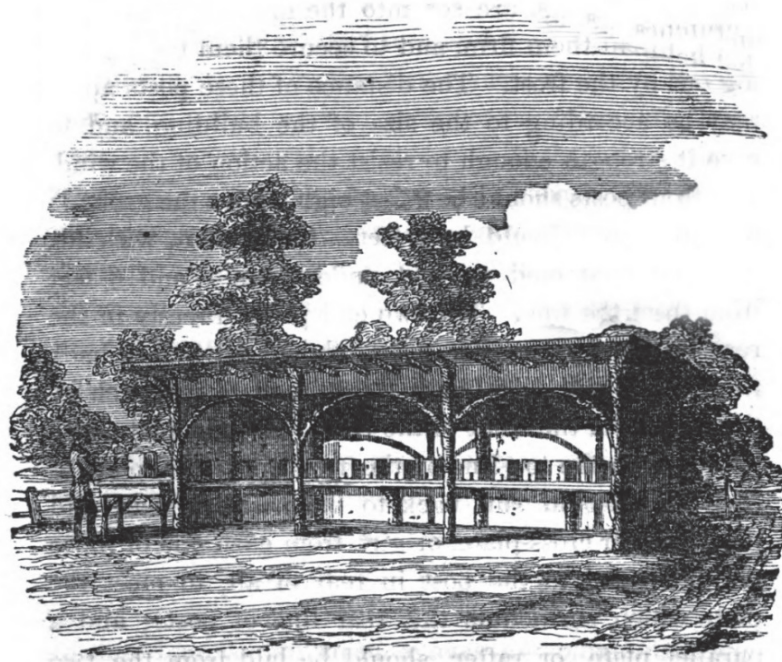


Figure 14 Lewis Allen's Practical Rustic Bee Shelter. Found in Lewis Allen's *Rural Architecture*, 249.

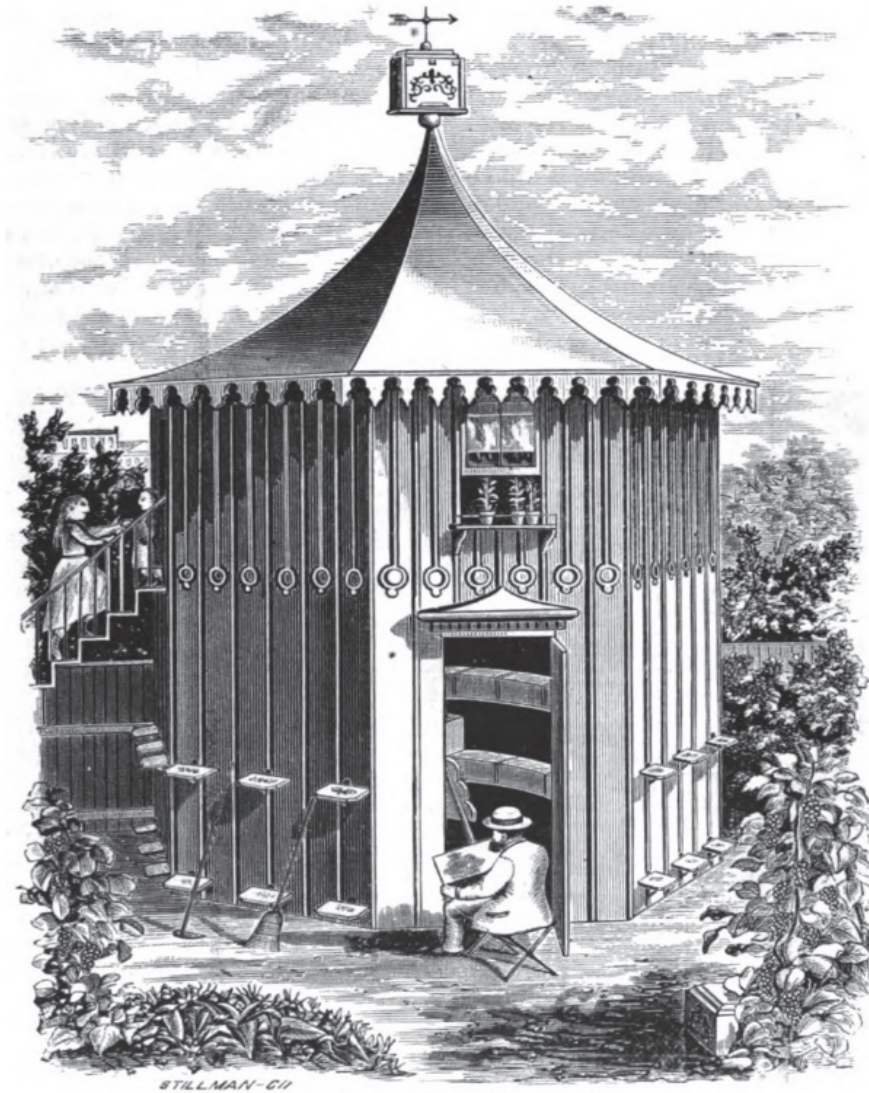


Figure 15 A.I. Root's Ornamental Octagon "Modern House Apiary" note the alighting boards.
Found in A.I. Root's ABC of Bee Culture, 16.



Figure 16 A.I. Root's San Diego, Frontier California Apiary. *Found in A.I. Root's ABC of Bee Culture, 80.*

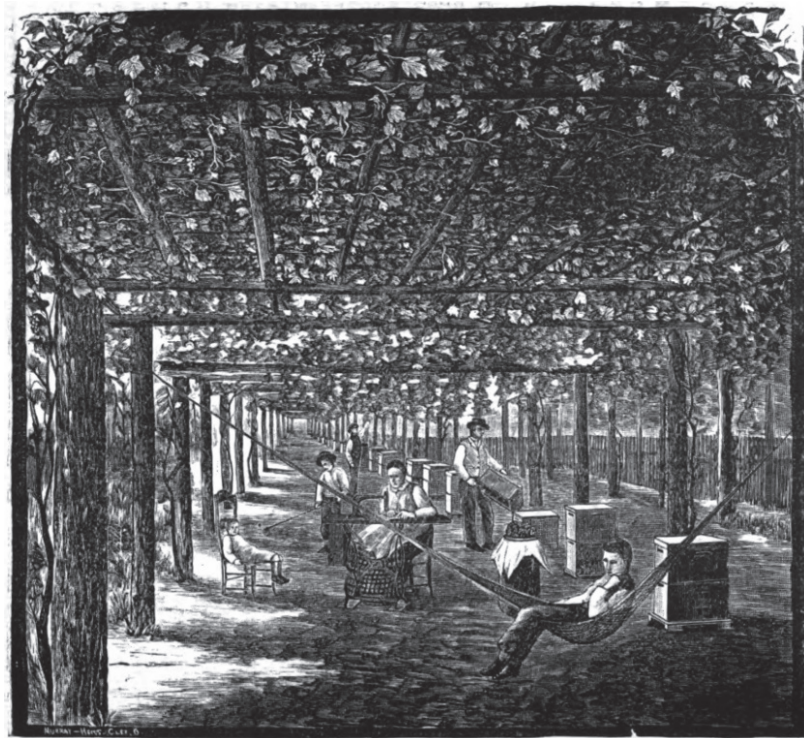


Figure 17 A. Leyvraz's Outdoor Livingroom Florida Apiary. *Found in A.I. Root's ABC of Bee Culture, 171.*



OLIVER FOSTER'S 14-HIVE HOUSE APIARY.

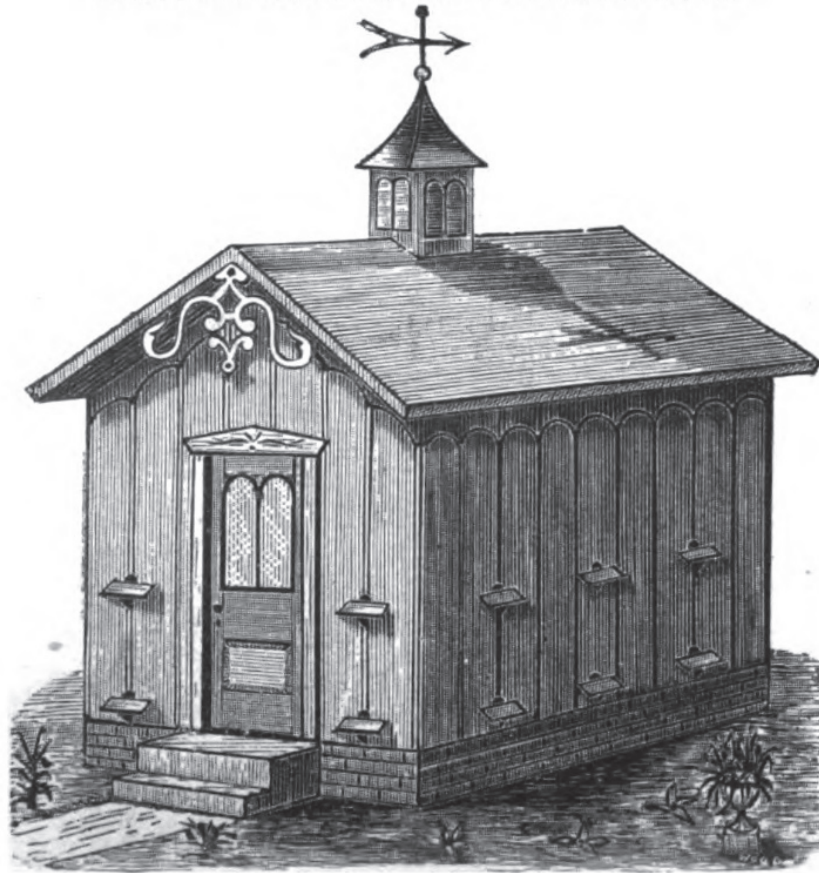


Figure 18 Olive Foster and A.I. Root Bee Cottage Style Bee Houses, with dormers (above) and alighting boards (below). Found in *A.I. Root's ABC of Bee Culture*, 20.

Indiana & Regionalisms

Other regions within the United States referenced beekeeping and apiary typologies. The Abby Aldrich Rockefeller Folk Art Museum in Colonial Williamsburg has folk paintings depicting skeps in gardens, while manuscripts and diaries referenced bee houses in the Chesapeake region. Published references in journals and in letters, confirmed that New England Beekeepers practiced bee culture. The Midwest, where two intact bee houses remain, also maintained a strong beekeeping tradition.

Three apiary structures remain in Jefferson County in southern Indiana near the Ohio River including, two intact bee houses and a honey house. The bee house cultural tradition dated to the late nineteenth-century when Indiana state geologist, E.T. Cox reported several farmers engaged in beekeeping in 1874.¹³⁴ Cox reported, Pleasant Vernon's apiary as the, 'most extensive apiary' located near the Indiana-Kentuck Creek. A 1925 photograph of the Vernon farm house included the bee house and honey house in the distance (Figure 19). The Vernon bee house and honey house were sited, like many others, within view of the farm house and enclosed in the yard by a picket fence. Cox noted the bee house, used exclusively for bees, had superior construction which protected against other insects. Reported by Cox, Vernon's hives produced one hundred or more pounds of white honey during the season. This bee house and honey were later moved to a city park in Jefferson County, in Madison, Indiana in 1997.

United States Census Records recorded that Pleasant Vernon (1822-1897) was born in Stokes County, North Carolina and that he lived in Milton Township, Jefferson County, Indiana in 1860. By 1870, he was listed as a farmer, owning real estate valued at \$200, with

¹³⁴ Cox, *Sixth Annual Report of the Geological Survey of Indiana made in the year 1874*, 177.

a personal estate valued at \$1,000.¹³⁵ The doubling of his estate in ten years may be from his successful beehives or other farming pursuits.

Incognito bee houses and honey houses were often unperceived in the agricultural landscape, converted for other uses or abandoned. In 1988, Edna Vernon a descendant of Pleasant, wanted the buildings removed from her property because of their dilapidated condition. The derelict bee house would be unrecognizable as such without the alighting boards. The neglected honey house appeared as a typical shed, if the bee house was not situated in an adjacent half courtyard (Figure 20). This demonstrates the difficulty in recognizing these forms if they are altered or moved. Lee Rogers, a Vernon farm neighbor, moved the houses to his farm in Canaan. In 1997, Rogers restored and moved the houses to Pearl Park in Madison, Indiana.¹³⁶ Another bee house, similar in size and detail located at the Gross Farm near Brooksborg, in Milton Township, Jefferson County, Indiana was converted to a garden shed. These small buildings adapted easily for other purposes, would remain unseen without a trained eye, a few reasons, perhaps, why bee houses are not well known.

The Vernon bee house, 13 feet 3-inches deep by 10 feet 3-inches wide and 12 feet 6-inches high, exhibits typical features of the form. It is front gabled, with wood clapboards. Five-half-inches cast iron stakes on cast iron dishes, serve as the bee house footings. In his 1829 book, *The Pyramidal Bee-hive*, Pierre Du Couëdic de Villeneuve (1743-1822) recommended placing an earthenware dish filled with water underneath the legs of a bee stand to prevent ants from entering.¹³⁷ The iron dish footings on the Madison bee house likely serve the same purpose. The beekeeper possibly filled the dish with tar or water to

¹³⁵ 1870 United States Census found at ancestry.com. Pleasant H. Vernon at findagrave.com. Accessed 10 May 2016. <http://www.findagrave.com/cgi-bin/fg.cgi?page=gr&GRid=47409918&ref=acom>.

¹³⁶ Rogers, "Rare 19th century Bee Houses Moved to Park," Unknown date 1997.

¹³⁷ Du Couëdic de Villeneuve, *The Pyramidal bee-hive*, 50.

prevent unwanted bugs from entering the bee house. The sides and rear have alighting boards, or bee landing strips, with individual bee hole entrances, for a total of thirty hives. The rear hatch provides ventilation, while the open-raked gable roof features simple brackets (Figure 21-25).

The interior features of the bee house enhanced the life of bees to support a high honey yield. The bee house's double walls insulated with sawdust, protected against extreme temperatures. The hives sat on two stacked shelves with metal rests for honey comb frames. A cover would have been placed on top and the back to close the hive. Glass boxes placed above functioned as a super, allowing the bees to store excess honey. The beekeeper sold these boxes, with the honey and wax together, directly to a customer (Figure 26).

The honey house, similar in construction, had smaller proportions than the bee house. The floor had a ventilation hatch to keep the honey and stored materials cool. The beekeeper likely stored honey or equipment in the honey house and extracted honey from the combs (Figure 27).

Patents

Several United States apiary patents included elements of this bee house. William Faulkner, of Vevay, Indiana, approximately nineteen miles from the Vernon Farm, applied for a U.S. Patent number 74,065 in 1868 called, *Improvement in Apiary*. He improved the bee house apiary by putting the house on iron posts in iron cups filled with tar to prevent insect infiltration. He also devised a system of ventilation in which a pit dug beneath the bee house, with a sunken hatchway that opened into the floor of the hive, provided cooled air prior to air conditioning. The register in the ceiling led to a flue outside, which provided

ventilation. He also proposed insulating the walls with chaff or saw dust. The Vernon bee house used the cast iron footings, dish, and wall insulation, like those portrayed in the patent but only a gable-hatch for ventilation and not a roof flue. Since the towns are in close proximity, it was plausible that Faulkner and Vernon knew each other personally. Although Vernon's bee house exhibited similar features to Faulkner's design, he chose only to implement part of the patent (Figure 28).

Other patents from the second half of the nineteenth century indicated the popularity of experimentation. I.W. Carter from St. Louis, Missouri received U.S. patent number 84,994 in 1868. Carter's patent did not specify many details but suggested multiple bee entrance holes beneath the roof line. The house had a simple gable roof with a door large enough for a beekeeper to enter. Charles Oscar Lett, of Eclectic, Alabama received his apiary U.S. patent number 685,337, in 1901 (Figure 29). This apiary design's primary objective prevented infiltration of insects and vermin and secondarily protected it from cold weather, while maintaining clear and open access for the bees. The hives set on a shelf, suspended from above and housed in a gable roof shelter. When the temperature lowered, the beekeeper pulled the shelf up into the eave of the roof while a door enclosed the bottom. These patents, among others filed with the United States Patent Office, inform bee house typologies. Perhaps these forms were built but then altered for other uses.

Chesapeake

Several examples from the Colonial Williamsburg area referenced skep hives and a bee house. In Carl Lounsbury's work, *An Illustrated Glossary of Early Southern Architecture and Landscape*, published in 1994, included a 1733 deed book from Colonial Williamsburg which referenced a bee house, '[The carpenter was paid for] plank & Work Done about the

Beehouse,' suggesting the owner housed beehives in a bee house.¹³⁸ A painting by an anonymous folk artist at the Abby Aldrich Rockefeller Folk Art Museum depicted a conical skep on a wooden stand within rows of plants and trees. The skep's central location in the garden and in the painting, suggested its necessary role in pollination and the cultural importance of bees, seemingly guarded by trees and sheep poised in front of the beehive, protecting it from harm.¹³⁹ Another folk artist named Harriet De painted two skeps sitting on a wooden bench with flowering bushes behind. The nearby pond and fountain provided ample water for the bees. The house in the background would have allowed the beekeeper to keep watch over the hives. The young girl kneeling, focused her gaze on the beehive, anticipating the sweet stores of honey. The female artist depicted, the treasures of an established estate such as, a grand house, ornamental garden, offspring, and beehives.¹⁴⁰

References to apiculture can also be found for the Chesapeake region. In Carl Lounsbury's work, *An Illustrated Glossary of Early Southern Architecture and Landscape*, he referenced the Blake farm in Maryland which had, 'one bee shed 10 feet by 5,' which were typical dimensions.¹⁴¹ A Chesapeake craftsman who lived and operated an inn in Annapolis, Maryland, William Faris (1728-1804), laid out his garden in the 1760s. He kept a diary throughout his life and received a gift from a neighbor in 1793 who, 'Made me a present of Hive of Bees.' By the next year he, 'put the frame of the bee house together.' This bee house may have been pine boxes which housed bees directly or served as shelters for skeps.¹⁴² Skeps placed on stands was a widespread practice throughout the United States and Britain, as advocated by Allen and Loudon, well into the nineteenth century.

¹³⁸ Lounsbury, *An Illustrated Glossary*, 31.

¹³⁹ O'Malley, *Keywords in American Landscape Design*, 133.

¹⁴⁰ O'Malley, *Keywords in American Landscape Design*, 133.

¹⁴¹ Lounsbury, *An Illustrated Glossary*, 31.

¹⁴² Sarudy, "A Chesapeake craftsman's," 146-7.

New England

References to bee houses from, *The New England Farmer and Horticultural Journal*, published in Boston, described New England's strong beekeeping tradition. The journal reported the price of honey weekly, alongside that of other key agricultural staples like wheat and corn. On April 29, 1835 honey is price ranged from 37 cents to 42 cents per gallon.¹⁴³ Several references to bee houses published in the journal showed the novelty of a bee house and its high honey yields. These designs enthused a spirit of experimentation. An anonymous author from Ostego County, New York, wrote in the *New England Farmer*, in June 1835:

we were shown the first bee-house we ever saw or heard of. One was four, and another six feet square, and six or several feet high, made perfectly tight, with a good floor, and with a door for occasional entrance.¹⁴⁴

This productive hive reportedly contained about 200 pounds of honey or 24 gallons, which would have been worth between \$8-10, a substantial sum.¹⁴⁵ Another 1833 article from the same journal, described bee houses constructed of brick or wood. If built of wood then the house should be set on 'stakes,' the size of common smoke house, with interior shelves.¹⁴⁶ This arrangement may have been similar to the cast iron stakes of the Indiana bee house.

Connecticut estates also established apiaries. In 1821, Martha Trumbull Stillman portrayed the Monte Video property of Daniel Wadsworth in Avon, Connecticut. She wrote, 'The place is a great deal handsomer than I expected. The buildings are all Gothic. First there is Uncles beautiful house; ...8th the bee house...'¹⁴⁷ Thomas Cole painted the Wadsworth estate in 1828 located at the Wadsworth Athenaeum in Hartford, Connecticut (Figure 30).

¹⁴³ Fessenden, *The New England Farmer and Gardener's Journal*, 335.

¹⁴⁴ O'Malley, *Keywords in American Landscape Design*, 135.

¹⁴⁵ O'Malley, *Keywords in American Landscape Design*, 135.

¹⁴⁶ O'Malley, *Keywords in American Landscape Design*, 135.

¹⁴⁷ O'Malley, *Keywords in American Landscape Design*, 135.

Although not visible, the painting depicted the picturesque landscape in which a bee house would have been located. The inclusion of an agricultural building in the description of a beautiful house and landscape conveyed the significance of the bee house. Beekeepers built their bee houses to be aesthetically pleasing as well as functional.

Cynthia G. Falk wrote, *Barns of New York*, in 2012, including an advertisement for Horatio Nellis who described himself as a 'dealer in Italian bees,' living in Canajoharie, NY in Montgomery County. The advertisement depicted his suburban residence with surrounding green houses, barns, apiary, and bee house. A brick and stone fence with a row of trees, surrounded the farmyard. Box hives situated at the immediate side of the house and an octagon bee house roughly the same height of the main house and barns, constituted the apiary. The bee house height showed its prominence and the Nellis' investment. The two-story octagon bee house had three shelves of bees with three entrances per side, while a chimney at the point of the roof, provided ventilation. The door allowed Nellis to access the inside of his bee house.¹⁴⁸

A reward of merit, from the Dutch Colonies in New York c.1820, illustrated a skep or straw hive on a stand printed by the copperplate engraving method with water coloring. Rewards of merit often depicted images of skeps and bees, a symbol of hard work. A teacher awarded a reward of merit to a child in a religious or secular school for good behavior.¹⁴⁹ This engraving illustrated a single skep on a low wooden stand with bracket supports. The skep had six bee holes on the side. Skeps stands, most often made of wood or sometimes stone, depicted in publications of the time survive as evidence. Skeps and skep stands were not often preserved, or people adapted the stands for other uses. The bee skep and stand symbolized industry and thrift in American culture. Another reward of merit from 1835,

¹⁴⁸ Falk, *Barns of New York*, 177-181.

¹⁴⁹ Fenn and Malpa, *Rewards of Merit*, 1994.

hand-painted engraving called, 'A Morning Walk,' can be found at the Library Company of Philadelphia¹⁵⁰ (Figure 31). In the illustration, a young child frolicked in a garden with a skep situated on a wooden stand, built of simple wood-posts raised about twelve-to-eighteen-inches off the ground. Although outside the frame, the stand probably contained additional skeps. Constructed in the typical dome manner, the skep had a bee hole at the base. The image depicted the hive set in a garden among blossoming flowers providing nectar for the bees. The presence of bees and a child playing with a doll, suggested people were not afraid to expose children to bees. Although these illustrations were not literal representations of skeps and stands, they offered general ideas of typical skep and stand typologies.

Another New Englander, Samuel Deane (1733-1814) authored a farming and animal husbandry dictionary in 1797. He wrote, [the] 'rural economy is incomplete where bees are wanting. The coft of keeping them is nothing, after the houfe and boxes are made...'¹⁵¹ The book recommended the bee house be open to the south or southwest or closed in the front with three doors in the back that could be opened to view the hives. The hives should sit on a bench slightly sloped, dispelling rain. To regulate the temperature, the beekeeper added boughs for shade and plastered the seams with clay in the winter. In very cold climates, straw should be placed within the house and removed by spring. Individual alighting boards for each hive could also be painted different colors to aid the bees navigation. Deane also recommended a shelf above the alighting boards to protect the bees from the rain.¹⁵²

¹⁵⁰ "A Morning Walk," Philadelphia: published by B. Bramell, No. 611, 1835, Graphic P. 2007.39.8, located at the Library Company of Philadelphia.

¹⁵¹ Deane, *The New England farmer*, 29.

¹⁵² Deane, *The New England farmer*, 29-32.

These apiary typologies, from various regions of the country, convey the cultural importance of beekeeping to Americans and followed standard practices with some regional variation. Beehives, depicted in paintings and patents and described in written records and journals, offered glimpses of historic apiaries now vanished from the landscape. The adaptive reuse of bee houses, proved their flexibility and usefulness and obscure this once common out building type.

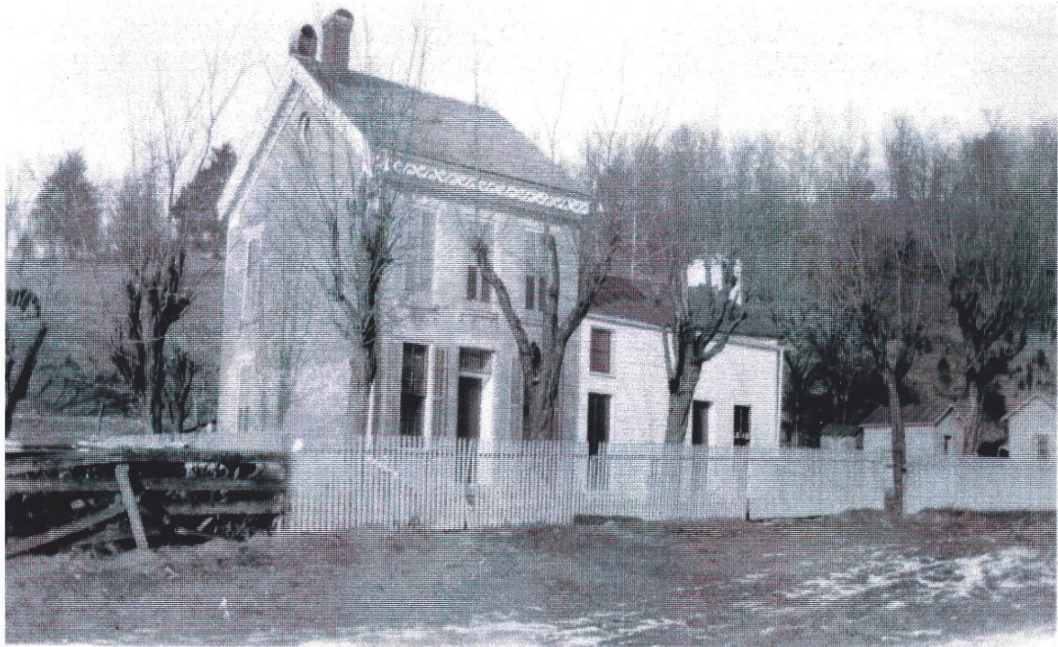


Figure 19 Vernon Farm 1925, Jefferson County, Indiana. Bee House and Honey House at the right. Photo courtesy of Jefferson County Historical Society.



Figure 20 Unrestored Vernon Bee House and Honey House c. 1988. The derelict condition and vegetation hide the features. Photo courtesy of Lee Rogers.



Figure 21 Vernon Bee House in Pearl Park, Madison, Indiana, door allowed beekeeper to enter house. *Photo by Author.*



Figure 22 Vernon Bee house Cast Iron Foot. *Photo by Author.*



Figure 23 Vernon Bee House Alighting Board. *Photo by Author.*



Figure 24 Vernon Bee House Side Elevation. Photo by Author.



Figure 25 Vernon Bee House Rear Elevation. *Photo by Author.*



Figure 26 Vernon Bee House Interior, note the glass box for honey comb on the shelf. *Photo by Author.*



Figure 27 Vernon Honey House, Pearl Park, Madison, Indiana. *Photo by Author.*

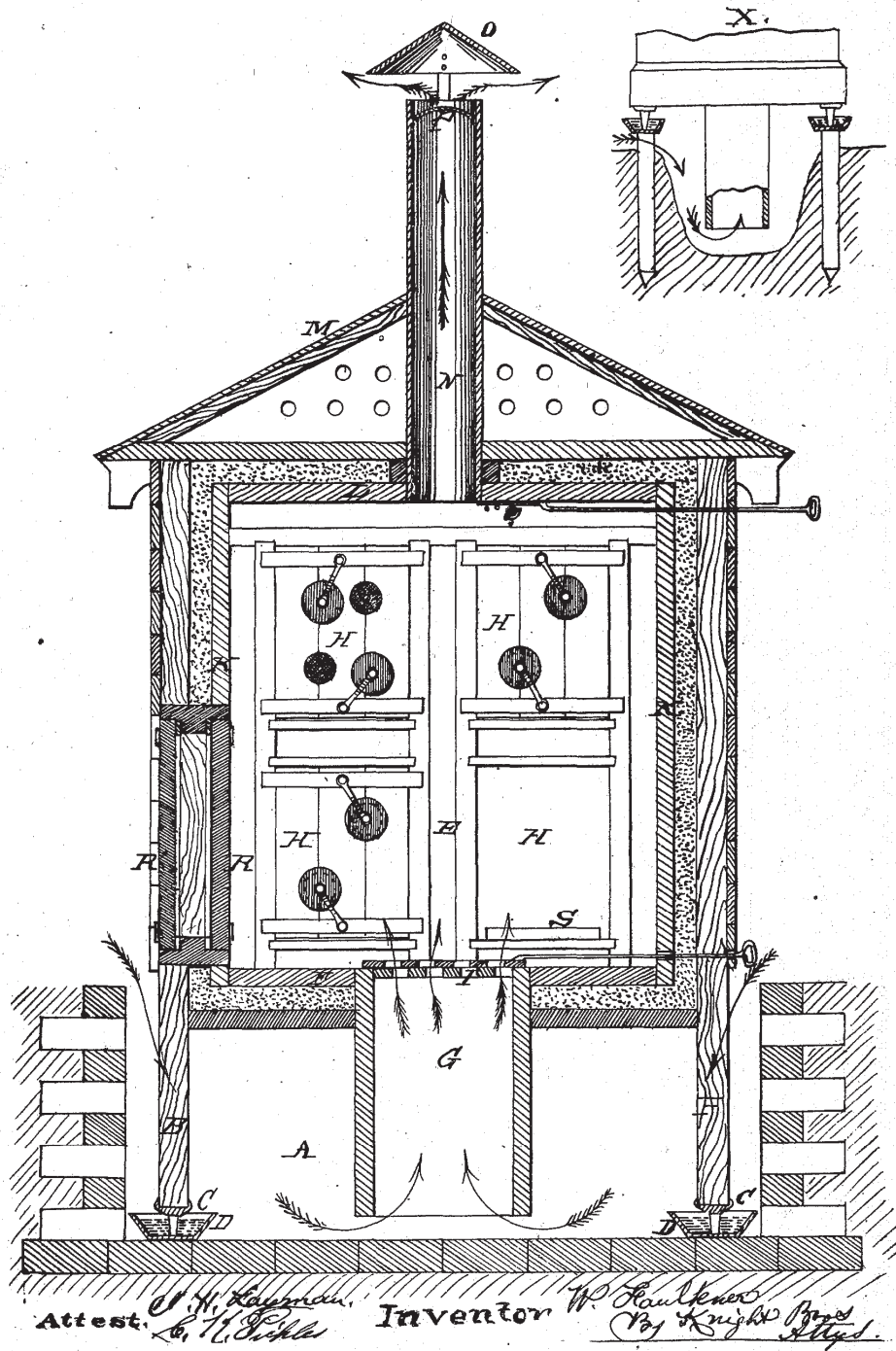


Figure 28 Faulkner's Bee house Patent Number 74,065, 1868. 'A' is the pit in the ground. Note the footings at 'C' and 'D.' 'G' is a central hatch for ventilation. 'H' represents the Hive. 'K' represents a double wall with chaff for insulation. 'N' is a flue for ventilation. See Patent for further details. Courtesy of the U.S. Patent Office. Accessed 5 May 2016.
<http://pdfpiw.uspto.gov/piw?Docid=74065&idkey=NONE&homeurl=http%3A%252F%252Fpatft.uspto.gov%252Fnetahhtml%252FPTO%252Fpatimg.htm>

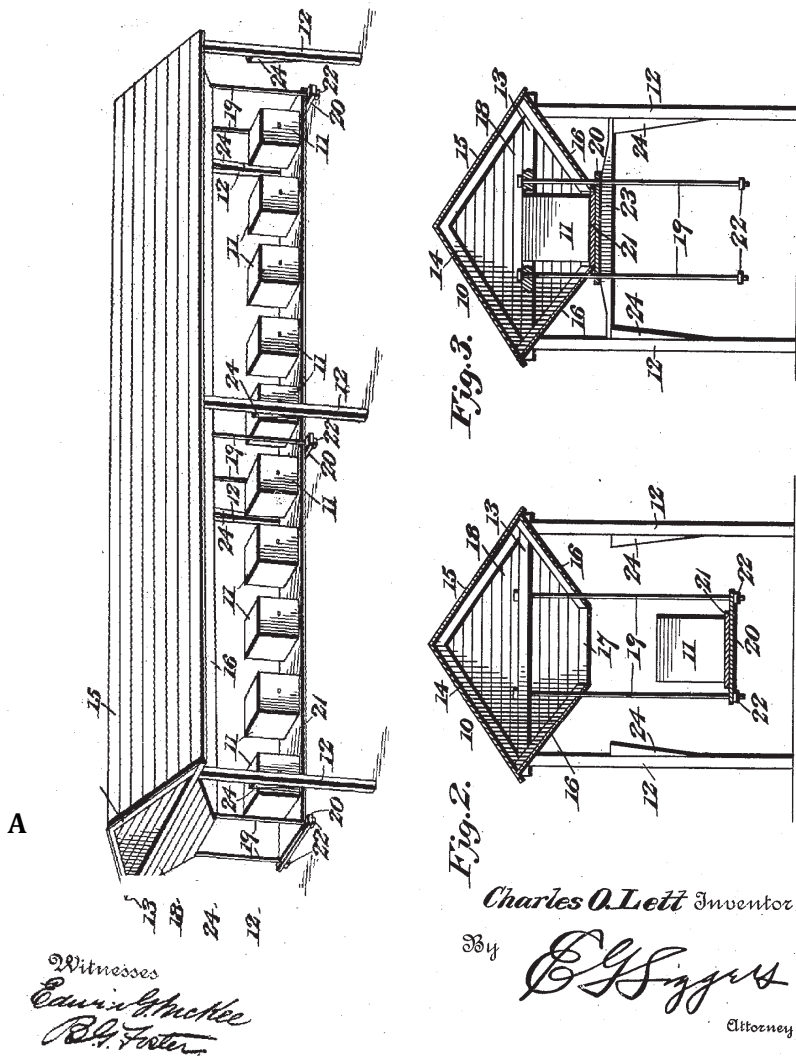


Figure 29 Charles Oscar Lett Bee Shelter Patent Number 685,337, 1901. **A.** and **Fig. 2** Shows the hive open. **Fig. 3** shows the hive closed. The Courtesy of the U.S. Patent Office. Accessed on 5 May 2016.
<http://pdfpiw.uspto.gov/piw?Docid=685337&idkey=NONE&homeurl=http%3A%252F%252Fpatft.uspto.gov%252Fnetahml%252FPTO%252Fpatimg.htm>



Figure 30 Thomas Cole, "View of Monte Video, Seat of Daniel Wadsworth, Esq.," 1828. *Courtesy of Wadsworth Athenaeum, Hartford, Connecticut and google images.*



Figure 31 A Morning Walk, Reward of Merit. *Courtesy of the Library Company of Philadelphia.*

Conclusions and Apiary Typologies

Historic apiary typologies varied throughout Europe and America, but common themes emerged. Concerns for bee health, maximum honey yield, wax production, and protecting investment, prompted beekeepers to experiment with and use different shelter forms. The bee house form, housing skeps or box hives, provided protection, security, and easy access for beekeepers (Figure 32). Although considered an unnecessary luxury by some beekeepers, others touted bee house benefits. These vernacular structural forms were either decorative and playful as an architectural folly in the landscape, or simply utilitarian and unadorned. The more decorative versions promoted beekeeping into a gentleman's pastime. The honey house, a specialized workroom and shed for storing equipment and honey, received little attention by most beekeepers, except A.I. Root. These vernacular buildings, similarly adorned as bee houses, were widely forgotten once adapted to other uses. Bee shelters, utilizing skeps or box hives, benefited from having at least one side exposed to the sun, a common problem in a bee house (Figure 33). This form varied from a decorative, whimsical rustic structure to a purely functional post-and-beam frame. Decorative versions placed within leisure gardens, allowed non-apidarists interaction with these forms. Perhaps, their low cost made them more common than their bee house counterparts. Impermanent and easily adapted to other uses, these versatile smaller buildings, as well as the bee house, fell out of favor with the advent of Langstroth's practical moveable-frame hive in 1852. Bee stands or a small stool, suffered a similar fate as bee shelters (Figure 34). They raised skeps off the ground and provided an alighting board for bees. However, their adaptably obscured their previous functions, removing them from the cultural landscape. Beekeepers experimented with these forms to provide efficient and healthy beehives. Most apiaries situated in a garden or near ample pasturage, supported

crop production through pollination. Beekeepers located their apiaries near main houses so that they could daily attend their hives. In northern regions, apiarists oriented hives facing south to benefit from the warm sun in winter. These adaptable forms supported successful beekeeping and were the unsung heroes of the agricultural landscape.

This thesis explored how beekeepers experimented with bee house forms and shelters overtime and across the United States and Great Britain. Although still used into the twentieth century, these historic bee houses became obsolete with the invention of Langstroth's moveable-frame hive, the standard practice among beekeepers today. This thesis reveals a once common outbuilding and feature that has largely disappeared from the American cultural landscape and rescued the bee house form from near total obscurity through patents, images, journals, surviving artifacts, buildings, and photographs. Hopefully this work will raise awareness of these rare agricultural buildings and bring forth further study and preservation.



Figure 32 Typical Features of a Bee house. *Drawn by Author.*

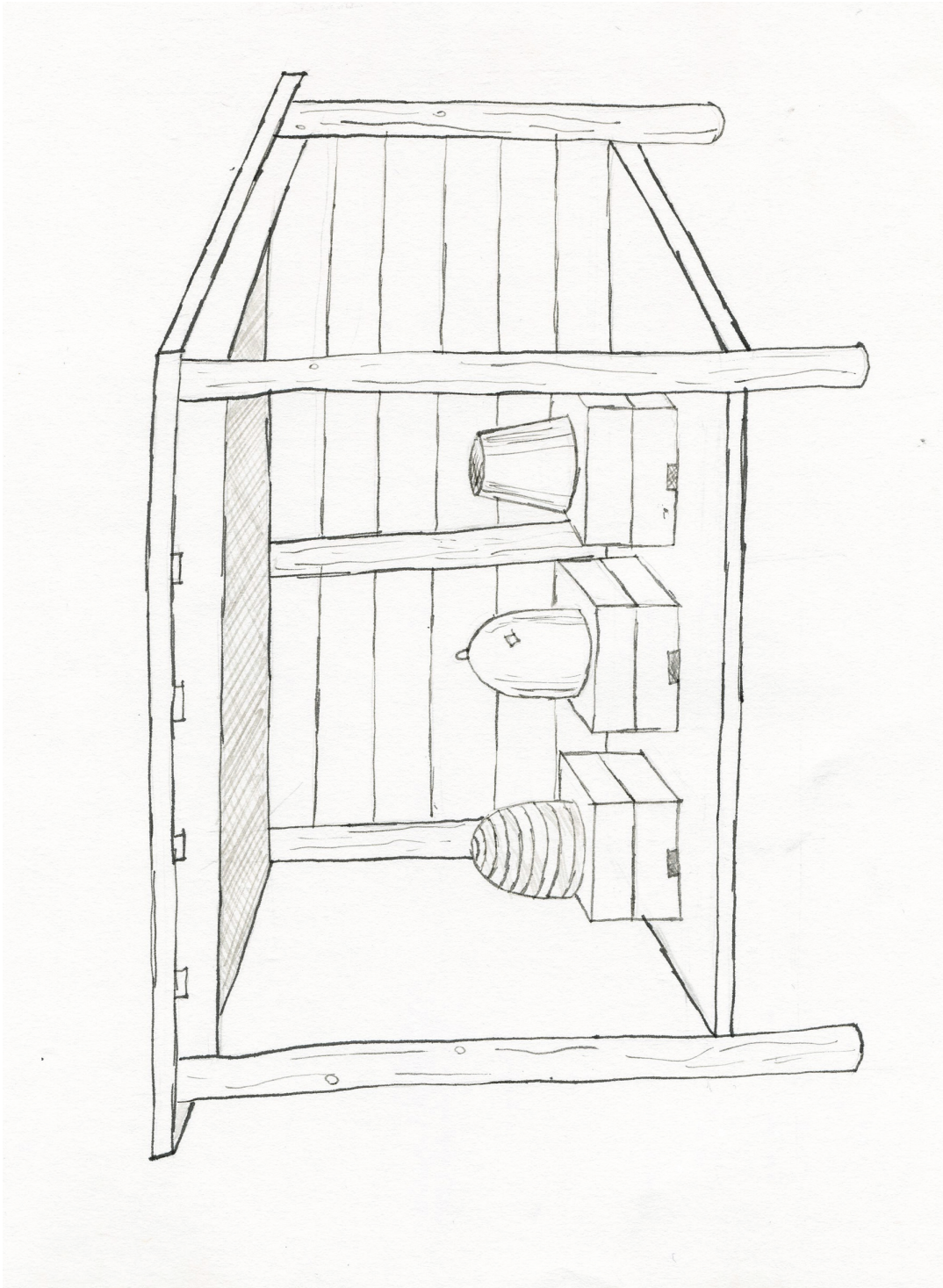


Figure 33 Typical Features of a Bee Shelter. *Drawn by Author.*

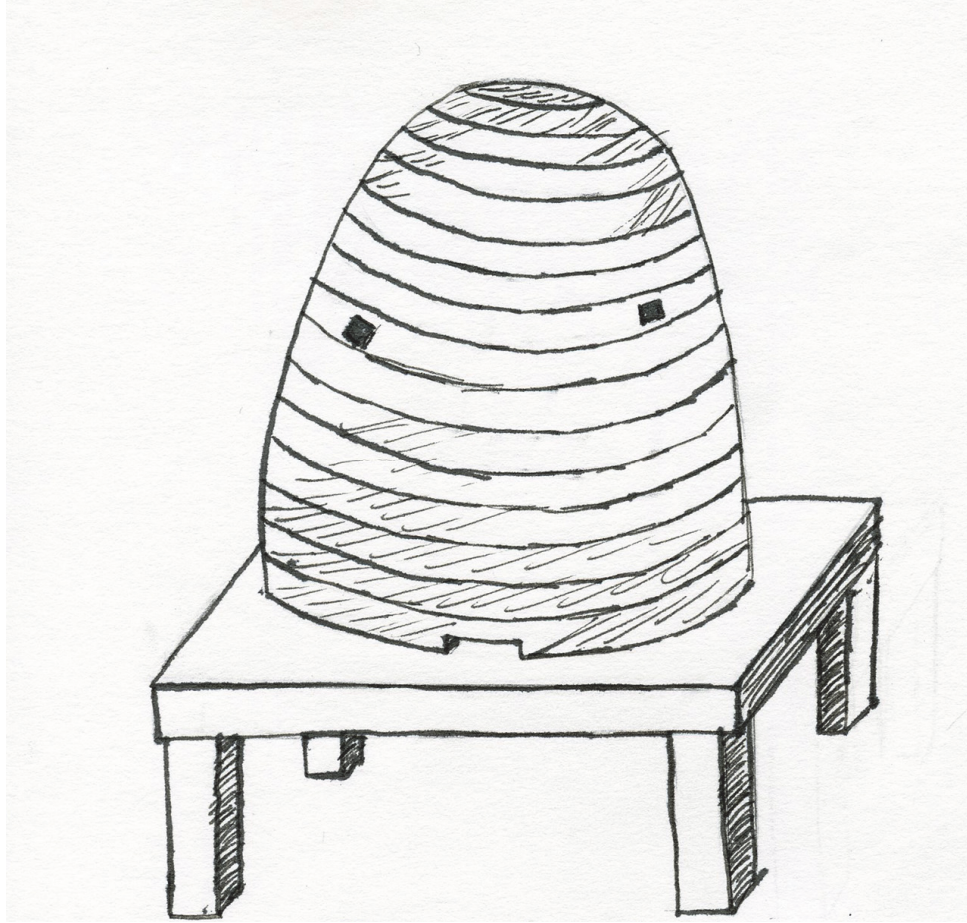


Figure 34 Typical Bee or Skep Stand. *Drawn by Author.*

Glossary

Alighting board a landing board for bees in front of the hive entrance.

Apiary a place where bees were kept, with two or more colonies in a small concentrated area.

Apiarist technical term for a beekeeper

Apiculture technical term for beekeeping

Bark Hive a hive made from a hollow log

Bee Alcove a large recess in a wall accommodating several shelves of straw beehives.

Bee Bole a recess in a wall to accommodate a single straw beehive. (Smaller than an alcove.)

Bee Culture beekeeping

Bee moth (Wax moth) a pest that infiltrated hives, feeding on nest materials and waste products, like beeswax.

Bee Niche bee alcove

Bee Space a 3/8-inch gap large enough for a bee, discovered by Langstroth

Bell Glass a glass vessel shaped like a dome or globe put on top of a hive.

Beehive a container for a honeybee colony

Bee House an enclosed stand-alone building, built to hold bees. A person is able to fit inside and access the hives.

Bee Shelter a structure with a roof and at least one or all four sides open to the elements.

Bee Stand (skep stand) a low wood or stone platform for a skep

Box Hives a wood box constructed to hold bees.

Chaff sawdust

Chaff hive a box hive insulated with chaff.

Collateral Hive beehive compartments arranged horizontally

Common Black Bee (German bee or *Apis mellifera*) honeybee imported to North America from Europe and commonly used in domestication in America until the introduction of the Italian bee in 1859.

Common Hive The collective term describing all reed based hives

Depriving Hive A hive with an aperture and passageway for an additional compartment.

Depriving System The queen is excluded from a compartment to prevent her laying eggs. The worker bees are allowed to pass through to build comb and store honey.

Hackle an outer straw tent-like covering placed over common hives for protection

Honey House a separate shed to store honey and supplies as well as extract honey from combs.

Italian Bee (*mellifera ligustica*) Introduced to the United States in 1859. Typical traits, less sensitive to cold, queens are more prolific, less aggressive, produce more honey, resist bee moth, better than the common black bee.

Moveable-frame Hive (Langstroth Hive) the honey combs are able to be individually removed from a box hive without cutting.

Nadir an additional hive, either a box or skep, added below the existing hive.

Queen Excluder a cover which prevents the queen from passing through but allows the other bees.

Single Hive or Swarming Hive A reed based hive without an aperture to add additional hives.

Skep a basket style of beehive made of straw or other reed

Spleet a small strip of wood or willow inserted into common hives for support.

Storified Hive (Storifying v.) two or more modular units tiered or stacked hives above the main hive.

Super an additional compartment above the main hive. The queen is excluded which allows the worker bees to make comb and honey. See depriving method.

Sulphuring the old custom of killing bees by placing hives over burning Sulphur.

Typologies a classification according to a general type.

Upright Hive or Trunk Hive traditionally an upright log hive used by beekeepers in the Northern Forest Zone of Europe.

Under-hiving or Nadiring an additional hive added below the main hive.

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Appendix

Figure 35: Mid-Atlantic Honey Production

United States Agricultural Census of 1860, 1930, 2012

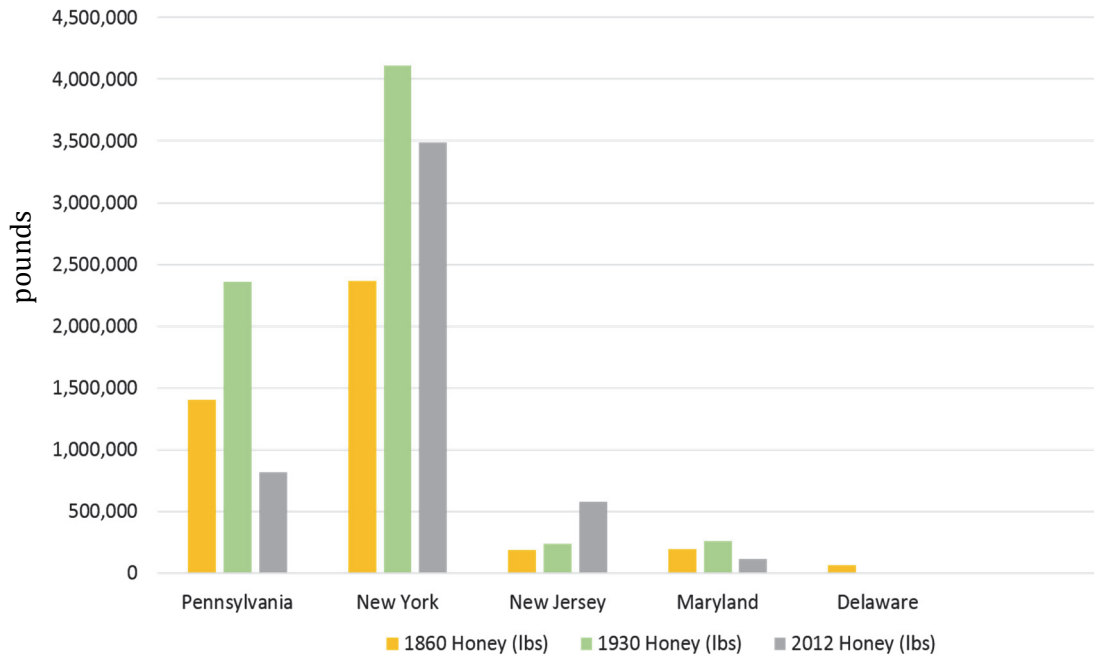
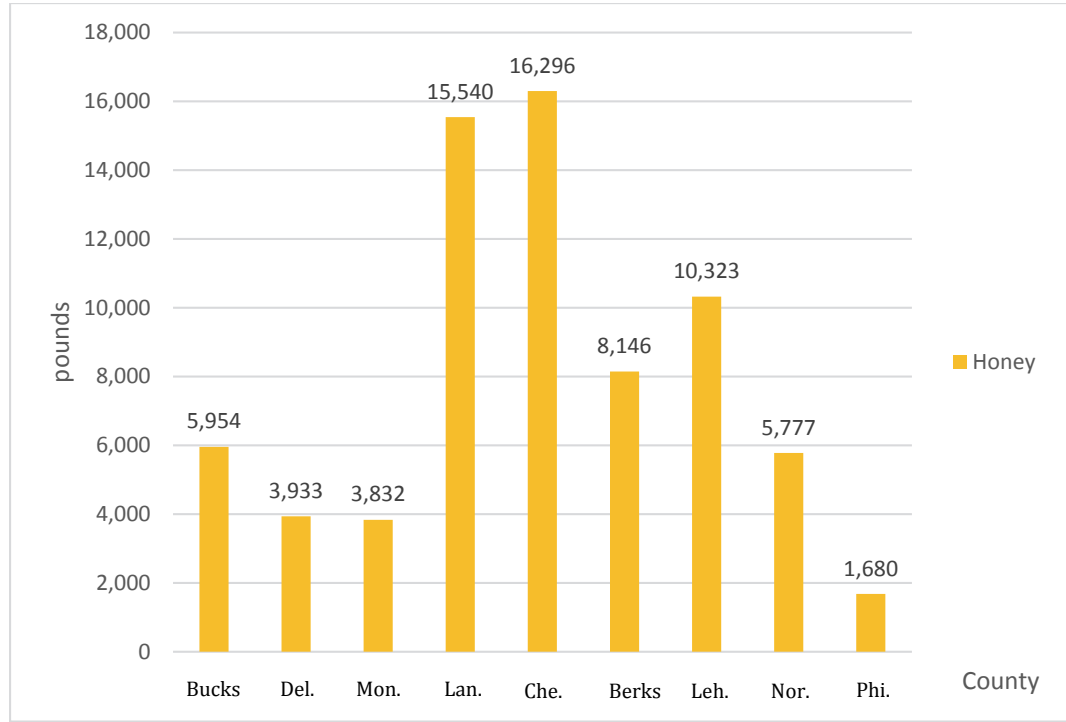


Figure 36: Counties Surrounding Philadelphia Honey Production

United States Agricultural Census 1860



Key:

Del. - Delaware

Mon. - Montgomery

Lan. - Lancaster

Che. - Chester

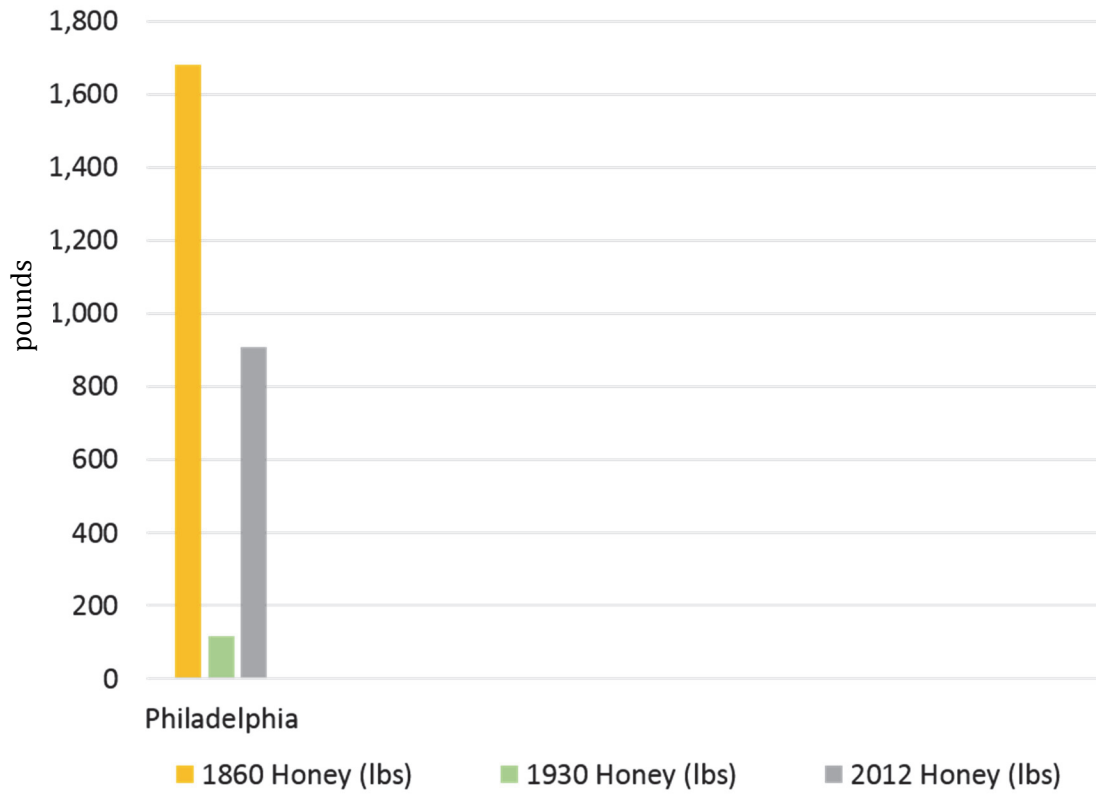
Leh. - Lehigh

Nor. - Northampton

Phi. - Philadelphia

Figure 37: Philadelphia County Honey Production by Year

United States Agricultural Census 1860, 1930, 2012



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